REPORT OF THE 38th MEETING OF THE COORDINATION GROUP FOR METEOROLOGICAL SATELLITES

CGMS-38

New Delhi, India
8-12 November 2010

Please note that this report is published together with a CD-ROM containing an electronic version of the report and all working papers presented at CGMS-38.

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CGMS MR 38

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FINAL REPORT OF THE PLENARY SESSION

A. INTRODUCTION

A.1 Welcome

On behalf of IMD, Dr Ajit Tyagi, Director-General of the Indian Meteorological Department (IMD), officially opened CGMS-38 at 09:00 on 8 November 2010 in New Delhi, India.

He welcomed participants of the 38th Session of CGMS to the Scope Complex. He also thanked EUMETSAT, the CGMS Secretariat, for the support provided in the preparations. Recalling that IMD became a CGMS Member in 1979, he reiterated the growing importance of the role of meteorological satellites and their contribution to the Global Observing System. With the forthcoming launch of INSAT-3D following INSAT-3A and Kalpana, IMD would be able to fully contribute both to the GOS and to the CGMS. He concluded by wishing all participants a fruitful and constructive meeting.

On behalf of the CGMS Secretariat, Dr Lars Prahm, EUMETSAT Director-General, also welcomed the participants, and expressed his sincere thanks to IMD for hosting the CGMS meeting and for the excellent organisational arrangements. Furthermore, he recalled EUMETSAT's long-standing commitment to CGMS and its willingness to continuing supporting the role of CGMS Secretariat.

He stated that meteorological satellites represented a key component of the Global Observing System and that the crucial task of enabling operational satellite operators, research and development institutions and WMO to ensure their efficiency and sustainability, through technical and operational coordination, lay within CGMS.

At this point, the plenary session was adjourned and the four CGMS Working Groups conducted their business over the next two days.

Following the resumption of the Plenary session on Thursday 11 November 2010, Dr Ajit Tyagi, Director-General of IMD, welcomed the participants to CGMS-38. He expressed his sincere thanks to Dr Lars Prahm, Director-General of EUMETSAT and the CGMS Secretariat for their support in organising the meeting in India in close cooperation with IMD.

He was pleased that this event provided IMD with a valuable opportunity to contribute to CGMS endeavors. As a member of CGMS, and with the launch of the INSAT-3D, Megha-Tropiques and SARAL satellites, India would further contribute to the WMO GOS and to the establishment of the Global Earth Observation System of Systems.

He concluded by iterating it was an honour for him to host CGMS-38 and wished the participants a fruitful meeting.

A.2 Election of Chairmen

Dr Ajit Tyagi, Director-General of the Indian Meteororological Department, was unanimously elected as Chairperson of CGMS-38, and the CGMS Secretariat as Rapporteur. The Plenary session confirmed the Chairpersons for the four Working Groups elected in the previous CGMS meeting, namely: Mr Marlin O Perkins for Working Group I on Telecommunications, with Mr Joaquin Gonzalez as Rapporteur; Prof Vasily Asmus for Working Group II on Satellite Products, with Dr Mitch Goldberg and Dr Johannes Schmetz as Rapporteurs; Mrs Suzanne Hilding for Working Group III on Contingency Planning with Mr Jerôme Lafeuille as Rapporteur; and Mr Mikael Rattenborg as Chairperson of Working Group IV on Global Data Dissemination, with Mr Gordon Bridge as Rapporteur.

A.3 Adoption of Schedule

CGMS-38 adopted the schedule and agreed that the four Working Groups would meet on 8-9 November 2010.

The Secretariat provided a draft agenda (see Annex 1), which was used as a basis for the subsequent discussions together with the list of working papers submitted to CGMS-38 (see Annex 2).

A.4 Nomination of Drafting Committee

The Drafting Committee was nominated, consisting of the Chairpersons of CGMS-38, its Rapporteurs, the Chairpersons of the Working Groups and their Rapporteurs, and the CGMS Secretariat.

The drafting of various sections of the final meeting report was carried out by the CGMS Secretariat with the assistance of CGMS participants, based upon summaries of submitted working papers and reports of the Working Groups and plenary sessions.

A.5 Review of Actions Items from the Previous Meetings

The Secretariat reviewed the outstanding actions from previous meetings, taking into account inputs provided in Working Papers by the Members, as well as by other means of correspondence, including e-mail. Related Working Papers: CMA-WP-01, CMA-WP-02, ESA-WP-03, EUM-WP-01/-02, KMA-WP-01, JMA-WP-01, NOAA-WP-01/-40.

Status of Actions and Recommendations resulting from CGMS-37 (as per 10 November 2010)

Actions open from CGMS-36 (at CGMS-37)

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
WMO	WGIII 36.24	Action 36.24: WMO to convene a contingency planning workshop in the second half of 2009 in order to investigate critical missions and associated potential contingency actions regarding the new missions implied by the Vision for the GOS in 2025. Deadline: 30 June 2009	Closed following discussions at CGMS-38.	(30 Jun 2009) New deadline: 30 Jun 2010	**CLOSED**
CGMS Task Force on Codes	WGIV 36.27	Action 36.27: CGMS Task Force on Satellite Data Codes to propose a permanent framework for the activity by CGMS-37. Deadline: CGMS-37	At the TFSDC meeting on 14 September 2009, the Task Force recommended updated Terms of Reference to continue its work and proposed to close the action. (See CGMS-38 WMO-WP-09). Closed following discussions at CGMS-38.	(CGMS-37) New deadline: CGMS-38	**CLOSED**

CGMS-37 permanent actions

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
CGMS Members	Permanent 01	All CGMS Members to inform the Secretariat of any change in the status or plans of their satellites to allow the updating of the CGMS Tables e-mail, of Satellites (tables 1-6 of the plenary report). The Secretariat to review the tables of current and planned polar and geostationary satellites, and to distribute this updated information, via the WWW Operational Newsletter, via Electronic Bulletin Board, or other means as appropriate. CGMS satellite operators to update table 7 for polar-orbiting satellite equator crossing times on an annual basis. CGMS Members to update the table on polar-orbiting satellite equator crossing times as well as the table on coverage from geostationary satellites.	EUM-WP-02, NOAA-WP-02, -03, -04, -07, -08, -19, -35, -40, -43	CGMS-38	CLOSED
CGMS satellite operators	Permanent 02	CGMS Members to report on spacecraft anomalies from solar events at CGMS meetings.	EUM-WP-05, NOAA-WP-05	CGMS-38	CLOSED
CGMS Members	Permanent 03	CGMS Members to review the list of available list servers used by CGMS groups and update as appropriate.	Ongoing	CGMS-38	CLOSED
CGMS Members	Permanent 04	CGMS satellite operators to consider the IOC satellite requirements, especially the data dissemination methods, bearing in mind the ongoing formations of GOOS Regional Alliances (GRAs).	EUM-WP-16, NOAA responded at CGMS XXXV, no update at this time.	CGMS-38	CLOSED

CGMS-37 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
ROSHYDROMET	37.01	Action 37.01: ROSHYDROMET to inform CGMS about the availability of Meteor-M calibration data. Deadline: CGMS-38		(CGMS-38) New Deadline: CGMS-39	**OPEN**
EUM, NOAA	37.02	Action 37.02: EUMETSAT and NOAA to inform CGMS about the cooperative scientific studies being carried out as part of the preparations for MTG and GOES-R. Deadline: CGMS-38	EUM-WP-26 WGII/10, NOAA-WP-08	CGMS-38	**CLOSED**
EUM	37.03	Action 37.03: EUMETSAT to inform CGMS about the data dissemination plan for MTG. Deadline: CGMS-38	EUM-WP-34 WGIV/2	CGMS-38	**CLOSED**
ESA	37.04	Action 37.04: ESA to inform CGMS whether the soil moisture information derived from SMOS data is comparable to that derived from Scatterometer data. Deadline: CGMS-39		(CGMS-38) New Deadline: CGMS-39	**OPEN**
CGMS Members (JAXA)	37.05	Action 37.05: CGMS members are encouraged to collaborate with JAXA in the context of the GPM and CEOS Precipitation Constellation activities. JAXA to report on the status of these collaborative activities. Deadline: CGMS-38	NOAA collaborates with JAXA through mutual participation in GPM X-Cal Working Group and the CGMS International Precipitation Working Group (IPWG).	CGMS-38	**CLOSED**
CGMS Members	37.06	Action 37.06: CGMS Members who are not represented at CEOS should designate a focal point who will receive from CEOS the annual call for updates. Deadline: 30 Apr 2010	Confirmed by CEOS.	30-Apr-10	**CLOSED**
EUM	37.07	Action 37.07: CGMS Secretariat to revise the satellite table and provide it to CGMS Members. Deadline: 30 April 2010	The tables available on the WMO web site: http://www.wmo.int/pages/prog/sat/Satellites.html will be used for this purpose.	30-Apr-10	**CLOSED**
CGMS Members	37.08	Action 37.08: CGMS satellite operators take the Vision for the GOS in 2025 into account when developing their own planning, and to report at the next meeting of CGMS on their initiatives to respond and contribute to its continued implementation. Deadline: CGMS-38	NOAA-WP-11	CGMS-38	**CLOSED**
CGMS Members	37.09	Action 37.09: CGMS members to provide reports to the next session of CGMS on climate-related activities and plans in support of GCOS requirements. These reports should include comments on the maturity index for climate data records under development by NOAA, as well as on the *Guideline for the Generation of Satellite-based Data-sets and Products Meeting GCOS Requirements* (GCOS-128). Deadline: CGMS-38	EUM-WP-15, NOAA-WP-13	CGMS-38	**CLOSED**

CGMS-37 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	37.10	Action 37.10: CGMS members to a) review the draft updated GCOS Implementation Plan (IP-09/10) during the open review period running from November 2009 to February 2010, and send their comments to the GCOS Secretariat; b) provide input to GCOS for the purpose of the Guideline for the generation of satellite-based data-sets and products meeting GCOS requirements. Deadline: 15 February 2010.	E-mail to plenary 15 Jan 2010. JMA e-mail 3 Feb 2010: No further comments. Information provided to GCOS Secretariat 16Apr2010. 'Guideline on the Generation of Data-sets and Products Meeting GCOS Requirements' (note the generic title) which is now available on the GCOS website as GCOS-143 (WMO/TD-No. 1530), May 2010 (http://www.wmo.int/pages/prog/gcos/Publications/gcos-143.pdf); NOAA has reviewed the GCOS Implementation Plan.	15-Feb-10	**CLOSED**
EUM	37.11	Action 37.11: CGMS Secretariat to prepare a letter including a statement from CGMS on the importance of space observations for climate monitoring. Deadline: 15 November 2009	CGMS Secretariat letter sent 16 Nov 2009. Copy iterated to CGMSPLEN on 4 Feb 2010.	15-Nov-09	**CLOSED**
VL Co-chairs	37.12	Action 37.12: VL Co-chairs to discuss with VL sponsoring agencies the funding of the Technical Support Officer (TSO) position from the end of 2010 onwards. Deadline: CGMS-38	In consultation with VL Co-chairs, WMO sent a letter to CGMS satellite operators on 5/07/2010. In principle support was received. WMO-WP-16. NOAA accepted funding up to end of 2011. NOAA-WP-14 Funding still to be found for 2012 onwards. Deadline from the end of 2011 onwards	(CGMS-38) New Deadline: CGMS-39	**OPEN**
VL Co-chairs	37.13	Action 37.13: VL Co-chairs and WMO to convene the fifth Virtual Laboratory Management Group (VLMG-5) meeting during the first half of 2010. Deadline: CGMS-38	VLMG-5 was convened in Beijing from 12 to 16 July 2010. Report available at: http://www.wmo.int/pages/prog/sat/Reports.html#VLMGWMO-WP-16, NOAA-WP-14	CGMS-39	**CLOSED**
WMO	37.14	Action 37.14: WMO to continue dialogue with ISRO regarding the establishment of an Indian CoE and the co-sponsoring of the CoE in Oman. Deadline: CGMS-38.	NOAA-WP-14 PLENARY	(CGMS-38) New Deadline: CGMS-39	**OPEN**
WMO + VL Co-chairs	37.15	Action 37.15: VL Co-chairs and WMO to seek an agreement between CGMS, COMET and WMO with a view of using the ESRC as a resource library for the VL. Deadline: CGMS-38	WMO-WP-16	CGMS-39	**CLOSED**
WMO + VL Co-chairs	37.16	Action 37.16: The Co-chairs, in consultation with the WMO Space Programme and other relevant WMO Departments, to prepare a roadmap towards widening the scope of VL activities to serve the needs of emerging scientific communities in developing countries. This roadmap will be reviewed by the VLMG and presented to CGMS-38 for approval. Deadline: CGMS-38.	NOAA-WP-14	CGMS-39	**CLOSED**
CGMS Members	37.17	Action 37.17: CGMS Members to complete the tables of data access information, and to provide the relevant internet links to WMO. Deadline: CGMS-38	EUM-WP-36; NOAA responded via email. PLENARY	(CGMS-38) New Deadline: CGMS-39	**OPEN**

CGMS-37 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
WMO	37.18	Action 37.18: WMO to finalise the IROWG Terms of Reference in accordance with the conclusions of CGMS-37 and inform the CGMS Secretariat and the two nominated Co-Chairs. Deadline: 31 December 2009.	WMO e-mail 7 Dec 2009 provided the ToR. CGMSPLEN informed via e-mail 4 Feb 2010.	31/12/2009	**CLOSED**
EUM	37.19	Action 37.19: The CGMS Secretariat to send a proposal of the revised agenda to Members for comment and approval in order to use it at CGMS-38. Deadline: 28 February 2010	Circulated to working points of contact of Members in June 2010 for comment.	28-Feb-10	**CLOSED**
EUM	WGI 37.20	Action 37.20: CGMS Secretariat to develop the CGMS coordinated response on the future use of the 401–403 MHz band at the 2010 SFCG-30 meeting (6-14 July 2010). Deadline: 31 January 2010	EUM input to SFCG-30 prepared meeting in July 2010. EUM-WP-24	31-Jan-10	**CLOSED**
EUM	WGI 37.21	Action 37.21: EUMETSAT to present the CGMS Secretariat's statement on the final outcome of the rationalisation of the frequency assignments and use of the DCS uplink band (401-403 MHz). Deadline: SFCG-30	To be discussed at SFCG-30 in July 2010. EUM-WP-24	30-Jun-10	**CLOSED**
CGMS Members	WGI 37.22	Action 37.22: CGMS members to present their plans for frequency bands above 275 GHz. Deadline: CGMS-38	EUM-WP-21, NOAA-WP-17	CGMS-38	**CLOSED**
CGMS Members	WGI 37.23	Action 37.23: All CGMS members to report on their plans of utilisation for the band 7750-7850/7900 MHz (i.e. including the 7850-7900 MHz extension if agreed in WRC-11). Deadline: CGMS-38	EUM-WP-22, NOAA-WP-18	CGMS-38	**CLOSED**
CGMS Members	WGI 37.24	Action 37.24: CGMS members to coordinate with CEOS in providing inputs for the report being prepared by ITU-R "The essential role and global importance of radio spectrum use for Earth observations and for related applications." In particular, for chapter 4 about the potential economical impacts of data loss due to RF interference. Deadline: 31 May 2010	Answered by EUMETSAT in EUM/SES/LET/10/0161 (10 March 2010), DG letter to CEOS EO Frequency Spectrum and SFCG Coordinator confirming name for coordinator on EUMETSAT side. EUM-WP-20. NOAA coordinated with CEOS and responded to the ITU report and provided input on chapter 4 about the potential economic impacts of data loss due to RF interference.	31-May-10	**CLOSED**
CGMS Members	WGI 37.25	Action 37.25: CGMS members to review the proposed position for WRC-12 contained in WMO-WP-01 and send comments to the Chairman of SG-RFC (philippe.tristant (at) meteo.fr) and to WMO Secretariat (jlafeuille (at) wmo.int). Deadline: 31 December 2009	JMA e-mail 24 Dec 2009: Supports the proposal. EUM e-mail 3 Feb 2010: Supports the proposal. EUM-WP-20 Reminder to plenary 12Jul2010. NOAA responded via email and supports the proposal.	31-Dec-09	**CLOSED**
CGMS Members	WGI 37.26	Action 37.26: In the future when reporting on systems, all CGMS members are asked to expand the details to cover the use of the different frequency bands and the related services. Deadline: CGMS-38	EUM-WP-23. NOAA provided expanded information on its frequency bands and services in all of its working papers.	CGMS-38	**CLOSED**
CGMS Members involved in GSICS	WGII 37.27	Action 37.27: GSICS to work with CEOS WGCV to assess Dunhuang and Qinghai Lake as reference sites. Deadline: CGMS-38	NOAA-WP-24	CGMS-38	**CLOSED**
ESA	WGII 37.28	Action 37.28: ESA to provide a working paper on the long-term monitoring of MERIS as a reference calibration instrument. Deadline: CGMS-38		CGMS-38) New Deadline: CGMS-39	**OPEN**
NOAA (GSICS EP Chair)	WGII 37.29	Action 37.29: GSICS Executive Panel Chair to send letter to JAXA on the roles and responsibility of JAXA as a GSICS full member. Deadline: 30 Apr 2010	NOAA informed CGMS that the WMO Space Programme Director has completed this action.	30-Apr-10	**CLOSED**

CGMS-37 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members involved in GSICS	WGII 37.30	Action 37.30: GSICS agencies to implement web-accessible instrument performance monitoring capabilities using the guidelines provided from the GSICS Coordination Centre. Deadline: CGMS-38	GSICS internal action that will take a few years to implement at all agencies.	CGMS-38	**CLOSED**
CMA	WGII 37.31	Action 37.31: CMA to make available in near-real time the FY-3A sounder radiance data for NWP. CMA to provide a status of the work to the CGMS Secretariat. Deadline: 31 January 2010	CMA has started providing available FY-3A sounder radiance data to ECMWF. Also, access to FY-3 sounder data is possible through the ftp server by becoming a registered user of http://fy3.satellite.cma.gov.cn/ArssEn	31-Jan-10	**CLOSED**
NOAA (GSICS EP Chair)	WGII 37.32	Action 37.32: NOAA to organize a working-level meeting of experts in coordination with GSICS, to provide a consensus algorithm for achieving a GSICS version-1 MSU and AMSU intercalibrated data-set. Deadline: 30 Aug 2010	NOAA-WP-25	30-Aug-10	**CLOSED**
CGMS Members	WGII 37.33	Action 37.33: CGMS confirms Dr G. Huffman as single point of contact for GEO precipitation activities.	CLOSED (completed during the CGMS-37 plenary session).	30-Oct-09	**CLOSED**
NOAA	WGII 37.34	Action 37.34: On the basis of existing scientific prototype software for GOES-R, NOAA to report on the availability of software to other satellite operators with similar planned geostationary instruments. Deadline: 30 June 2010	NOAA-WP-32	30-Jun-10	**CLOSED**
KMA	WGIV 37.35	Action 37.35: KMA to provide CGMS with information on its Point of Contact for user access enquiries. Deadline: 30 April 2010	Dr (Mr) Bongju Lee, National Meteorological Satellite Centre/KMA E-mail: bjlee@kma.go.kr CGMSPLEN informed by e-mail 4 Feb 2010.	30-Apr-10	**CLOSED**
NOAA	WGIV 37.36	Action 37.36: NOAA is invited to develop a simplified current GOES/GOES-R user data access scheme, for use especially during the period of transition from the current GOES system to the operational GOES-R and S system. Deadline: CGMS-38	NOAA-WP-36	CGMS-38	**CLOSED**
CGMS satellite operators	WGIV 37.37	Action 37.37: All CGMS satellite operators to regularly include user statistics in their reports on current satellite systems. Deadline: CGMS-38	EUM-WP-03/-04. NOAA is actively investigating methods to include user statistics when reporting on current satellite systems.	(CGMS-38) New Deadline: CGMS-39	**OPEN**
CMA	WGIV 37.38	Action 37.38: CMA to inform CGMS about its upgraded FENGYUNCast service. Deadline: CGMS-38		CGMS-38	**CLOSED**
NOAA	WGIV 37.39	Action 37.39: NOAA to report on its plans for the full integration of GEONETCast Americas into the global GEONETCast system and service all GEO Societal Benefit Areas. Deadline: CGMS-38	NOAA-WP-39	CGMS-38	**CLOSED**
CGMS satellite operators	WGIV 37.40	Action 37.40: CGMS satellite operators to consider using the layout of the table of satellite data requirements for South and central America, presented in document ET-SUP-RED-1/Doc. 6.2, (24.IX.2009) as a template for the collection of user requirements in other WMO Regions. Deadline: CGMS-38	NOAA-WP-42	CGMS-38	**CLOSED**
WMO	WGIV 37.41	Action 37.41: WMO to consider including Metop-IASI data within the RARS. Deadline: CGMS-38		CGMS-38	**CLOSED**

CGMS-37 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
WMO - TFSDC	WGIV 37.42	Action 37.42: The Chairman of the Task Force on Satellite Data Codes should write to the CGMS Secretariat explaining the rationale behind the WMO-requested actions and provide full supporting documentation to allow CGMS to formulate possible further actions on Members concerning the categorization of their products. Deadline: 30 Apr 2010		30-Apr-10	**CLOSED**
WMO, ROSHYDROMET	WGIV 37.43	Action 37.43: WMO to confirm with ROSHYDROMET its membership of the Task Force on Satellite Data Codes. Deadline: 30 Apr 2010		30-Apr-10	**CLOSED**

CGMS-37 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
WMO	Recommendation 37.01	Recommendation 37.01: WMO to continue to keep the Dossier on the Space-based Global Observing System under review by the relevant groups of experts of WMO Members (e.g. the CBS/OPAG-IOS Expert Teams on Satellite Systems and on Satellite Utilization and Products). (Replacing recommendation 36.02)	The Dossier is updated at least twice a year and is brought to attention of the relevant Expert Teams (ET-SAT, ET-SUP, ET-EGOS). WMO-WP08	CGMS-38	**CLOSED**
WMO, CGMS satellite operators	Recommendation 37.02	Recommendation 37.02: • WMO to continue to pursue harmonisation of structure and contents of the GOS Dossier and the CEOS databases, in cooperation with CEOS. (Replacing recommendation 36.03); • That CGMS space agencies support WMO in filling the gaps in the GOS Dossier Volume II (Instrument descriptive tables) in response to specific requests by WMO; • WMO to continue to inform CGMS of the status of the Rolling Requirements Review process (RRR); and additionally • that WMO continues to report on the major updates to the Dossier on the Space-based Global Observing System.	NOAA is very supportive of this recommendation and will provide any information needed by the WMO. WMO-WP-08	CGMS-38	**CLOSED**
ESA	Recommendation 37.03	Recommendation 37.03: As far as practical, ESA will include additional fields in the forms used for the CEOS Call for updates, in order to address the detailed questions to be answered for the Dossier.		CGMS-38	**CLOSED**
CGMS satellite operators	Recommendation 37.04	Recommendation 37.04 CGMS satellite operators are invited to take the Vision for the GOS in 2025 into account when developing their own planning, and to report at the next meeting of CGMS on their initiatives to respond and contribute to its continued implementation. (Ref. Recommendation 36.04).	NOAA-WP-11 / WMO-WP-03	CGMS-38	**CLOSED**
CGMS Members	Recommendation 37.05	Recommendation 37.05: CGMS Members, including research space agencies, are invited to participate in SCOPE-CM and propose additional pilot projects for the sustained and coordinated processing of environmental satellite data, in particular for the oceanic and/or terrestrial ECVs.	Action being pursued by SCOPE-CM.	CGMS-38	**CLOSED**

CGMS-37 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Recommendation 37.06	Recommendation 37.06: CGMS Members are invited to support collaboration and CGMS invited individual countries to contribute to the WMO Trust Fund or provide a secondment, as appropriate.	NOAA has no response at this time. WMO appreciates secondment from Japan in 2010 and from Germany in 2010-2011.	CGMS-38	**CLOSED**
CGMS Members	Recommendation 37.07 WGI	Recommendation 37.07: CGMS members are encouraged to continue to inform spectrum meeting representatives on the relevance and importance of frequency agenda items of importance to CGMS.	Discussed in WG I EUM: Discussed in relevant European fora including EUMETSAT Delegate bodies in spring 2010. NOAA-WP-16.	CGMS-38	**CLOSED**
CGMS Members involved in CEOS WG CV and GSICS	Recommendation 37.08 WGII	Recommendation 37.08: CEOS WG CV and GSICS to study and report on intercomparisons of vicarious calibrations and trends in visible channels obtained from various land sites.	EUM-WP-27, NOAA-WP-26	CGMS-38	**CLOSED**
CGMS Members involved in GSICS	Recommendation 37.09 WGII	Recommendation 37.09: GSICS to establish a publicly accessible database to provide full history of operational changes that affect instrument performance and calibration. It should include the date and time of each operating changes that affect the performance and calibration of each instrument, a short summary of the change, and a quantitative assessment of the severity of the impact on the instrument's calibration.	NOAA reports this action is underway within GSICS.	CGMS-38	**CLOSED**
CGMS Members	Recommendation 37.10 WGII	Recommendation 37.10: All CGMS agencies are encouraged to participate in GSICS in order to ensure a worldwide comparability and seamless integration of space-based observation data sets, which will ultimately benefit all.	ISRO, JAXA and ROSHYDROMET are now full members, ESA is observer.	CGMS-38	**CLOSED**
NOAA	Recommendation 37.11 WGII	Recommendation 37.11: NOAA is encouraged to merge the MSU and AMSU data into a consistent climate time series of radiance/temperature data. A report to CGMS-38 is welcome.	NOAA-WP-27	CGMS-38	**CLOSED**
CGMS Members	Recommendation 37.12 WGII	Recommendation 37.12: CGMS Members to contribute to page changes of the "Special Collection Issue" of papers arising from IPWG-4 in the AMS Journal of Applied Meteorology and Climatology.	NOAA will be providing the resources (~10 K) to print 150-200 copies of the issue, anticipated in early 2011.	CGMS-38	**CLOSED**
CGMS Members	Recommendation 37.13 WGII	Recommendation 37.13: CGMS members to provide support for attendance at the next IPWG Workshop, 4-8 October 2010, in Hamburg, Germany for six scientists from developing and least developed countries.	See NOAA's response to Recommendation 37.12.	31-Aug-10	**CLOSED**
CGMS Members involved in GSICS	Recommendation 37.14 WGII	Recommendation 37.14: GSICS is requested to provide IPWG current and archived instrument metadata and information regarding instrument health for sensors used to estimate precipitation.	NOAA has started to provide this information as part of their real-time instrument monitoring system which includes AMSU-A and –B (MHS) and SSMIS see: http://www.star.nesdis.noaa.gov/smcd/spb/icvs/index.php.	CGMS-38	**CLOSED**
CGMS Members - satellite operators	Recommendation 37.15 WGII	Recommendation 37.15: CGMS operators are requested to undertake reprocessing of L1 radiance data and L2 precipitation data sets when significant calibration corrections are developed and algorithm improvements are implemented into operations.	NOAA has a new climate data records program which is planning this activity.	CGMS-38	**CLOSED**

CGMS-37 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members - satellite operators	Recommendation 37.16 WGII	Recommendation 37.16: CGMS operators are requested to contribute in a timely fashion to the open archive of the international constellation of precipitation-relevant sensors, for example, for use in GPM.	NOAA sensor data-sets contributing to GPM are always open and available from CLASS. (www.class.noaa.gov)	CGMS-38	**CLOSED**
CGMS Members involved in IPWG	Recommendation 37.17 WGII	Recommendation 37.17: Co-chairs of IPWG are invited to formally contact KMA concerning its participation in IPWG. KMA to provide IPWG with the point of contact. Deadline: 30 June 2010	During visit to KMA in August 2010, NOAA invited KMA to attend IPWG.	30-Jun-10	**CLOSED**
CGMS Members	Recommendation 37.18 WGII	Recommendation 37.18: WMO encourages CGMS members to repeat the very informative international operational AMV algorithm intercomparisons at regular time intervals of about 3-4 years.	EUM-WP-28. NOAA is investigating AMV algorithm intercomparisons at regular time intervals.	CGMS-38	**CLOSED**
CGMS Members	Recommendation 37.19 WGII	Recommendation 37.19: CGMS members should provide support to the next IWW10 meeting by approving participation of scientists and operational staff working on the utilisation and derivation of satellite winds and, if possible, by providing some support to travel of relevant people from the research community.	EUM-WP-29. NOAA supported travel of Dr. John LeMarshall (Australian Bureau of Meteorology) to IWW10.	30-Jun-10	**CLOSED**
CGMS Members	Recommendation 37.20 WGII	Recommendation 37.20: Efforts by CGMS Members to enhance the use of AMVs in NWP should continue to address both the quality of the AMVs as well as the way the product is utilized in NWP assimilation systems.	EUM-WP-28. NESDIS is involved in the many activities that contribute to this recommendation (see response within NOAA-WP-01).	CGMS-38	**CLOSED**
CGMS polar operators	Recommendation 37.21 WGII	Recommendation 37.21: In view of the success of the polar winds all efforts should be undertaken to continue such products as long as possible from imaging instruments in polar orbits.	EUM-WP-28. See NOAA response within NOAA-WP-01.	CGMS-38	**CLOSED**
CGMS members involved in IWWG 10	Recommendation 37.22 WGII	Recommendation 37.22: IWWG 10 is requested to address the development of a stand-alone software package for the derivation of AMVs from imaging satellite instruments.	EUM-WP-29. IWW10 co-chairs, Jaime Daniels (NOAA) and Mary Forsythe (Met Office) have submitted a working paper (see EUM-WP-42) on this topic to Jo Schmetz (EUMETSAT; IWWG rapporteur to CGMS).	CGMS-38	**CLOSED**
CGMS Members	Recommendation 37.23 WGII	Recommendation 37.23: CGMS endorsed and recommended all topics listed in EUM-WP-31 section 6 for a detailed discussion at IWWG 10.	EUM-WP-29. IWW10 co-chairs, Jaime Daniels (NOAA) and Mary Forsythe (Met Office) have submitted a working paper (see EUM-WP-29) to Jo Schmetz (EUMETSAT; IWWG rapporteur to CGMS) that summarizes the outcomes of the 10th International Winds Workshop (IWW10) that took place in Tokyo from 22-26 February 2010. This working paper includes a summary of discussions and recommendations of items listed in EUM-WP-31.	CGMS-38	**CLOSED**
JMA	Recommendation 37.24 WGII	Recommendation 37.24: JMA is invited to report at IWW10 on the derivation and quality of AMVs derived from the MTSAT imaging at time intervals as short as 7 and 4 minutes, respectively.	NOAA reported that JMA did present material at IWW10 on this action.	CGMS-38	**CLOSED**
EUM, NOAA	Recommendation 37.25 WGII	Recommendation 37.25: On the basis of existing scientific prototype software for product retrievals, NOAA and EUMETSAT offer to other satellite operators existing prototype algorithm software for testing and further development.	EUM-WP-26. NOAA can only provide software through bilateral agreements and potential licensing agreements.	CGMS-38	**CLOSED**

CGMS-37 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Recommendation 37.26 WGII	Recommendation 37.26: CGMS agencies are encouraged to review NOAA-WP-17 and EUM-WP-28, and provide working papers describing their product development processes at CGMS-38.	NOAA and EUMETSAT propose the action.	CGMS-38	**CLOSED**
NOAA	Recommendation 37.27 WGII	Recommendation 37.27: NOAA is encouraged to include GRUAN radiosondes into NPROVS and to provide regular performance statistics of satellite products with GRUAN.	NOAA-WP-33.	CGMS-38	**CLOSED**
CGMS Members	Recommendation 37.28 WGII	Recommendation 37.28: CGMS members are invited to consider the testing and use of the NOAA NPROFS and EDGE systems and to contribute to comparisons by providing relevant data sets.	NOAA-WP-33.	CGMS-38	**CLOSED**
CGMS satellite operators	Recommendation 37.29 WGIV	Recommendation 37.29: Satellite operators to support the further development and expansion of IGDDS/RARS as operational components of the WIS architecture.	NOAA has no response at this time.	CGMS-38	**CLOSED**
CGMS satellite operators	Recommendation 37.30 WGIV	Recommendation 37.30: All Satellite operators to consider applying as DCPCs.	NOAA is reviewing the criteria for applying as a DCPC. WMO-WP-06	CGMS-38	**CLOSED**
CGMS satellite operators	Recommendation 37.31 WGIV	Recommendation 37.31: Satellite operators to prepare metadata related to satellite data and products to the GISCs in accordance with the WMO core profile of the ISO metadata standard and to make them available to the GISCs.	NOAA is preparing new metadata standards are being applied to JPSS and GOES-R.	CGMS-38	**CLOSED**
CGMS satellite operators	Recommendation 37.32 WGIV	Recommendation 37.32: Satellite operators to apply ISO 23950 for search as an effective enablement for interoperability between systems, including the WIS.	NOAA has no response at this time.	CGMS-38	**CLOSED**
CGMS - TFSDC	Recommendation 37.33 WGIV	Recommendation 37.33: The CGMS Task Force on Satellite Data and Codes (TFSDC) to interact as appropriate with the WMO/CBS Inter-Programme Expert Team on Data Representation and Codes (IPET-DRC), and the WMO/CBS Inter-Programme Expert Team on Metadata and Data Interoperability (IPET-MDI) with a view to contributing to the development of the WMO/WIS data representation and code forms for satellite data and products, and to the development of a comprehensive WIS data representation system policy.	On-going task of TFSCD. WMO-WP-05.	CGMS-38	**CLOSED**

B. REPORT ON THE STATUS OF CURRENT SATELLITE SYSTEMS

B.1 Polar-Orbiting Meteorological Satellite Systems

CMA-WP-03 reported on the status of Chinese polar orbiting meteorological satellite programme. The FY-1 is the first Chinese polar-orbiting meteorological satellite series that started with the launch of FY-1A on 7 September 1988. The FY-1 program totally produced four satellites in total, namely the FY-1A/B/C/D. The FY-1 series is a 3-axis stabilised spacecraft programme, carrying the multi-channel Visible and Infrared Scanning Radiometer (VIRR) for the Earth environment monitoring at sub-point, the resolution is 1.1km; and Space Environment Monitor (SEM) for in-situ observation of charged particles in solar wind. Direct Readout Service is available through HRPT transmission. As of 24 September 2010, the FY-1D is operational. The FY-3 satellites are a new series that will replace the FY-1 series. The first FY-3 satellite, FY-3A, was launched on 27 May 2008 and is also 3-axis stabilised. To keep the continuity of AVHRR observations, FY-3A carries the multi-channel Visible and Infrared Scanning Radiometer that flies on FY-1. In addition, the FY-3A carries the Medium Resolution Spectral Imager (MERIS), the Microwave Radiation Imager (MWRI), the Infrared Atmospheric Sounderspace (IRAS), the Microwave Temperature Sounder (MWTS), the Microwave Humidity Sounder (MWHS), the Total Ozone Unit and Solar Backscatter Ultraviolet Sounder (TOU/SBUS), as well as an Earth Radiation Budget instrument. FY-3 transmits data in three modes: L-band AHRPT, X-band MPT, and DPT. Direct Readout Service of AHRPT is globally provided. According to the schedule of the FY-3 program, the FY-3B satellite will be launched on 5 November 2010. The satellite is designed for a lifetime of 3 years. The LST is 14:00 for the FY-3B satellite, 10:00 for FY-3A.

The status of the EUMETSAT Polar System (EPS), as of August 2010, was provided in EUM-WP-03. The paper reported that the operational status of the EPS low Earth orbit polar system is stable and the Metop-A satellite continued to perform well over the reporting period, with only limited unplanned outages occurring on IASI, GRAS, ASCAT and A-DCS. In-Plane Manoeuvres, GOME instrument throughput performance testing, IASI instrument software upload and other routine instrument maintenance led to some further, planned minor losses of operational data. In particular, it can be noted that the Metop-A platform has continued to behave normally without any major anomaly (e.g. payload switch off). The redundant AHRPT has continued to be operated according to switching zones defined according to the trade-off between user needs and radiation risk. Due to the situation of NOAA17, a new extension of switching zones is being analysed and is provided in section 2.2 of the Working Paper. Dissemination of Metop-A products has continued nominally during the reporting period (except for the above mentioned outages). The operational Level-1 product services (ATOVS, AVHRR, IASI, GOME, GRAS, ASCAT), and Level-2 product services (ASCAT soil moisture, ATOVS and IASI retrievals), have continued nominally.

IMD requested IASI Level-2 processing software to be made available. EUMETSAT indicated that Level-1 software is part of AAPP and Level-2 data is available on EUMETCast on the GTS.

Action 38.01: EUMETSAT to report on availability of IASI Level-2 product extraction software for direct readout. Deadline: CGMS-39.

NOAA-WP-02 informed CGMS on how the National Oceanic and Atmospheric Administration (NOAA) manages a constellation of four geostationary and eleven polar orbiting meteorological spacecraft, including six military satellites, from the Satellite Operations Control Centre (SOCC) in Suitland, Maryland. These satellites provide continuous observations of weather conditions and environmental features of the western hemisphere, monitor global climate change, verify ozone depletion and land surface change, monitor the critical space environmental parameters, and support search and rescue efforts across the globe. This document briefly addressed the status of the geosynchronous and Low Earth Orbiting spacecraft constellations as of 22 September 2010.

The POES spacecraft constellation includes one primary, three backups, and one secondary spacecraft. These spacecrafts are in circular orbits inclined at approximately 98 degrees (retrograde). As of 21 May 2007, NOAA declared EUMETSAT's METOP-A as NOAA's mid-morning primary operational spacecraft. NOAA's primary afternoon operational spacecraft, NOAA-19, was launched on 6 February 2009 and declared operational 2 June 2009. Three backup spacecraft, NOAA-18, NOAA-17 and NOAA-15 provide additional payload operational data. NOAA-16 is a secondary afternoon spacecraft supporting additional user data requirements.

Table 1: Current Polar-Orbiting Satellites Coordinated within CGMS
(as of 11 November 2010; sorted by Equatorial Crossing Time and organisation)

Orbit type (equatorial crossing times)	**Satellites in orbit** (+operation mode) P=Pre-operational Op=operational B=back-up L=limited availability R= R&D	**Operator**	**Equatorial Crossing Time and orbital altitude** A=Ascend (northward) D=Descend (southward)	**Launch date**	Expected end of service	Payload/Instruments	Remarks, URL on NRT data access
Sun-synchronous "early morning" orbit (05:00 –07:00) (17:00 – 19:00)	FY-1D (Op)	CMA	06:50 (D) 866 km	15 May 2002	≥2009	CHRPT, MVISR, SEM	Functional. Last s/c of FY-1 series.
	NOAA-16 (B)	NOAA	17:57 (A) 849 km	21 Sep 2000		AVHRR	Functional, no APT, no LAC. Intermittent problems with AVHRR.
	DMSP-F13 (B)	NOAA	18:33 (A) 850 km	24 Mar 1995			Defence satellite. Data available to civilian users through NOAA. Only 1 recorder on-board with limited functionality.
	DMSP-F14 (B)	NOAA	17:24 (A) 852 km	4 Apr 1997		SSMI1, SSMT2 (Microwave Temperature Sounder)	Defence satellite. SSMI1 (microwave temperature sounder) non-functional. SSMT2 non-functional. No functional on-board recorder. Data available to civilian users through NOAA
	DMSP-F17 (Op)	NOAA	17:31 (A) 850 km	4 Nov 2007			Defence satellite. SSMIS. Data available to civilian users through NOAA.

Orbit type (equatorial crossing times)	**Satellites in orbit** (+operation mode) P=Pre-operational Op=operational B=back-up L=limited availability R= R&D	**Operator**	**Equatorial Crossing Time and orbital altitude** A=Ascend (northward) D=Descend (southward)	**Launch date**	Expected end of service	Payload/Instruments	Remarks, URL on NRT data access
Sun-synchronous "morning" orbit (07:00 – 12:00) (19:00 – 24:00)	DMSP-F18 (Op)	NOAA	08:00 (D) 833 km	18 Oct 2009		SSMI/S	(SSMI/S)
	FY-3A	CMA	10:00 (D) 836 km	27 May 2008			AHRPT/MPT transmission, 11 instruments; SBUS failed, IRAS with intermittent problem.
	FY-3B	CMA	14:00 (A) 836 km	2010		AHRPT/MPT, VIRR, MERSI, MWRI, IRAS, MWTS, MWHS, TOU/SBUS, SEM, ERM, SIM	
	Metop-A (Op)	EUMETSAT	21:30 (A) 817 km	19 Oct 2006	2012		Operational. HRPT and LRPT not functional. EUMETCast.
	NOAA-17 (B)	NOAA	9:22 (D) 810 km	24 June 2002			Functional. AMSU-A1 failed. DTR5 Failed February 2003. STX3 output power degraded to inoperable level. STX1 diminished performance.
	DMSP-F15 (B)	NOAA	19:37 (A) 850 km	12 Dec 1999		SSMT2 (microwave water vapour sounder)	Defence satellite. SSMT2 (microwave water vapour sounder) non-functional. Data available to civilian users through NOAA.

Orbit type (equatorial crossing times)	**Satellites in orbit** (+operation mode) P=Pre-operational Op=operational B=back-up L=limited availability R= R&D	**Operator**	**Equatorial Crossing Time and orbital altitude** A=Ascend (northward) D=Descend (southward)	**Launch date**	Expected end of service	Payload/Instruments	Remarks, URL on NRT data access
	DMSP-F16 (Op)	NOAA	20:04 (A) 850 km	18 Oct 2003		SSMIS.	Defence satellite. SSMIS. Data available to civilian users through NOAA.
	METEOR-M N1	ROS-HYDROMET	09:30 (D) 835 km	17 Sep 2009			HRPT, LRPT. Commissioning ongoing.
Sun-synchronous "afternoon" orbit (12:00 – 17:00) (00:00 – 05:00)	NOAA-15 (B)	NOAA	04:46 (D) 807 km	13 May 1998			Functional (intermittent problems with AVHRR, AMSU-B & HIRS). AMSU-A1 channels 11 & 14 inoperative.
	NOAA-18 (B)	NOAA	13:45 (A) 854 km	20 May 2005		HIRS, MIMU-2	Functional. Noise on HIRS long wave channels. 7 June 2009 MIMU-2 failure (loss of redundancy)
	NOAA-19 (Op)	NOAA	13:51 (A) 870 km	6 Feb 2009		MHS	Primary pm spacecraft as per 2 June 2009, part of IJPS. Functional. Noise on MHS Channel H3.
Non-sun synchronous Orbit	OSTM/Jason-2 (Ocean Surface Topography Mission)	CNES EUMETSAT NASA NOAA	(66° inclin.) 1336 km	20 Jun 2008	Mid 2013	Sea surface topography measurement. Global ocean circulation for climate prediction.	Follow-on of Jason-1.

ROSC/ROSH-WP-01 provided information on the launch of a new Russian polar-orbiting meteorological satellite Meteor-M 1, which occurred on 17 September 2009. The WP also gave information on satellite design, main parameters, ground segment, payload composition and characteristics.

Meteor-M1 is currently in its test phase. However, several images have been received in and processed by SRC "Planeta" of Roshydromet. Examples of applications were presented at the Plenary meeting. Roshydromet indicated its willingness to make Meteor-M1 a contribution to the WMO Global Observing System after commissioning, i.e. in the course of 2011. WMO thanked Roshydromet for this and strongly recommended the need to inform the user community on the detailed modalities for the access and use of the data (e.g. the direct readout and global data characteristics).

Action 38.02: Roshydromet to make technical details of microwave Sounder data (in meta-data format) available to the global user community. Deadline: 31 March 2011.

B.2 Geostationary Meteorological Satellite Systems

CMA-WP-04 reported on the status of the current FY-2 geostationary programme. The programme has produced 5 satellites FY-2A/B/C/D/E capable of S-VISSR imagery observation. Currently FY-2D and FY-2E are operational. FY-2D was launched on 15 November 2006 and is positioned at 86.5 º. FY-2E was launched on 23 December 2008 and is positioned at 105º. FY-2D and FY-2E alternatively make observations to transmit images every 15 minutes during the rainy season from June to September, and every 30 minutes from October to May. FY-2C has been moved to 123.5º since November 2009. The FY-2 Programme is planned to continue and the planning for FY-2F/G/H has been approved. The capabilities of FY-2F/G/H will be identical to FY-2C/D/E. The designed lifetime of FY-2F/G/H is 3 years. The launch of FY-2F is planned for 2011.

EUM-WP-04 reported on the status of the Meteosat System until June 2010. The operational status of the geostationary systems is stable with Meteosat-6 at 67.5º East (Indian Ocean Data Collection Data Collection Platform), Meteosat-7 at 57.5º East (Indian Ocean Data Collection imaging), Meteosat-8 at 9.5º East (Rapid Scan Service) and Met-9 at 0º (primary 0º Meteosat service).
No significant in-flight anomalies have occurred on board the Meteosat satellites during the reporting period. It should be noted that Meteosat-6 will need to be re-orbited in April 2011. In view of the Meteosat-6 re-orbiting, a different configuration for Meteosat-7 has been tested in the first half of the spring 2010 eclipse season to confirm the capability of Meteosat-7 to take over the IODC DCP mission from Meteosat-6. This test was successful and has increased the confidence on the capability of Meteosat-7 to support the IODC DCPs also during eclipse crossing. Further tests are planned in the autumn 2010 eclipse season to confirm these positive findings.

After de-orbiting of Meteosat-6, there will be a need for an increased coordination between satellite operators to secure a continued coverage of the Indian Ocean.
WMO thanked EUMETSAT for the continued coverage of the Indian Ocean.

Recommendation 38.01: CGMS recommended to consider the possibility to extend the IODC coverage after 2013 and after the end of life of Meteosat-7.

IMD-WP-13 presented the current status of the INSAT Meteorological Satellites. At present India has two geosynchronous satellites in orbit for meteorological purposes namely Kalpana-1 and INSAT-3A. Kalpana-1 was launched in 2002 and INSAT-3A in 2003. Both satellites have a 3-channel very high resolution Radiometer (VHRR) scanning the Earth in visible (0.55 - 0.75 um), water vapour (5.7 -7.1 um) and the thermal infra red (10.5 -12.5 um) bands. The instrument has a 2 km resolution in the visible channel and 8 km resolution in water vapour and thermal infra red bands. It has three modes of operation, namely, a full frame of 33 minutes, a normal frame of 23 minutes and a sector scan of 7 minutes duration. In addition to VHRR, INSAT-3A has a 3-channel CCD payload which scans the earth in visible, near infra red and shortwave infra red and has a resolution of 1 km in all three bands.

JMA-WP-02 provided an update on MTSAT. JMA switched the operational use of MTSAT-1R's imaging function over to MTSAT-2 on 1 July 2010. MTSAT-2 operates in geostationary orbit at 145 degrees, and MTSAT-1R has been on standby in geostationary orbit at 140 degrees east since the switchover of the imaging function. The IDCS of MTSAT-1R has been functioning properly since the satellite began operation. JMA currently obtains images from MTSAT-1R to enable examination and review of small-sector observation capability.

KMA-WP-02 updated CGMS on the status of the COMS program as a part of the space-based component of the WMO Global Observing System. This document includes the current status of COMS payloads, the information about the observation channels, and data transmission.

CGMS congratulated KMA for having joined CGMS with an operational geostationary satellite and for having prepared for the provision of data to global community.

NOAA-WP-04 informed CGMS on how NOAA manages a constellation of four geostationary and eleven polar orbiting meteorological spacecraft, including six military satellites, from the Satellite Operations Control Centre (SOCC) in Suitland, Maryland. These satellites provide continuous observations of weather conditions and environmental features of the western hemisphere, monitor global climate change, verify ozone depletion and land surface change, monitor the critical space environmental parameters, and support search and rescue efforts across the globe. This document briefly addressed

the status of the geosynchronous and low-earth-orbiting spacecraft constellations as of 22 September 2010.
The current Geostationary Operational Environmental Satellites (GOES) are three-axis stabilized spacecraft in geosynchronous orbits. The current primary satellites, GOES-13 and GOES-11, are stationed over the east and west coasts of the United States. These satellites are used to provide simultaneous images and soundings of the Western Hemisphere. GOES-14 is located at 105º West supporting National Weather Service (NWS) Space Weather Prediction Centre with the X-Ray Spectrometer (XRS) and Solar X-Ray Imager (SXI) instruments. GOES-12 was re-located at 60º West to support coverage of South America in June 2010. GOES-10 was decommissioned on 2 December 2009. GOES-3 and GOES-7, spin-stabilized satellites from the previous GOES series, continue a track record of more than 55 years of combined service via continued support of non-NOAA users in a data relay mode (non-imaging).

WMO thanked NOAA for the coverage of South-America with GOES-12.

Table 2: Current Geostationary Satellites Coordinated within CGMS
(as of 11 November 2010, sorted by longitude and organisation)

Sector	Satellites currently in orbit (+type) P: Pre-operational Op: Operational B: Back-up L: Limited Availability	Operator	Location	Launch date	Expected end of service	Payload/Instruments	Remarks, URL on NRT data access
West–Pacific (108°E-180°E)	MTSAT-1R (B)	JMA	140°E	26 Feb 2005			Multifunctional Transport Satellite (in-orbit back-up to MTSAT-2).
	MTSAT-2 (Op)	JMA	145°E	18 Feb 2006			Fully functional.
	FY-2E	CMA	123°E	23 Dec 2008			5 channel VISSR, to be moved to 105°E at the end of 2009.
	COMS	KMA	128°E	26 Jun 2010		HRIT/LRIT Meteorological imager (MI), Geostationary Ocean Color Imager (GOCI)	In-Orbit Test until the end of 2010.
East-Pacific (180°W-108°W)	GOES-11 (Op)	NOAA	135°W	3 May 2000			Operational GOES-West spacecraft since 28 Jun 2006. X-Ray Positioner failed February 2008.
	GOES-14 (P)	NOAA	105° W	27 Jun 2009			Stored in-orbit.
West-Atlantic (108°W-36°W)	GOES-12 (Op)	NOAA	60°W	23 Jul 2001			Support South America users (May 2010) SXI Imaging suspended indefinitely April 2007. X-Ray Positioner failed April 2007.
	GOES-13 (Op)	NOAA	75°W	24 May 2006			XRS/EUV instrument had a capacitor failure rendering unit inoperable.

Sector	Satellites currently in orbit (+type) P: Pre-operational Op: Operational B: Back-up L: Limited Availability	Operator	Location	Launch date	Expected end of service	Payload/Instruments	Remarks, URL on NRT data access
	GOES-15	NOAA	90° W	4 Mar 2010			In commissioning phase.
	Meteosat-8 (B)	EUMETSAT	9.5°E	28 Aug 2002	2016		No LRIT. Back-up to Meteosat-9. Rapid scanning service. EUMETCast.
East-Atlantic (36°W-36°E)	Meteosat-9 (Op)	EUMETSAT	0°W	21 Dec 2005	2019		Primary s/c. Fully operational. EUMETCast.
	FY-2C (Op)	CMA	105°E	19 Oct 2004			S-VISSR (improved), DCS, SEM. Expected end of service at the end of 2009 and be moved to 123.5°E.
Indian Ocean (36°E-108°E)	FY-2D (Op)	CMA	86.5°E	15 Nov 2006			S-VISSR (improved), DCS, SEM.
	Meteosat-6 (B)	EUMETSAT	67.5°E	20 Nov 1993	Apr 2011		Functional. Back-up to Meteosat-7. DCP mission support. EUMETCast. Likely to be de-orbited in 2010.
	Meteosat-7 (Op)	EUMETSAT	57.5°E	2 Sep 1997	2013		Functional. EUMETCast. IODC coverage committed till end 2013. Further requerst for extension until 2016 to be made.
	GOMS-N1 (L)	Roshydromet	76°E	31 Oct 1994			Since 09/1998 in stand-by

Sector	Satellites currently in orbit (+type) P: Pre-operational Op: Operational B: Back-up L: Limited Availability	Operator	Location	Launch date	Expected end of service	Payload/Instruments	Remarks, URL on NRT data access
	INSAT 3-C (L)	IMD	74°E	24 Jan 2002			No meteorological payload. Used for dissemination of processed meteorological data in broadcast mode in S-Band only over India and neighbouring countries. No WEFAX broadcast capability in L-band.
	Kalpana-1 (Op) (formerly METSAT)	IMD	74°E	12 Sep 2002		Monitoring cyclones & monsoon CMV Winds OLR Rainfall Estimation	Dedicated meteorological satellite. Working satisfactorily.
	INSAT-3A (B)	IMD	93.5°E	10 Apr 2003		- Monitoring cyclones & monsoon - CMV Winds - OLR - Rainfall Estimation - Mesoscale features - Flood/intense precipitation advisory - Snow detection	Operational since 24 Apr 2003. A 3-channel VHRR imager and CCD payload available for use similar to INSAT-2-E.

B.3 Research and Development Satellite Systems

CNSA-WP-01 informed CGMS about the status of the current China National Space Administration (CNSA) Earth Observation missions. Chinese Earth observing system plays an important role in the nationwide land resources survey, ecological construction, environmental protection and disaster mitigation. Currently, the system comprises the FY-series of satellites, and the HY-1B and HJ-1 satellites.

ESA-WP-01 provided CGMS with information on the status of the current European Space Agency Earth Observation (EO) missions. Two of them, MSG and MetOp are in cooperation with EUMETSAT. The success of the Envisat mission, launched in 2002, is well established, with a constant increase of user demand for data and services. A major milestone was the ESA 2010 Living Planet Symposium in Bergen (Norway) attended by 1,250 participants. Today, the Envisat mission has exceeded the original foreseen 5 years lifetime and a 3 years extension from 2011 to 2013 has been approved.

ERS-2, the second ESA EO mission, launched in 1995, continues to satisfy the steady increasing data demand despite the failure of the gyroscopes and the low rate recorders for which workaround solutions have been successfully implemented. PROBA, an experimental ESA satellite, has provided remarkable hyperspectral data since 2001. The archive contains more than 15,000 products.

The Gravity field and steady-state Ocean Circulation Explorer (GOCE), was successfully launched on 17 March 2009. The commissioning phase and instrument calibration was completed by early September 2009.

More recently, ESA had 2 new explorer launches: SMOS was launched on 2 November 2009 and was commissioned in May 2010. ESA indicated that SMOS data is now made available to the oceanography and meteorology communities.

Cryosat was launched on 8 April 2010 and since then, commissioning and validation activities have taken place. Data was first released to the cal/val teams just after three months. Commissioning activities will be completed on 25 October 2010. The release of Cryosat data to the scientific community is expected in autumn 2010.

JAXA-WP-01 reported on the current status of JAXA's Advanced Land Observing Satellite (ALOS) – "Daichi" and Greenhouse gases Observing SATellite (GOSAT) – "Ibuki" is updated. In the post operation phase, Daichi continues to contribute to the Sentinel Asia Step 2 project which was newly initiated. The calibration results of Ibuki's sensors; TANSO-FTS (Thermal And Near infrared Sensor for carbon Observations - Fourier Transform Spectrometer) and TANSO-CAI (Thermal And Near infrared Sensor for carbon Observations - Cloud and Aerosol imager) are also reported.

NASA-WP-01 summarised the current missions of NASA. NASA currently operates 14 Earth Science missions, which are detailed in the paper. 13 of those missions are operating beyond their design life. 6 of those missions are more than 10 years old. 5 of those missions have failed instruments or reduced capability instruments. Continued operation of the current missions is determined through a biennial science review process called a "Senior Review". Operational uses of the missions are considered in the review, but science is the primary factor. The next review is early 2011.

All missions were conceived as "research" missions, but efficiency of communications and ground data handling has supported operational and near-real-time applications.

The paper also presented a summary table for GCOS Essential Climate Variables (ECV). NASA's current missions address nearly all of the space-based GCOS Essential Climate Variables (ECV) and include a wide diversity of measurements. Upper-air wind and ocean salinity are the only ECVs not currently covered. Calibration and validation efforts assure a significant contribution to long-term time series.

Table 3: Current R & D satellites discussed within CGMS
(as of 11 November 2010, sorted by organisation)

Satellites in orbit	**Operator**	**Orbital altitude and Equator Crossing Time** A=Northw D=Southw +Altitude	**Launch date**	**Expected end of service**	**Application/ instruments**	*Remarks, URL on data/product access*
PARASOL	CNES	705 km sun-synchr.	18 Dec 2004	End 2011	POLDER Characterisation of clouds and aerosols micro-physical and radiative properties.	Data can be accessed at http://www.icare.univ-lille1.fr/ PARASOL was moved to a lower orbit (3.9 km beneath the A-Train) on December 2, 2009, where it is still operating
SPOT-5	CNES	832 km sun-synchr.	3 May 2002		DORIS, HRG, HRS, VEGETATION Cartography, land surface, agriculture and forestry, civil planning and mapping, digital terrain models, environmental monitoring	
CBERS-02	CNSA/ AEB	10:30 (D) 778 km	21 Oct 2003		Multi-spectral Camera, Infrared Scanner Camera, Wide Field Imager Camera	Land resource observation
CBERS-02B	CNSA/ AEB	10:30 (D) 778 km	19 Sep 2007		Multi-spectral Camera, Infrared Scanner Camera, Wide Field Imager Camera	Land resource observation
HJ-1A	CNSA	650 km 10:30 A	06 Sep 2008		Land, resource and environment monitoring	
HJ-1B	CNSA	650 km 10:30 A	06 Sep 2008		Land, resource and environment monitoring	

Satellites in orbit	**Operator**	**Orbital altitude and Equator Crossing Time** A=Northw D=Southw +Altitude	**Launch date**	**Expected end of service**	**Application/ instruments**	*Remarks, URL on data/product access*
HY-1B	CNSA	10:30 +/-30 min (D) 798 km	11 Apr 2007		Ocean colour and temperature scanner and 4 bands CCD imager. (CZI)	In operation.
ERS-2	ESA	10:30 (D) 785 km	21 Apr 1995		Altimeter, SAR, SAR-wave, ATSR, Scatterometer, GOME	▪ No on-board recorder since 2003, the data acquisition is ensured over a network of acquisition stations. ▪ ATSR-2 instrument anomaly since Feb 2008.
ENVISAT	ESA	10:00 (D) 800 km	1 Mar 2002		10 instruments for Environment: ASAR, AATSR, MERIS, GOMOS, MIPAS, SCHIAMACHY, RA-2, MWR, DORIS	▪ MIPAS is operated at 80% of its duty cycle. ▪ GOMOS performs with reduced azimuth range, since Aug 2005. GOMOS instrument anomalies since early 2009. ▪ Altimeter: Loss of secondary frequency (S-band) in Jan.08, compensated with on-ground ionospheric corrections. Operations funding extended 3 years.
GOCE	ESA	(6:00 A) 250 km	17 Mar 2009		Gravity-Field and steady-state Ocean Circulation Explorer,	Commissioning achieved.
CRYOSAT-2	ESA	717 km Non-sun-synchronous	8 Apr 2010		Polar ice monitoring	
SMOS	ESA	755 km (6:00 A)	2 Nov 2009		Ocean salinity and soil moisture	

Satellites in orbit	**Operator**	**Orbital altitude and Equator Crossing Time** A=Northw D=Southw +Altitude	**Launch date**	**Expected end of service**	**Application/ instruments**	*Remarks, URL on data/product access*
PROBA	ESA	10: 30 (D) 615 km	22 Oct 2001		CHRIS	Drifting orbit. Technology experiment. AO Science mission since 2001.
OCEANSAT-1	ISRO	12:00 (A)/ 24:00 (D) 98.28° 720 Km sun-synchronous	26 May 1999			Multifrequency Scanning Microwave Radiometer (MSMR) for SST, Sea surface wind speed, total water vapour, cloud liquid water, sea ice extend, rainfall, soil moisture etc.
OCEANSAT-2	ISRO	Sun synch. 723 km (12:00 D).	23 Sept 2009		Scatterometer, Radio Occultation Sounder, Ocean Colour Monitoring	
DAICHI (ALOS)	JAXA	10:30 691.65 km sun-synchronous	24 Jan 2006		PRISM, AVNIR-2, PALSAR	Mapping, precise land coverage observation, disaster monitoring, resource surveying.
IBUKI (GOSAT)	JAXA & Japan's Ministry of Environment	13:00 666km sun-synchronous	23 Jan 2009		TANSO-FTS and TANSO-CAI	Greenhouse gas and carbon dioxide monitoring.
TRMM	JAXA/ NASA	402 km non-sun-synchr.	27 Nov 1997		Precipitation Radar equipment provided by JAXA and TRMM Microwave Imager (TMI), satellite bus and other instruments provided by NASA	Measures tropical rainfall/precipitation and radiation energy

Satellites in orbit	**Operator**	**Orbital altitude and Equator Crossing Time** A=Northw D=Southw +Altitude	**Launch date**	**Expected end of service**	**Application/ instruments**	*Remarks, URL on data/product access*
ACRIMSAT	NASA	716 km sun-synchr.	20 Dec 1999		ACRIM III	Active Cavity Radiometer Irradiance Monitor Satellite Measures total solar irradiance, studies incoming solar radiation and adds measurements of ocean and atmosphere currents and temperatures as well as surface temperatures.
Aura	NASA/BNSC	705 km sun-synchr.	15 Jul 2004		Comprehensive measurements of atmospheric chemistry and trace gasses	
Terra	NASA	705 km sun-synchr.	18 Dec 1999		CERES, MISR, MODIS, MOPITT, ASTER	Measurement of the Earth's climate system, atmosphere, land, oceans and interactions with solar radiation
Jason-1	NASA/ CNES	1336 km non-sun-synchr.	07 Dec 2001		Laser retroreflector array Poseidon-2 solid state radar altimeter DORIS receiver Jason Microwave Radiometer BlackJack GPS Receiver tracking system	Ocean surface topography Follow-on mission to TOPEX/P. Monitor global ocean circulation for global climate prediction.
Aqua	NASA	705 km sun-synchr.	04 May 2002		AMSR-E, AIRS, AMSU-A, CERES, HSB, MODIS	Collects data on Earth's water cycle, precise atmospheric and oceanic measurements, and interaction with solar radiation AMSR-E provided by JAXA. HSB provided by INPE (no longer functional)
Landsat 7	NASA	705 km sun-synchr.	15 Apr 1999		Enhanced Thematic Mapper Plus Instrument (ETM+)	Well-calibrated, multispectral, moderate resolution, substantially cloud-free, sunlit digital images of the Earth's continental and coastal areas

Satellites in orbit	**Operator**	**Orbital altitude and Equator Crossing Time** A=Northw D=Southw +Altitude	**Launch date**	**Expected end of service**	**Application/ instruments**	*Remarks, URL on data/product access*
NMP EO-1 (New Millennium Program Earth Observing-1)	NASA	10:01 (D) 705 km sun-synchr.	21 Nov 2000		Advanced Land Imager Hyperion LAC (atmospheric corrector)	Demonstrates and validates advanced technology instruments (multi and hyperspectral), spacecraft systems, and in flight mission concepts
QuikSCAT (Quick Scatterometer)	NASA	803 km sun-synchr.	19 Jun 1999	23 Nov 2009	SeaWinds	Sea surface wind speed and direction data for global climate research operational weather forecasting and storm warning. Services stopped 23 Nov 2009 after antenna failure. Used for calibration only.
SORCE (Solar Radiation and Climate Experiment)	NASA	(40˚ incl) 640 km non-sun-synchr.	25 Jan 2003		- XPS (Extreme Ultraviolet (XUV) Photometer System) - TIM (Total Irradiance Monitor) - SIM (Spectral Irradiance Monitor A&B) - SOLSTICE (Solar Stellar Irradiance Comparison Experiment A&B)	Will provide total irradiance measurements and full spectral irradiance measurements. Continuation of ACRIMSAT total solar irradiance measurements.
GRACE (Gravity Recovery and Climate Experiment)	NASA/DRL	(89˚ incl) 485 km non-sun-synchr.	17 Mar 2002		- Star Camera Assembly - GPS BlackJack Receiver - Instruments Processing Unit - Laser Retro-Reflector Assembly - K-Band Ranging Instruments - SuperSTAR Accelerometers	Accurate global and high-resolution determination of static and time-variable components of Earth's gravity field Measurement of: - Gravitational field - GPS atmospheric and ionospheric limb sounding

Satellites in orbit	**Operator**	**Orbital altitude and Equator Crossing Time** A=Northw D=Southw +Altitude	**Launch date**	**Expected end of service**	**Application/ instruments**	*Remarks, URL on data/product access*
CALIPSO	NASA/ CNES	705 km sun-synchronous	28 Apr 2006		Lidar CALIOP Infrared radiometer IIR Visible camera WFC	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations for climate predictions. Data can be accessed at <http://eosweb.larc.nasa.gov/PRODOCS/calipso/table_calipso.html> and http://www.icare.univ-lille1.fr/ CALIPSO functioning with its back-up laser since March 2009
CloudSAT	NASA/ CSA	705 km sun-synchronous	28 Apr 2006		Global cloud properties (applications: air quality, aviation safety, disaster management, energy and water management)	
OSTM (Jason-2)	NASA/NOAA	1336 km non-sun-synchr.	20 Jun 2008		Oceanography, geoedy/gravty, climate monitoring, marine meteorology instruments: LRA, JMR, DORIS-NG, POSEIDON-3, AMR, GPSP	Follow-on mission to Jason-1
Monitor-E	ROSCOSMOS	(550 km) (10:30)	26 Aug 2005		Land Observing Satellite	Experimental exploitation
RESURS-DK1	ROSCOSMOS	Elliptical orbit, H_p=360km, H_a=604km, incl.=70.4°	15 Jun 2006		- Panchromatic scanner - Multi-spectral scanner - PAMELA (Italy) for primary cosmic radiation investigation - ARINA for earthquake prediction investigation	Exploitation

B.4 Other LEO Satellites

NOAA-WP-03 provided information on the Ocean Surface Topography Mission (OSTM)/Jason-2 and the Jason-3 missions. They are a joint effort among four organisations: NOAA, EUMETSAT, CNES, and NASA, to measure sea surface height by using a radar altimeter mounted on a low-earth orbiting satellite. The collection of precise measurements of sea surface height is essential for ocean climatology and ocean weather applications. Ocean climatology includes global sea-level rise, a key indicator of climate change, decadal variability in the ocean, seasonal/inter-annual variability, and coastal variability and its impact on ecosystems. Ocean weather involves operational oceanography, surface wave forecasting and evaluation, and hurricane intensity forecasting. Research satellites, TOPEX/Poseidon and Jason-1, have been instrumental in providing sea surface height measurements necessary for ocean modelling, forecasting El Niño/La Niña events, and hurricane intensity prediction.

The currently operational satellite OSTM/Jason-2 launched in June 2008, maintains data measurements continuity. The Jason-3 mission will ensure the continuity of the 20 + year data record. Jason-3 is a joint US and European mission. The launch in 2013 with an overlap with the Jason-2 mission of about 6 month is planned. The overlap period will be used to conduct initial cross-calibration and validation activities, complete on-orbit check-out operations, and maintain consistent observations of sea surface height between the successive altimeter missions. The paper also presented the operational Jason-2 mission status and an overview of NOAA activities performed to support the operational Jason-2 mission and plans for the Jason-3 mission.

B.5 Spacecraft Anomalies from Solar and other Events

CMA-WP-17 summarised the activities of CMA related to space weather observation. The space weather activity is conducted by the National Centre for Space Weather (NCSW) which is another role of the National Satellite Meteorological Centre of CMA. The paper first introduced the work of the Inter-Programme Coordination Team for Space Weather (ICTSW) in defining the basic parameters and core observing requirements for space weather with the goal of integrating the space weather observation into the WMO Information System. Dr Zhang Xiaoxin, NCSW, is involved in this part of work and co-chairs the ICTSW. The paper then listed the CMA's work to date and focussed on establishing a capability in space weather observation. This included the space-based instruments onboard FY-3 and future FY-4 spacecraft; the ground facilities for monitoring the solar events, the middle and upper atmosphere and Ionosphere, the GPS network, and the Meridian Space Weather Monitoring Project that will build a chain of stations along the 120ºEast longitude and the 30ºNorth latitude for solar observation.

WMO-WP-17 reported on the early outcome of the Inter-Programme Coordination Team on Space Weather (ICTSW), which involves 11 countries and six international organisations. The ICTSW has developed a draft work plan and started to develop a set of observing requirements along the lines of the Rolling Requirements Review process.

Building on the operational arrangements implemented by the International Space Environment Service (ISES), consideration will be given to the harmonisation of data management practices following WMO Information Systems (WIS) best practices and standards, and to the possible participation of ISES Regional Warning Centres as WIS Data Collection or Production Centres (DCPC).

EUM-WP-05 provided an updated report on all anomalies attributed to solar events that had been detected on EUMETSAT in-orbit satellites (i.e. Metosat-6, -7, -8 and -9 and Metop-A) from October 2009 till June 2010. The anomalies on EUMETSAT spacecraft due to solar events before October 2009 were reported at previous meetings.

NOAA-WP-05 provided an example of a new space weather product under development, the progression and prediction of the solar cycle, a summary of recent significant space weather events, including energetic electron activity, and a description of how NOAA Geosynchronous Operational Environmental Satellites (GOES) data are used for satellite anomaly assessment. The new product is one that will serve customers, such as the satellite industry and those who depend on conditions in the space environment that affect satellites used for communication, navigation, and other daily activities. Predictions are given for the year and magnitude of Solar Cycle 24 maximum. The consensus prediction is that the new cycle will be smaller than recent cycles and reach maximum in May 2013. This prediction, of great importance for planning activities affected by solar activity, will be updated as needed. Information was provided that shows space weather activity increasing during August 2009 through July 2010 emerging from the recent solar minimum. While it is typical for energetic electron fluxes to increase during the declining phase of the solar cycle as recurrent coronal holes produce regular intervals of high-speed solar wind that interacts with the geomagnetic field, we are still observing intervals of high electron fluxes. Electron fluxes reached high levels on 46% of days during the last five months of the period. Finally, NOAA described how the GOES data were used to characterise the space weather environment during the Galaxy 15 anomaly.

EUMETSAT thanked the NOAA SWPC for their support on space weather activities impacting satellites. EUMETSAT satellites were particularly struck by heavy ions. EUMETSAT also highlighted the emergence of a system of provision on collision warnings, in relation with space debris.

Action 38.03: CGMS Members to report on their activities related to Space Debris/collision mitigation measures. Deadline: CGMS-39.

Action 38.04: CGMS Members to provide information on anomalies affecting their spacecraft and payload caused by cosmic radiation. Deadline: CGMS-39.

C. REPORT ON FUTURE SATELLITE SYSTEMS

C.1 Future Polar-Orbiting Meteorological Satellite Systems

CMA-WP-05 informed CGMS that CMA has accepted the user requirements for the subsequent FY-3 models after FY-3A/B, which leads to the plan for some changes in the instrument payloads onboard future FY-3 models. Compared with FY-3A/B/C, some noticeable changes will take place on FY-3D and subsequent models in that the current 10-channel Visible and Infrared Radiometer (VIRR) will be removed, and whose function will be merged with the MERSI-2 that undertakes the mission of VIS & IR imaging in both the morning and the afternoon orbits. For the atmosphere sounding mission, the Atmospheric Sounding Interferometer will replace the current 26-channel IRAS in both M/A orbits. The current TOU + SBUS for the ozone mission is planned to be replaced by the Ozone Monitoring Suite, a high spectral resolution UV-VIS spectrometer to fly in the morning orbit, and by the Greenhouse gases Monitoring Instrument, a short wave infrared spectrometer to fly in the afternoon orbit. Other new instruments for FY-3 will be the Wind Radar (WindRAD), a radar scatterometer for sea-surface winds working in C band and Ku band, and the GNSS Occultation Sounder (GNOS), a radio-occultation sounder for the measurement of meteorological parameters.

General support was expressed on the need to coordinate scatterometer observations. This will be addressed in Working Group III.

EUM-WP-06 described the status of preparations for the launch of the EPS Metop-B satellite, foreseen for April 2012 from Baikonur with a Soyuz launcher. The preparation activities include the satellite AIT (Assembly Integration and Test), LEOP (Launch and Early Operations Phase) and launcher procurement, ground segment upgrades, system integration and V&V (Verification and Validation) and operational preparations. Although 'ordinary' development and AIT problems have been found, none of these are currently anticipated to impact the launch date or preparations.

EUM-WP-07 presented the status of the Programme Preparation of the EPS Second Generation (EPS-SG), currently in Phase A. The roadmap for approval of the Programme at EUMETSAT and ESA has been consolidated, and interactions with the International and European National Partners have intensified to negotiate draft cooperation concepts and agreements.

The ESA industrial competitive studies will start by January 2011, addressing Phase A and Phase B1, and aiming at their completion in late 2012. The major decisions expected in 2011 at EUMETSAT level include the approval of

the EPS-SG Preparatory Programme covering the EUMETSAT Phase B (2012 to mid 2014) and the approval of the EPS-SG Payload Complement to be used as the baseline for the Phase B studies and the preparation of the full Programme Proposal covering Phases C/D/E.

NOAA-WP-06 discussed the NOAA future polar-orbiting environmental satellite system. NOAA first addressed the current operational system. Information was provided on the international polar-orbiting satellite program coordination between EUMETSAT and NOAA. The goal of this cooperation is to provide continuity of measurements from polar orbits, cost sharing, and improved forecast and monitoring capabilities through the introduction of new technologies. An agreement is in place between NOAA and EUMETSAT on the Initial Joint Polar-orbiting Operational Satellite System (IJPS). This programme will include two series of independent but coordinated NOAA and EUMETSAT satellites, exchange of instruments and global data, cooperation in algorithm development, and plans for real-time direct broadcast.

The NOAA Working Paper also discussed the development and implementation plans for JPSS. The restructured US Polar Satellite programmes will consist of the JPSS program for the afternoon orbit and the DWSS programme in the early morning. JPSS will provide significantly improved operational capabilities and benefits to satisfy the critical civil and national security requirements for space-based, remotely sensed environmental data. The advanced technology visible, infrared, and microwave imagers and sounders that are being developed will deliver higher spatial and resolution atmospheric, oceanic, terrestrial, and solar-geophysical data enabling more accurate short-term weather forecasts and significantly improved long range numerical weather forecasts as well as serving the data continuity requirements for improved global climate change assessment and prediction. The program is on the path to creating a high performance, polar-orbiting satellite system that will be more responsive to user requirements and provide sustained, space-based measurements as a cornerstone of an Integrated Global Observing System. These activities represent a sound beginning for achieving the planned national and international operational satellite programs that will ensure continuous support to a variety of users.

In response to a question from IMD, NOAA indicated that they had no plans to have Direct Read Out Service on NPP and JPSS-1, which had been addressed in Working Group IV.

NOAA also confirmed its responsability on the Common Ground system for NOAA and DoD satellites. It is planned that data from both JPSS and DWSS would be made available, as this was planned in the NPOESS programme.

Table 4: Future Polar-Orbiting Satellites Coordinated within CGMS
(as of 11 November 2010, sorted by Equatorial Crossing Time and organisation)

Orbit type (equatorial crossing times)	Future additional satellites	Operator	Equatorial Crossing Time and orbital altitude A=Ascend. (northward) D=Descend. (southward)	Planned launch date	Nominal life time (years)	Payload/Instruments	Remarks, URL on planned NRT data access
Sun-synchronous local "early morning" orbit (05:00 – 07:00)	DMSP-F19	NOAA	05:30 (D) 833 km	2012		(SSMI/S)	
	DMSP-F20	NOAA	05:30 (D) 833 km	2014		(SSMI/S)	
	FY-3B	CMA	836 km	2010		- " -	
	FY-3C	CMA	836 km	2013		- " -	
Sun-synchronous local "morning" orbit (07:00 – 12:00) (19:00 – 24:00)	FY-3D	CMA	836 km	2015		- " -	
	FY-3E	CMA	836 km	2017		- " -	
	FY-3F	CMA	836 km	2019		- " -	
	FY-3G	CMA	836 km	2021		- " -	
	Metop-1 (B)	EUMETSAT	21:30 (A) 817 km	2012	4.5	HRPT, LRPT. EUMETCast.	
	Metop-3 (C)	EUMETSAT	21:30 (A) 817 km	2016	4.5	HRPT, LRPT. EUMETCast.	
	EPS-SG 1a	EUMETSAT		2019	8.5		
	EPS-SG 1b	EUMETSAT		2020	8.5		
	DMSP-F18	NOAA	08:00 (D) 833 km	2009		(SSMI/S)	
	METEOR-M N3	ROS-HYDROMET	TBD ~560 km	2012		HRPT, LRPT	

Orbit type (equatorial crossing times)	Future additional satellites	Operator	Equatorial Crossing Time and orbital altitude A=Ascend. (northward) D=Descend. (southward)	Planned launch date	Nominal life time (years)	Payload/Instruments	Remarks, URL on planned NRT data access
	NPP-NPOESS Preparatory Project	NOAA/NASA	13:30 (A) 833 km	2011		(VIIRS, CrIS, ATMS, OMPS, CERES) HRD. Monitoring climate trends, global biological productivity	
Sun-synchronous local "afternoon" orbit (12:00 – 17:00)	JPSS-1	NOAA	13:30 (A) 833 km	2014		VIIRS, CrIS, ATMS, OMPS-NP, CERES	
	JPSS-2	NOAA	13:30 (A) 833 km	2018		VIIRS, CrIS, ATMS, OMPS-LP, ERBS, SARSAR, ADCS	
	METEOR-M N2	ROS-HYDROMET	15:30 (A) 835 km	2010		HRPT, LRPT	
Non-sun synchronous Orbit	Jason-3	EUMETSAT NOAA CNES		2013	5	OST	66° inclination
	Jason-CS			2017	5-7	OST	TBC

C.2 Future Geostationary Meteorological Satellite Systems

CMA-WP-06 informed CGMS that the planning for subsequent FY-2 satellites has been completed and involves another three spacecraft models and the future continuous operation of the FY-2F/G/H satellites will depend on the successful implementation of this plan. Though the mission of the spacecraft to be produced will be similar to that of their predecessors, there will be differences in the spectral parameters of the onboard VISSR, especially the improvement of the signal/noise ratio, and the bandwidth of the visible channel. These changes in VISRR specification are expected to result in better performance of future FY-2 satellites.

CNSA-WP-02 provided CGMS with information on the status of the future China National Space Administration Earth Observation missions. It includes FY-4, CBERS 03/04, HY-2, HJ-1 C, and ZY-3 satellites. FY-4 is scheduled to be launched in 2015, CBERS 03 in 2011 and ZY-3 in 2011. Others will continue to be developed accordingly to the planning. This Working Paper provided information on the development of these satellites.

EUM-WP-08 reported on the current status of the MSG programme and the related preparations for the launches and commissioning of MSG-3 and MSG-4 satellites launch and commissioning. Taking into account the outcome of the agreement at the 67th EUMETSAT Council in June 2009, the time frame from June to August 2012 has been agreed with Arianespace as a reduced launch period for MSG-3. The plan for the MSG-4 launch is still in January 2014, with the understanding that the MSG-4 launch date will be revisited after the commissioning of MSG-3. The satellites are kept in a clean room at the Prime contractor's premises. The ongoing work focussed on anomaly investigations and corrective actions.

EUM-WP-09 presented the status of the activities for the Meteosat Third Generation (MTG) Programme as performed within the framework of the MTG Preparatory Programme at EUMETSAT. The Working paper addressed the progress achieved until early September 2010, and the short term objectives upon which EUMETSAT is concentrating efforts in the design and development of the system. The status of the MTG activities at ESA was also presented in the document.

The MTG Programme activities at EUMETSAT are part of the MTG Preparatory Programme. Phase B which started in January 2009 following the successful completion of the Preliminary Requirements Review (PRR) at the end of Phase A. At a EUMETSAT Council meeting in March 2010 the MTG End User Requirements Document (EURD) was agreed by Delegations and in June 2010 the Council agreed the contents of the MTG Programme Proposal, covering the Phase C/D and E activities of the EUMETSAT Programme. The voting process for approving the Programme is ongoing, with a target completion by the end of 2010. Engineering work is progressing towards the preparation of the system Preliminary Design Review (PDR), to

consolidate requirements, plans and preliminary design before start of the development work in Phase C/D.

At space segment level, as part of the ESA MTG Programme, Phase B1 was completed in July 2009 with the release of the Invitation to Tender for the Phase B2-C/D and support to Phase E, to select the industrial prime consortium for the satellites. Following delivery of the industrial offers, the evaluation process was finalised at the end of June 2010.

Negotiations in preparation for the Phase B2 are now ongoing.

IMD-WP-15 presented information on three satellites, namely INSAT-3D, Megha-Tropiques and SARAL. Indian Space Missions for Atmospheric are currently planning missions for Oceanic Science studies.

The next major upgrade in observations from the geostationary platform will be on the INSAT-3D satellite scheduled for launch in 2011. It will be an exclusive meteorological satellite carrying advanced meteorological payloads, viz. a 6-channel imager and a 19-channel sounder.

JMA-WP-03 provided a report on plans for Himawari-8 and Himawari-9, follow-on satellites to MTSAT-2. JMA plans to launch Himawari-8 in summer 2014 and commence its operation in 2015, when MTSAT-2 is scheduled to complete its period of operation. The Agency also plans to launch Himawari-9 in 2016. In July, JMA completed contract arrangements for the manufacture of Himawari-8 and -9, which have identical specifications. Currently, their production is in the design phase. Himawari-8 and -9 carry Advanced Himawari Imager (AHI) units comparable to the Advanced Baseline Imager (ABI) on board GOES-R to enable enhanced nowcasting, NWP and environment monitoring. JMA plans to facilitate two ground stations to establish site diversity in order to mitigate the rain attenuation effect on the Ka-band to be used for the imagery data downlink. Downlinked data will be delivered to the Meteorological Satellite Center, which generates satellite products and delivers them to users.

JMA-WP-08 informed CGMS that, additionally, JMA has set up an environment for the development of new products from the follow-on satellites on collaboration with JMA's Meteorological Satellite Center (MSC) and other internal related divisions. In the future, the Agency plans to start development with the cooperation of EUMETSAT and NOAA/NESDIS. Products of interest to be developed are as follows:

- Global Instability Index (GII) for preconvective weather situation monitoring (to be used in weather forecasting services);
- Detection of volcanic ash plumes for volcanic activity monitoring; and
- Improvement of Atmospheric Motion Vectors (AMVs) derived from satellite observation as essential input for global and regional NWP models.

EUMETSAT commended the document and thanked JMA for the efforts made to improve AMVs and to address the GII.

KMA-WP-03 reported on tentative plans for follow-on satellites to COMS. Currently, the plan is to launch a follow-on satellite to COMS in 2017 before COMS complete its operation. A post COMS-B mission is planned for launch in the 2018 time frame. The COMS follow-on satellite is tentatively planned to carry an imager comparable to the Advanced Baseline Imager (ABI) or the Flexible Combined Imager (FCI).

The other missions will be planned in 2010 in cooperation with other relevant Korean Ministries.

NOAA-WP-07 provided a status report and an overview of the future GOES satellite system. GOES-P was launched on 4 March 2010, reached geostationary orbit and was renamed GOES-15. The first visible image from GOES-15 arrived on 6 April 2010 and the first infrared arrived on 26 April 2010. GOES-15 completed Post Launch Testing (PLT) and is in on-orbit storage mode at 89.5°W as a standby spacecraft for the operational GOES satellites.

Steady progress has continued with the development of the GOES-R programme in 2009. The spacecraft, ground segment and all instruments are in the implementation phase. The new GOES-R instruments will advance operational environmental remote sensing technology by several decades. The technological advances will provide environmental information over a greater geographical location in less time, at higher resolutions, and with higher spectral content.

NOAA-WP-08 reported on the continued cooperation between NOAA and EUMETSAT activities that are being conducted as part of the preparations for MTG and GOES-R. In particular, these include cooperation on a GEO lightning mission cooperation and an IRS Hyperspectral mission cooperation. NOAA and EUMETSAT are scheduled to meet during November 2010, at NASA Goddard Space Flight Center, to discuss, among other topics, the status of these activities.

ROSH/ROSC-WP-02 provided information on the new geostationary meteorological satellite “Electro-L” which is planned to be launched in 2010. Currently the satellite is completing its electrical tests. The working paper reported on the principal characteristics and status of the satellite. The Lavochkin Association is carrying out the final preparations necessary to provide a successful launch of “Electro-L” in this year. After launch, the satellite will be located at longitude 76°East over the Indian Ocean, an ideal observation point to observe nearly the entire Russian territory.

Electro-L will support a meteorological mission, operative Earth observation collecting geosphere and solar activity data, retransmission data from emergency buoys, meteorological platforms.

The following missions of Electro-L can be divided into two main subsystems:

A subsystem providing hydro-meteorological and helio-geophysical information. This subsystem consists of:

- multi-spectral scanning facility (MSU-GS); MSU-GS will provide the formation image of full Earth disk in 10 spectral bands (3 visible, 7 IR with characteristics of data image like MSG); JSC "Russian Space Systems" is a developer of this facility; for transmission image from MSU-GS is used transmission system with 7.5 GHz with a data rate of 30.72 Mbits/sec;

- heliogeophysical equipment complex (GGAK); GGAK will provide monitoring of variations in the electromagnetic solar radiation, corpuscular radiation fields and variations of the geomagnetic field of the Earth. For transmission of data from GGAK in a quasi-continuous mode a channel with speed 1.7 GHz - 2.5 Mbps is used.

A subsystem for the retransmission of data. This subsystem consist of:

- channels of collecting and transmitting data from the net of ground measuring platforms to large processing centers of ROSHYDROMET;

- hydrometeorological data exchange channel between the main and regional centers for receiving and processing information, located in Novosibirsk and Khabarovsk;

- distribution channel for processed hydrometeorological information in HRIT and LRIT formats; and

- channel for signals from emergency buoys, COSPAS-SARSAT.

Table 5: Future Geostationary Satellites Coordinated within CGMS
(as of 11 November 2010, sorted by longitude and organisation)

Sector	Future additional satellites	Operator	Planned launch	Nominal life time (years)	Planned location	Payload/Instruments	Remarks URL on planned NRT data access
East-Atlantic sector (36°W-36°E)	MSG-3	EUMETSAT	2012	7	0°	LRIT, EUMETCast.	
	MSG-4	EUMETSAT	2014	7	0°	LRIT, EUMETCast.	
	MTG I1	EUMETSAT	2017	8.5			Meteosat Third Generation 1st imaging satellite
	MTG S1	EUMETSAT	2019	8.5			Meteosat Third Generation 1st sounding satellite
	MTG I2	EUMETSAT	2022	8.5			Meteosat Third Generation 2nd imaging satellite
	MTG I3	EUMETSAT	2026	8.5			Meteosat Third Generation 3rd imaging satellite
	MTG S2	EUMETSAT	2027	8.5			S2 Meteosat Third Generation
	MTG I4	EUMETSAT	2030	8.5			Meteosat Third Generation 4th imaging satellite
East-Pacific (180˚W-108˚W) and West-Atlantic (108˚W-36˚W)	GOES-R	NOAA	2015		135° W or 75° W	ABI, GLM, SUV, EXIS, SEISS , HRIT/EMWIN, Search and Rescue, Data Collection Service (Advanced Baseline Imager, Geostationary Lightning Mapper), Solar UV Imager, Extreme UV and X-ray Irradiance Sensors, Space Environment In-Situ Suite)	
	GOES-S	NOAA	2016		135° W or 75° W		
Indian Ocean (36˚E-108˚E)	FY-2F	CMA	2011		86.5°E	5 channel VISSR	
	FY-4A, C, E	CMA	2014			Multi-spectral imager, Atmospheric Sounder, lightning mapper, SEM	

Sector	Future additional satellites	Operator	Planned launch	Nominal life time (years)	Planned location	Payload/Instruments	Remarks URL on planned NRT data access
	Electro-L N1	Roshydromet	2010		76°E	HRIT/LRIT	
	Electro-L N2	**Roshydromet**	**2011**		**14.5° W (TBD)**		
	Electro-M N1	Roshydromet	2015		TBD		
	INSAT-3D	IMD	2010		TBD	Dedicated Meteorological mission with improved 6-channel Imager and a 19 channel Sounder.	
	FY-2G	CMA	2013		123°E	5 channel VISSR	
West-Pacific (108˚E-180˚E)	FY-4B, D, F	CMA	2016			Multi-spectral imager, Atmospheric Sounder, lightning mapper, SEM	
	Himawari-8	JMA	2014		140°E		(Previously MTSAT follow-on).
	Himawari-9	JMA	2016		140°E.		Himawari-8/-9: 15 years of operations foreseen in total.

C.3 Future Research and Development Satellite Systems

CNSA-WP-02 reported on the status of the future CNSA missions. It includes the FY-4, CBERS 03/04, HY-2 and HJ-1C, and ZY-3 satellites. FY-4 is scheduled to be launched in 2015. CBERS 03 will be launched in 2011. ZY-3 will be launched in 2011. Others will continue to be developed according to their planning.

Over the next five years, China will start to implement a high-resolution Earth observation system, continue to develop new types of sun synchronous orbit and geostationary-orbit meteorological satellites, oceanic satellites, Earth resources satellites and small satellites for environmental protection and disaster mitigation monitoring and forecasting, which will initiate researches on technologies of new-type remote-sensing satellites. The goal is to establish an all-weather, 24-hour, multi-spectral, differential-resolution Earth observation system for stable operation, and achieve stereoscopy and dynamic monitoring of the land, atmosphere and sea. The new Earth observation missions under development include FY-4, CBERS 03/04, HY-2, HJ-1 C and the ZY-3 satellites.

As the main tasks, the remote sensing community continues to make the overall plan for the development of the satellite remote-sensing ground system, and the application system. Its aim is to:

- integrate and improve the present satellite remote-sensing ground system;

- set up and improve supporting facilities for quantitative application, including a remote-sensing satellite radiation calibration station; and

- form several important application systems; and to make breakthroughs in major satellite remote-sensing application fields.

ESA-WP-02 informed CGMS on the status of the future ESA Earth Observation missions. Two of them, MTG and Post EPS (now EPS-SG) are in cooperation with EUMETSAT. The Living Planet Program has three lines of implementation: Earth Explorer satellites, Earth Watch satellites plus services and applications demonstration. The 7th Core Explorer is under selection out of three pre-selected. The call for the 8th Earth Explorer was issued recently and a down selection of 2 missions will be proposed to the November 2010 ESA's PB-EO. GMES represents the major new initiative of European efforts in Earth Observation. The start of the GMES pre-operational services took place in 2008, with the provision of relevant data. The first GMES dedicated satellites (the "Sentinels") will be launched in 2012-2013. Related activities are under way at all stages within the Agency, the EC and at Member States level.

IMD-WP-15 presented information on Megha-Tropiques and SARAL.

Megha-Tropiques is a joint India-France (ISRO-CNES) mission with a shared responsibility for development of payloads, using ISRO's IRS bus. A PSLV launcher will launch the satellite from Sriharikota in an orbit with 867 km altitude and 20° inclination in 2011. The mission life is 3 years. Megha-Tropiques will carry four payloads, MADRAS, SAPHIR , ScaRaB and a GPS Radio Occultation Sensor (ROSA). MADRAS (Microwave Analysis and Detection of Rain and Atmospheric Structures), will be a passive imaging radiometer. SAPHIR (Sounder for Atmospheric Profiling of Humidity in the Intertropics by Radiometry) will have 6 channels around 183 GHz having 10 km ground resolution. ScaRaB is a Scanner for Radiation Budget Measurement, and ROSA a GPS-Radio Occultation Sensor, similar to the one flown on Oceansat-2.

SARAL-AltiKa is an ISRO-CNES collaborative mission, and is being planned to be launched in 2011. The AltiKa Mission belongs to the global altimetry system for the precise and accurate observations of ocean topography, circulation and sea surface monitoring with same accuracy as ENVISAT and complementary to the JASON-2 mission. The AltiKa Payload comprises a Ka-band (35.75 GHz, BW 500 MHz) radar altimeter, a dual-frequency MW radiometer (23.8 and 37 GHz) for tropospheric range correction, DORIS, for achieving adequate orbitography performance and LRA for orbitography and system calibration.

JAXA-WP-02 provided the status of JAXA's Future Satellite Systems, which includes Global Change Observation Mission (GCOM), Global Precipitation Measurement (GPM)/Dual-frequency Precipitation Radar (DPR), Earth Clouds, Aerosols and Radiation Explorer (EarthCARE)/Cloud Profiling Radar (CPR), and Advanced Land Observing Satellite-2 (ALOS-2). It should be noted that GCOM-W1 will be launched in November 2011 at the earliest.

NASA-WP-02 gave a brief description of future missions from NASA's Earth Science Division.

NASA's future missions fall into 5 categories: Foundational Missions, Decadal Survey Tier-1 Missions, Decadal Survey Accelerated Tier-2 Missions, Decadal Survey Venture Class Missions, and Climate Missions.

- Foundational Missions are those precursors initiated ahead of the 2007 National Research Council (NRC) Decadal Survey. These include: GLORY, Aquarius, NPP, LDCM and GPM;
- Decadal Survey Tier 1 Missions are the first group of missions identified by the NRC in its 2007 Decadal Survey. These include: SMAP, ICESat-2, DESDynI, and CLARREO-1;
- Decadal Survey Accelerated Tier 2 Missions are the first subset of Tier 2 missions identified by the NRC. These include: ASCENDS and SWOT.

  Others will be launched post-2020 and are not included in the Working Paper. A significant investment in mission-related technology is being

made by NASA's Earth Science Technology Office for most of the Decadal Survey missions, including all those in Tiers 2 and 3;

- Decadal Survey Venture Class Missions were recommended by the NRC Decadal Survey as a new programme for smaller-scale, principal-investigator led missions. The first three opportunities for these were in airborne missions (2009 solicitation, 2010 selection), a small satellite mission, and spaceflight-ready orbital instrument development (solicitations under development); and
- Climate missions are a new class of missions associated with the Fiscal Year 2011 (FY11) budget request, which calls for NASA to provide follow-on observational capability for a small number of environmental parameters for which NASA initiated US research observations and for which near-term transition to operational partners is not expected. These climate missions include OCO-2, SAGE-3, PACE, GRACE and OCO-3.

Other missions, but likely to be addressed at future CGMS meetings, are additional Tier-2, Tier-3 and Climate missions such as CLARREO-3,4, HyspIRI (hyperspectral), GEO-CAPE (GEO air quality), ACE, GPM Constellation, LIST (altimeter), PATH (all-weather T,P,RH), GRACE-2, SCLP (snow processes), GACM (atmospheric profiling), 3D-WINDS (tropospheric wind LIDAR).

CGMS Members invited R&D agencies to ensure that data from their planned satellites are made available to operational entities for rapid inclusion in their activities. ESA and NASA confirmed that they had an interest and that planned data policies would enable this. JAXA informed CGMS that data policy issues still had to be resolved.

Table 6: Future R&D satellites discussed within CGMS
(as of 11 November 2010, sorted by Equatorial Crossing Time and organisation)

Future satellites	Operator	Equatorial Crossing Time and orbital altitude	Planned launch date	Nominal life time (years)	Application/Instruments	Remarks, URL on planned data/product access
SARAL	CNES/ISRO	800 km (6:00D).	2011		AltiKa (Ka band altimeter) Doris receiver Argos-3 Laser retroreflector	
MEGHA-TROPIQUES	CNES/ISRO	867 km 20° inclination	2011	3	Microwave radiometer (MADRAS), microwave humidity sounder (SAPHIR), Radio Occultation sounder, Earth radiation budget (SCARAB)	
HJ-1C	CNSA	499 km (6:00 D)	2010		Land, resource and environment monitoring	
CBERS-03	CNSA/AEB	778 km (10:00 A)	2011		Land, resource and environment monitoring	
CBERS-04	CNSA/AEB	778 Km (10:30 D)	2012		Land, resource and environment monitoring	
ADM-Aeolus	ESA	405 km (18:00 A)	Sept 2011		Wind profiles	
SWARM (three satellites)	ESA	2 sats at 450 km 1 sat at 530 km (drifting up to 9 hours from the lower pair)	June 2011		Earth interior	
EarthCare	ESA/JAXA	400 km (10:30D)	Sep 2013		Cloud, radiation, aerosols	
Glory	NASA	705 km (13:30 A)	Feb 2011		Aerosol polarimetry and total solar irradiance	

Future satellites	Operator	Equatorial Crossing Time and orbital altitude	Planned launch date	Nominal life time (years)	Application/Instruments	Remarks, URL on planned data/product access
SAC-D/Aquarius	NASA/CONAE	657 km (6:00 D)	Apr 2011		Global sea surface salinity (SSS)	
OCO-2	NASA	705-km, Sun-Synchronous	Feb 2013		Atmospheric Carbon Dioxide sources and sinks (dry air column Mole fraction)	Replacement for failed OCO mission launch.
GPM (core)	NASA/JAXA	405 km 65° inclination	Jul 2013		Global Precipitation, Evaporation and water Cycle measurements.	Follow-on and expanded mission of the current on-going TRMM
LDCM (Landsat Data Continuity Mission)	NASA/US Geological Survey	705 km (10:00 D)	Dec 2012		Extension of Landsat record of multispectral 30m resolution	
SAGE-III	NASA / SOMD	320 km, 51.6 deg inclination (Space Station)	May 2014		Stratospheric ozone, aerosols, water vapor	Instrument available in May 2014, but launch and deployment on the International Space Station (ISS) unknown.
SMAP	NASA	685 km, Sun Sync, (18:00 pm)	Nov 2014		Soil Moisture, Freeze-thaw state	
ICESat-2	NASA	600 km, 94-deg inclination	Oct 2015		Ice sheet thickness, sea ice thickness, vegetation height, carbon and biomass	Follow-on mission to ICESat.
GRACE-FO (Follow-On)	NASA	400 km, 89-deg inclination	2016		Ocean currents and mass, ice sheets, GPS (P,T,humidity)	Follow-on to GRACE
CLARREO-1	NASA	650 km, 90-deg inclination	Nov 2017		Spectrally resolved and calibrated IR Earth radiance, GNSS (T,P,humidity)	Provides traceabilty to absolute SI-calibrated standards, Phased 180-deg with CLARREO-2
DESDynI	NASA	400 km, Sun-Sync, (6:00 am)	Nov 2017		Radar and Lidar instruments only	
PACE (Pre-ACE)	NASA	650 km, Sun-Sync, (13:00 pm)	2018		Aerosols and Ocean Color	Preliminary to ACE mission which will add cloud profiling

Future satellites	Operator	Equatorial Crossing Time and orbital altitude	Planned launch date	Nominal life time (years)	Application/Instruments	Remarks, URL on planned data/product access
ASCENDS	NASA	450 km, sun-synchronous (10:30 am)	2019		Carbon Dioxide (day and night). Utilizes laser technologies.	
SWOT	NASA	970 km, 78-deg inclination	2020		Lake levels, river discharge, ocean surface topography	
CLARREO-2	NASA	650 km, 90-deg inclination	2020		Spectrally resolved and calibrated reflected solar (RS) Earth radiance, GNSS (T,P,humidity)	Provides traceabilty to absolute SI-calibrated standards, Phased 180-deg with CLARREO-1
GCOM-W1	JAXA	700 km (13:30 A)	JFY2011 (Jan 2012)		Global water and energy circulation	
GCOM-C1	JAXA	800 km (10:30 D)	JFY2014		Carbon cycle and radiation budget (Atmosphere, Ocean, Land and Cryosphere)	
Kanopus-V N1	ROSCOSMOS	650 km (10:30)	2010		Monitoring of naturally occurring and man-made extreme events	
Kanopus-V N2	ROSCOSMOS	650 km (10:30 A)	2011		Monitoring of naturally occurring and man-made extreme events	

C.4 Future other LEO Satellites

EUM-WP-10 presented the status of the development of the Jason-3 Programme and plans for follow-on missions. The Jason-3 mission, which is a joint effort among four organisations: NOAA, CNES, and NASA to measure sea surface height by using a radar altimeter mounted on a low-earth orbiting satellite. The collection of precise measurements of sea surface height is essential for ocean climatology and ocean weather applications. Ocean climatology includes global sea-level rise, a key indicator of climate change, decadal variability in the ocean, seasonal/inter-annual variability, and coastal variability and its impact on ecosystems. Ocean weather involves operational oceanography, surface wave forecasting and evaluation, and hurricane intensity forecasting.

The Jason-3 mission will ensure the continuity of the 20 plus year data record started with TOPEX/Poseidon in 1992 and continued with Jason-1 and 2. The launch of Jason-3 is planned in 2013 with a 6-month overlap with Jason-2. The overlap period will be used to conduct initial cross-calibration and validation activities, complete on-orbit check-out operations, and maintain consistent observations of sea surface height between successive altimeter missions.
In order to ensure continuity of these key measurements over the next 15 years, discussions have been initiated between potential Partners in Europe and in the US on a new programme named Jason CS (Continuity of Service). The programme will be based on at least two satellites, the first one being launched in 2017 covering the time span before a new technology can eventually become operational.

EUM-WP-11 reported on GMES which covers several areas of applications, among which EUMETSAT has targeted to play a key role as satellite data provider for the oceanography and atmosphere user communities.

As part of GMES, Sentinel-3 will provide crucial data for information services to the European Union and its Member States. The services cover areas such as climate change, sustainable development, environmental policies, and European civil protection, development aid, humanitarian aid and the European Common Foreign and Security Policy. The Sentinel-3 mission will produce a consistent, long-term set of remotely-sensed marine and land data for (operational) ocean state analysis, forecasting and service provision.

In its role as operator of Sentinel-3 oceanography mission, EUMETSAT will:

- Generate and disseminate all Sentinel-3 products routinely required by the GMES Marine Core Service and its related downstream services;

- Serve the offline requests of the Operational Oceanography User Community for Sentinel-3 products (using a distributed network of centres of expertise);

- Monitor and control the spacecraft and flight operations segment;

- Acquire payload data, in a mode consistent with the GMES ground segment design which is under ESA's responsibility.

To fulfil this operational role, EUMETSAT has undertaken, under a cooperation agreement with ESA, the development of a ground segment to serve the needs of the Sentinel-3 mission, and for the routine operations to be engineered, validated and rehearsed by a dedicated operations team.

IMD-WP-02 reported on how ISRO plans to develop a microwave temperature sounder to be carried onboard a LEO satellite and the baseline design has been developed. The proposed temperature sounding unit will have 17 channels with a set of 15 channels distributed over off-resonance wings in the 50-60 GHz Oxygen absorption spectrum for sounding up to 40 km in the atmosphere. In addition two radiometer channels (23.8, 31.5 GHz) are selected for surface and other atmospheric corrections. The system design adheres to a total power radiometer configuration because of its better noise performance than a Dicke-switched receiver.

C.5 Future HEO or Combinations of LEO and GEO Missions

NOAA-WP-09 presented information on operational solar wind monitoring and coronal mass ejection imaging. Solar wind data and coronal mass ejection (CME) imagery are critical for warnings and alerts of potential and impending geomagnetic storms, which are the most damaging form of space weather. NOAA currently receives all this data from NASA and ESA research missions which are, in some cases, well beyond their 2-year design lives. NOAA has studied how to follow these research missions with a continuing operational capability. At the direction of the White House Office of Science & Technology Policy (OSTP), NOAA and other federal agencies are developing a plan to address the long-term need for solar wind and CME data. NOAA studies identified government smallsats, commercial data buys, and refurbishment of the NASA Deep Space Climate Observatory (DSCOVR) as options for meeting solar wind requirements. NOAA also studied new, smaller coronagraph designs for CME imaging. This work was brought to the interagency study for OSTP, which recommended refurbishing DSCOVR to meet near-term requirements, building and flying a demonstration coronagraph, and considering commercial data buys to meet long-term requirements. The DSCOVR solar wind mission and CME imager were included in the President's Fiscal Year 2011 budget request. Planning activities continue in anticipation of congressional authorisation.

NOAA-WP-10 reported on the progress of the Global Space-based InterCalibration System (GSICS), including:

- The completion and implementation of algorithms for intercalibration, including generation of correction coefficients, of the geostationary

infrared imagers from NOAA, EUMETSAT, JMA, CMA and KMA to reference quality EUMETSAT IASI and NASA AIRS hyperspectral infrared sounders;

- The development of the GSICS Procedure for Product Acceptance (GPPA) to document the GSICS intercalibration and correction algorithms;

- Establishment of the GSICS data servers and wiki pages for communication and data access;

- The addition of ISRO as a full member, and JAXA and ESA as observers;

- Document, prepared by NIST and NASA, on prelaunch characterisation of optical systems;

- Open access to the SADE database by CNES to provide critical benchmark comparisons of visible/near infrared sensors;

- Guidelines for CGMS agencies to provide web accessible instrument monitoring performance;

- The establishment of the GPM X-Cal Working Group as an associated member of GSICS; and

- Enhanced communication with SCOPE-CM to address the intercalibration needs for their pilot projects.

D. OPERATIONAL CONTINUITY AND RELIABILITY

To trigger the discussion on Item D, the report of Working Group III was introduced. The plenary noted that for the geostationary constellation no continuity issue was anticipated, there might be scope for optimization of the locations, and there would be a critical transition to new generations around 2015. For the polar-orbiting constellation, particular attention was needed on the PM orbit, and it was recommended optimizing the distribution of orbital planes. Generally speaking there is a need to ensure data availability and exchange.

CGMS recalled that the WMO “Vision for the GOS in 2025” calls for substantial enhancements and additions to the current GOS baseline, and agreed that CGMS should incorporate these changes stepwise into a new baseline. Since many of these enhancements are planned to be implemented by 2015 already, CGMS agreed that they should be reflected in a new CGMS baseline with this target date. This would strengthen the status of these new missions, provide visibility on the achieved progress, while highlighting the remaining gaps. CGMS tasked WMO to prepare an update along the lines of

Annex 2 of WG III Report, in consultation with the relevant Expert Teams, for submission to CGMS in advance of CGMS-39, with a view to incorporate the agreed changes in the relevant WMO Manuals and Guides in 2012.

D.1 Global Planning, Including Orbital Positions and Reconfiguration of the Space-based Component of the GOS

NASA-WP-06 reported on NASA's heterogeneous satellite constellations and the advantages and challenges of their implementation and maintenance. The primary advantage is near simultaneous observations for process studies. The primary challenge is data access and assimilation along with its calibration and validation. In addition, there are challenges with operational safety and commands that can be mitigated with formal working groups managing the constellation operations and considering new members or removing existing members. The "morning constellation" initiated in 1999 includes Landsat 5 and 7, Terra, EO-1 and CONAE's SAC-C mission with local equatorial crossing times between 10:00 and 10:30. The "afternoon constellation" or "A-Train" initiated in 2002 includes Aqua, Aura, CNES's PARASOL, CNES/NASA CALIPSO, CSA/NASA CloudSat, and future plans to add Glory, OCO-2 and JAXA's GCOM-W1 all with local equatorial crossing times between 13:30 and 14:00.

WMO-WP-08 gave an update on the WMO Dossier on the Space-based Global Observing System (GOS Dossier), incorporating the latest information provided by satellite operators, which is available online and opens for review by CGMS Members.

The GOS Dossier comprises an introduction followed by five volumes:

Vol. I Satellite programmes description
Vol. II Earth observation satellites and their instruments
Vol. III Gap analysis in the space-based component of GOS
Vol. IV Estimated performance of products from typical satellite instruments
Vol. V Compliance analysis of potential product performances with user requirements

This current issue, updated in October 2010, contains details on more than 260 instruments and 220 satellites.

NASA and ESA thanked WMO for this document which is very complementary to the work carried out on the CEOS Missions, Instruments and Measurements (MIM) database.

WMO-WP-09 reported on the WMO proposal to develop a space-based architecture for climate monitoring.

The global community faces the need to better organise its effort for improved and sustained monitoring of climate from space. WMO therefore proposed the

development of a space-based architecture for climate monitoring, in collaboration with GCOS, CGMS, CEOS and GEO. This followed a request expressed by WMO Members at the sixty-second session of the WMO Executive Council in June 2010. It is underlined that the Council wished that CGMS "would expand its activity to the coordination of operational missions in support of climate monitoring".

The architecture should enhance, and be modelled after, the end-to-end system which has been created over the past fifty years for weather observations, research, modelling, forecasting, and services. Given the complexity of the climate system, and the emerging requirements of the WMO Integrated Global Observing System (WIGOS), as well as the needs of the Global Framework for Climate Services (GFCS) effort, feedback and contributions will be sought from multiple partners and special efforts will be made to reach out to the research and development space agencies as well as the climate research community.

ESA added that a collaborative process has been proposed to define an initial architecture, starting with the development of a concept document, the outline of which is proposed in the Appendix to the working paper.

ESA also thanked WMO SP for addressing the very important subject of coordination and cooperation regarding climate monitoring from space. ESA asked that some other related ongoing activities such as the strategic decision by CEOS a couple of years ago to include climate from space as a priority, the recent creation of a CEOS Climate Working Group and the fact that GEO has climate as one of its Societal Benefit Areas be strengthened in the paper. ESA will provide additional comments by the due date to clarify its position on some selected points.

ESA agreed to provide additional comments in due course.

NOAA indicated its readiness to work with WMO on the document, highlighting the needed coordination with CEOS, GEO, GCOS and WCRP and is recommending the pursued as part of a GEO task that WMO could co-lead.

NASA recognised the need for developing a Climate Architecture document and the need for cooperation, particularly with regards to implementation. NASA highlighted the possibility for GCOS to express clear requirements for such an infrastructure.

IOC recalled the need to look at the integrated system, i.e. involving in-situ and satellite data as this is done by the WCRP.

EUMETSAT supported the document as a very good and concrete basis for having a discussion on Climate Architecture. Climate is typically an area where the concept of research to operations could be developed. EUMETSAT recognised that WMO was a unique organisation to coordinate this task.

In conclusion, CGMS Members invited the WMO SP to consider the comments made at the Plenary and later in writing.

Action 38.05: CGMS Members to provide written recommendation to WMO on its proposal to develop a space-based architecture for climate monitoring by 15 December 2010. Deadline: 15 December 2010.

D.2 Inter-regional Contingency Measures

No Working Papers were presented under this item.

D.3 Long-term Global Contingency Planning

No Working Papers were presented under this item.

E. CGMS RESPONSE TO WMO AND OTHER INTERNATIONAL REQUIREMENTS

E.1 Support to WMO Meteorological Programmes and Projects

EUM-WP-12 reported on space matters related to the WMO EC/Congress. The agenda of the WMO Council and Congress was modified a few years ago to reflect the new WMO strategic plan. As a result discussions were structured according to expected WMO results. This had the consequence that benefits of the WMO Space Programme were neither identified nor debated.

Following the WMO Executive Council Resolution of June 2010, Space matters have been reinstituted on the agenda, and it is proposed to send a letter on behalf of CGMS acknowledging the recent WMO Council Resolution (3.4 Integration of WMO observing systems; 3.4.43-3.4.45) and requesting the WMO Secretary-General to implement it at the WMO Congress 2011.

WMO informed CGMS that the space programme will be discussed under the agenda item on the Global Observating System at the coming WMO Congress in 2011.

Action 38.06: CGMS Secretariat is invited to send a letter from CGMS Members to the WMO SG asking to reinstate a discussion on the WMO Space Program at the next WMO Congress in 2011. Deadline: 15 December 2010.

EUM-WP-13 presented the activities undertaken by EUMETSAT and its partners to support to the WMO strategy in RA-I and RA-VI. The main objective of these activities is to facilitate operational access to EUMETSAT data and infrastructure so that countries in these two regions, which are not

EUMETSAT Member or Cooperating States, can develop their capacities for using them.

The Working Paper also presented two recent EUMETSAT sponsored activities in these two regions: the AMESD project for RA-I (which builds on PUMA); and the DAWBEE initiative for RA-VI.

The AMESD programme started in October 2007 and emphasises the activities directly relevant to the NMHSs of the RA-I. Notably the installation of new receiving stations in 2010 to get operational access to EUMETSAT data and products, and other products disseminated by EUMETCast. Focus is also given to the associated training activities.

EUMETSAT initiated the DAWBEE Project - "Data Access for Western Balkan and Eastern European countries"– in order to meet some needs expressed by the countries in these regions with respect to access to EUMETSAT data, products and training. The document provided more details of the project, its status, and the cooperation established with the WMO secretariat.

EUM-WP-14 recalled that the EUMETSAT SAF on climate monitoring is contributing to three SCOPE pilot projects.

The SAF on support to Operational Hydrology and Water Management completed the development Phase in August 2010 and entered the Continuous Development and Operations Phase (CDOP), planned to continue until February 2012. All other SAFs are in their CDOP and will soon complete the 4th year of related activities.

Over the last few months, the number of operational SAF products increased, especially for the products based on EPS data. Similarly, there was an increased availability of SAF off-line products in the EUMETSAT Central Archive.

In 2010, the SAFs are all engaged in preparing proposals for a second slice of the CDOP, covering the period March 2012 to February 2017.

The SAF Network support to the WMO SCOPE-CM initiative has progressed well and remains in-line with plans for the approved Pilot Projects.

KMA-WP-20/JMA-WP-07 outlined the background and mission of the Pilot Project to develop support for NMHSs in satellite data, products and training along with the accomplishments of the first phase and the action plan for the second phase. WMO thanked KMA and JMA for this initiative.

Action 38.07: CGMS Satellite Operators are encouraged to note the usefulness of RA II Pilot Project web pages on the WMO Space Programme (WMOSP) website providing information related meteorological satellites for NMHSs users, and to support the Project

providing the information of satellite data and products answering to the questionnaire, which will be sent from the project co-coordinators. Deadline: CGMS-39

NOAA-WP-11 provided an explanation of NOAA's long-term satellite planning process supporting the GOS 2025 vision by sustaining NOAA's satellite services at today's operational capability level, investing in enhancements and optimisation of satellite sensors to improve constellation performance and capability, and improving satellite services (e.g. algorithm development, and product processing and distribution). NOAA plans to develop its environmental satellite programs by advancing system designs (i.e. JPSS, GOES-R), adding new capability sensors (e.g. altimetry, Earth Radiation Budget, Total Solar Irradiance, Ozone nadir and limb profiler, radio occultation, and geostationary lightning mapper), and fostering cooperation with other key government and international partners to support NOAA's diverse mission to understand and predict changes in Earth's environment and conserve and manage coastal and marine resources to meet our nation's economic, social, and environmental needs. This planning ensures continuity of measurements where and when appropriate, provides fiscally responsible estimates of the planned capabilities, and extends NOAA's capabilities to improve its nation's ability to protect lives and property.

WMO-WP-10 presented the Severe Weather Forecasting Demonstration Project (SWFDP), which is a project carried out by WMO and its Commission of Basic Systems (CBS) to enhance the use of outputs of existing numerical weather prediction (NWP) systems to achieve improved severe weather forecasting and warning services. While largely successful, some deficiencies have been identified, including in forecasting the rapid onset of localised severe thunderstorms, heavy precipitation and strong winds, in the absence of operational radar coverage. While satellite data processing systems have proven themselves as powerful tools for forecasting, the products could be more effectively used, and possibly further developed with operational forecasting and forecasters in mind, especially in developing and least developed countries where weather radars are few or non-existent, and expertise and capacities need to be dramatically increased. IMD indicated its willingness to join this group.

Recommendation 38.02: CGMS members to examine opportunities to incorporate Severe Weather Forecasting Demonstration Project (SWFDP) required data and products in their broadcast schemes. Deadline: CGMS-39.

E.2 Support to GCOS and other Climate Monitoring Activities

CMA-WP-16 listed the international activities CMA is currently involved in related to climate monitoring including SCOPE-CM and GSCIS. It then provided information on the activities and future plans of relevance to climate monitoring by CMA. This includes the project of reprocessing the historic data that has been stored since 1984, the work in building up the long-term CDR,

and developing web-based data service for user's access to the archived data. The paper mentioned that the Chinese Government has recently approved the FY-4 geostationary proposal which is capable of VIS & IR imagery, IR atmospheric sounding, and lightning mapping. In response to GCOS requirements, CMA will modify the future FY-3 instrument payloads that enable the measurement of trace gases relevant to greenhouse effect; replaces the current IRAS with the hyper-spectral Infrared Atmospheric Sounder; and the introduction of the GPS Radio Occultation (GRO) into the FY-3C and later satellite models for the measurement of temperature and humidity profiles. The Working Paper stated that with the full establishment of the FY-3 polar-orbiting system, and the improvement of operational performance of the FY-2 geostationary system, CMA will be capable of continued space observation to support long-term climate monitoring.

CNES-WP-01 provided CGMS with an overview of CNES activities related to the study and monitoring of climate change.

In 2008, on the occasion of the French presidency of the European Union, the issue of climate change became not only a priority of the European Space Policy, but also a priority of CNES. Since then, CNES has increased its efforts in this area and enhanced the visibility.

At the end 2008, CNES implemented an internal Climate change working group, with the following objectives to:

- analyse the CNES contribution to the studies on climate change;
- position the contribution in the international context; and
- make recommendations in order to enhance the efficiency and the visibility of the contribution.

The contribution of space observation to the monitoring and study of climate change obviously requires a large international cooperation among space agencies (and their coordinating bodies), but also with other world organisations such as GEO or WMO. CNES is carrying out activities in this field.

EUM-WP-14. Please refer to the abstract presented under Agenda Item E.1, The Working Paper recalled that the EUMETSAT SAF on climate monitoring contributes to three SCOPE-CM pilot projects.

EUM-WP-15 provided information on the formal establishment of an Implementation Plan for the generation of Climate Data Records (CDRs) and the related organisational activities that will make EUMETSAT more efficient in creating CDRs within its distributed ground segment. The document also provided comments on the maturity index for climate data records under development by NOAA, as well as on the Guidelines for the Generation of Satellite-based Data-sets and Products Meeting GCOS Requirements

(GCOS-128). The document also highlighted EUMETSAT involvement in international activities helping to reach GCOS goals. It also gave further information on the development of the reprocessing facilities at the Central Application Facility as well as a brief outlook into the future.

Cornerstones in 2010 were the decisions on the MTG programme that brought the Meteosat observation potentially to a time series of 50 years for those observations that were already available on the first generation satellites and on the EUMETSAT Implementation Plan in Support to Climate Monitoring that provides a formal framework of coordination for the generation of Climate Data Records in the near future. The establishment of this, and the organisational changes, went hand in hand with the progress in the establishment of dedicated reprocessing facilities at EUMETSAT to be used to support the EUMETSAT SAFs, SCOPE-CM, ESA-CCI and the ERA-CLIM project. In particular the latter once again highlights the importance of EUMETSAT data for global NWP model-based reanalysis.

Recommendation 38.03: CGMS members to consider ways and means to strengthen their support to international scientific expert teams involved in peer review of climate data records (for example, to the CGMS Working Groups IPWG, IWWG, ITWG and IROWG, and to the World Climate Research Programme Global Energy and Water Cycle Experiment Radiation Panel [WCRP GEWEX RP]). Deadline: CGMS-39

NOAA-WP-12 presented the Climate Date Records Project (CDRs) which provides for ongoing production of the CDRs and Climate Information Records (CIRs). CDRs and CIRs provide authoritative climate reference sets. They are required by scientists to detect, assess, model and predict climate change, and by decision-makers to devise effective strategies to respond, adapt, and mitigate the impacts of climate change. The programme leverages prior US investment by transitioning research products from NOAA, NASA and other agencies into sustained NOAA operations. Major CDR development and production actions include:

- Algorithm development, processing and re-processing of long-term data series;
- Calibration, validation and characterisation of data;
- Science and CIRs;
- Long-term data stewardship (to ensure that CDRs are easily understood, accessible, and of the highest possible quality);
- Applications for mitigation and adaptation; and
- Project management support.

This project officially started in 2009 with three major thrusts:

1. Processing of historical operational environmental satellite data for long-term CDRs;

2. Development of software for the National Polar-orbiting Operational Environmental Satellite System Preparatory Project (NPP) pre-processing to ensure NPP data are easily available for processing into CDRs (a format known as a "raw CDR"); and

3. Implementation planning for processing of the TSIS and CERES data for the J1 JPSS.

NOAA-WP-13 reported on NOAA/NESDIS' joint efforts to provide leadership under CEOS to coordinate an international response to the new 2010 Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC ('GCOS Implementation Plan'). The coordination will include participation by CEOS, CGMS, WCRP and other international working groups. In 2006, CEOS responded to the 2004 GCOS Implementation plan. The CEOS report identified 59 actions that cover key aspects of climate-related observations of the atmosphere, ocean and land. The report emphasised the importance of satellite measurements of the highest reliability to provide the long-term records needed to monitor climate change. In 2010, CEOS provided a very detailed progress report on the 59 actions to UNFCCC. CEOS, working with CGMS, WMO, WCRP and other international working group will develop a new response with a set of new actions in response to the new 2010 GCOS-IP (cf. WMO-WP-12).

WMO-WP-11 reported on the progress made with the Sustained Co-Ordinated Processing of Environmental Satellite data for Climate Monitoring (SCOPE-CM) effort, particularly in reference to guidance issued at CGMS-37. The World Climate Research Programme (WCRP), through the Global Energy and Water Cycle Experiment (GEWEX) has joined the SCOPE-CM Executive Panel in order to increase the involvement and better meet the needs of the research community. A project for an oceanic or an additional terrestrial ECV is still needed.

IOC offered its support to WMO should decide to address Ocean parameters.

WMO-WP-12 summarised GCOS activities related to satellite activities in support of climate monitoring, namely on:

- the 2010 update of the GCOS Implementation Plan and implications to satellite operators; and

- recommendations by GCOS and World Climate Research Programme (WCRP) expert panels related to space agencies.

WMO-WP-13 informed CGMS on its plan to convene a Workshop on continuity and architecture requirements for climate monitoring on 13-14

January 2011 designing the architecture of an expanded Global Observing System (GOS). This would efficiently meet the needs of climate monitoring requires a proper understanding of the specific requirements of climate monitoring for measurement continuity, as these requirements may differ from the operational continuity requirements. This was the origin of **CGMS Action 36.24** requesting WMO to convene a "contingency workshop".

It is thus proposed to convene, in collaboration with GCOS, a workshop focussing on the climate continuity requirements, the risk of gaps and the recommended architecture provisions to mitigate such risk of gaps. The workshop will be held on 13 and 14 January 2011 in Geneva.

The expected outcome of this workshop will be to inform the definition of the space-based architecture for climate monitoring (See CGMS-38 WMO-WP-09) and should contribute to further revision of the baseline for the space-based GOS (See CGMS-38 WMO-WP-03).

Action 38.08: CGMS Members are invited to participate in the First Workshop on Space-based Architecture for Climate, focussing on "Continuity and architecture requirements for climate monitoring", to be held on 13 and 14 January 2011 in Geneva. Comments on Workshop outline to be received by WMO by 1 December 2010. Deadline: 1 December 2010.

Action 38.09: WMO SP to check with the GEO SEC the possibility to co-sponsor the Workshop. Deadline: January 2011.

E.3 Support to IOC, JCOMM and other Ocean Monitoring Activities

EUM-WP-14. Please refer to the abstract presented under Agenda Item E.1, The Working Paper recalled that the EUMETSAT SAF on climate monitoring contributes to three SCOPE-CM pilot projects.

EUM-WP-16 provided a general overview of EUMETSAT activities in satellite oceanography. It described the general context, operational activities, involvement in ocean monitoring projects and international cooperation. Details on (pre-) operational products and products under development are provided in Working Paper **CGMS-38 EUM-WP-33**.

E.4 Support to GAW and other atmospheric chenistry monitoring activities

WMO-WP-14 recalled the background of the Global Atmosphere Watch (GAW) Programme noting that, with GAW, WMO has taken the lead in implementing the recommendations of the Integrated Global Atmospheric Chemistry Observations (IGACO) strategy. Through its Strategic Plan 2008-2015, GAW is aiming at the development and better integration of global

atmospheric chemistry observations; near-real time availability of some of the GAW data through the WMO Global Telecommunications System (GTS) and WMO Information system (WIS); coherent data processing chains within a GAW quality management system; and research and development towards assimilation of aerosols, ozone and greenhouse gases observations into models supporting products and services. An overview of GAW satellite observation needs and related challenges was presented. It was highlighted that the required coverage, precision, spatial and temporal resolution called for geostationary and low Earth orbit observation capabilities to be implemented and sustained. The risk of a gap was underlined for high resolution measurements of ozone and greenhouse gases.

GAW is planning to set up an ad-hoc Task Team in 2011 to review the needs of GAW regarding satellite measurements and the IGACO recommendations that date back to 2004. Members of this ad-hoc team are expected to be experts representing the relevant areas of GAW, collaborating partners and satellite agencies. The team will coordinate its work with the CBS Expert Team on Satellite Systems (ET-SAT).

CGMS Members took note of the creation of the GAW Satellite Requirements Task FORBE and thanked WMO for this.

E.5 Support to Satellite Requirements of other International Programmes

WMO-WP-15 reported on developments that occurred following the International Polar Year (IPY), namely through the establishment of the IPY Space Task Group (STG) and its Global Interagency IPY Polar Snapshot Year project (GIIPSY).

The Executive Council Panel of Experts on Observations, Research and Services (EC-PORS) was established by WMO to promote and coordinate programmes carried out in the Antarctic and Arctic regions. It interfaces with all relevant programmes meeting global needs for meteorological, climatological and hydrological observations, research and services in the Polar Regions, and prepares follow-on projects. The EC-PORS was tasked to promote a broad partnership to secure the legacy of the International Polar Year (IPY), potentially in the form of an International Polar Decade (IPD).

The Global Cryosphere Watch (GCW) is a global initiative, under preparation, to provide authoritative information on the cryosphere. GCW would include observation, monitoring, assessment, product development, prediction, and related research. It would provide the international mechanism for implementing the recommendations of the IGOS Cryosphere Theme. It should provide information on the past, current and future states of the cryosphere to meet the operational, research and service needs of weather, climate, hydrology and environmental science. GCW should ensure the implementation of a comprehensive, coordinated, and sustainable system of

in-situ and satellite observations, and that related information is accessible. In June 2010, the WMO Executive Council agreed that the GCW was a timely initiative and urged Members to support GCW activities.

Action 38.10: CGMS Members are invited to support the Global Cryosphere Watch (GCW) by identifying relevant operational satellite products, and developing new satellite derived climate products, which would contribute to GCW and to comment on the benefit of cryosphere reference sites that meet long-term in-situ needs as well as satellite cal/val needs. Deadline: CGMS-39.

Recommendation 38.04: CGMS Satellite Operators are invited to consider the development of new operational sensors for cryospheric variables, especially snowfall.

F. INTERACTION WITH INTERNATIONAL PARTNERS

F.1 GEO

No working papers were submitted under this item.

F.2 CEOS

No working papers were submitted under this item.

F.3 Other International Partners

EUM-WP-17 provided information to CGMS on the European initiative Global Monitoring for Environment and Security (GMES) and in what way EUMETSAT is involved and how its satellite programmes play a highly relevant role in the initiative.

NASA-WP-05 reported on the international activities of NASA. In the past 50 years, NASA's international cooperative activities have involved more than 3,000 agreements with over 100 nations or international organizations and these efforts will continue to grow. NASA uses the Space Act of 1958 to govern its international activities. NASA's cooperative activities must have scientific and technical merit and demonstrate a specific programmatic benefit to NASA. At the present time, two-thirds of NASA's 455 active international agreements are for missions led by the Science Mission Directorate, which includes space and Earth science. It should also be noted that more than half of NASA's 48 currently operating science missions include international participation, and 9 of 14 current Earth science missions include international participation. The major multilateral organisations through which NASA primarily coordinates its space-based Earth observation are GEO and CEOS. In addition, NASA has international partnerships for ground-based and

airborne programs, and specific international programs such as SERVIR and the educational GLOBE program.

G. WORKING GROUP REPORTS

Reports from the four working groups were presented by Mr Marlin O. Perkins (WG I on Telecommunications), Dr Johannes Schmetz (WG II on Satellite Products), Mr Jérôme Lafeuille (WG III on Global Contingency Planning) and Mr Mikael Rattenborg (WG IV on Global Data Dissemination). Please see pages 84-152 inclusive for the detailed Working Groups reports.

CGMS-38 took note of the reports and thanked the Working Group participants, Chairmen and Rapporteurs for their active and fruitful discussions.

CGMS-38 endorsed the proposed actions and recommendations formulated by each Working Group and congratulated the four Groups for their comprehensive reports and for their achievements since the preceding meeting of CGMS.

ESA informed CGMS that the CEOS Chairman had been tasked at the recent CEOS Plenary to write to CGMS proposing collaboration in Radio Frequency matters.

H. OTHER ITEMS OF INTEREST

H.1 Training

EUM-WP-18 reported on the status and future plans for EUMETSAT training activities in satellite meteorology and those in support of the Centres of Excellence (CoE) in Africa, the Middle East and Europe. The actual training activities follow an approved 5-year Training Plan (2009-2013).

Further guidance on EUMETSAT long term training is given in the EUMETSAT training strategy document, which was also approved in 2008 by the EUMETSAT Council. In these plans the scope of the EUMETSAT contribution to the WMO Virtual Laboratory (VLab) is also described. The User Service Training Team is responsible for conducting and implementing the training activities and plans.

IMD-WP-14 reported on Capacity Building in Satellite meteorology in the Asia Pacific Region. The benefits of space technology have introduced new dimensions in the study and understanding of the Earth's processes and in improving the quality of life of people. All countries should have access to space technology and must share the benefits. An essential pre-requisite to fruitfully use these opportunities is to develop human skills to adopt and adapt the space technology for the societal benefit. In recognition of this, a

consensus has emerged in the international community that if effective assimilation and appropriate application of space technology are to succeed in developing countries, devoted efforts must be made at local level for the development of necessary high level knowledge and expertise in space technology fields. Recognising this, the Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) was established on 1 November 1995. The United Nations Office for Outer Space Affairs (UN-OOSA) facilitated the establishment of the Centre, acting on recommendations by the UNISPACE – II (1982) Conference and the UN Committee on the Peaceful Use of Outer Space (COPUOS), endorsed by the UN General Assembly. Further information is available on www.cssteap.org

JMA-WP-06 reported on the status of JMA's ADDE (Abstract Data Distribution Environment) server. JMA is operating a new service using an ADDE server to enable the provision of training environments using client viewer software since April 2010.

JMA supports MTSAT data users in NMHSs with a variety of training materials and tools such as SATAID (SATellite Animation and Interactive Diagnosis) through the Virtual Laboratory page of the Meteorological Satellite Center (MSC) website and other JMA websites. In addition to these provisions, the Agency has also offered the new service for training purposes via the Internet since April 2010

KMA-WP-18 reported on the 4th International Training Course on Analysis of COMS Data in Korea. KMA organised the training course for potential foreign users from 11 countries in the Asia-Pacific area in order to introduce the COMS programme and to inform the user community of COMS data.

KMA-WP-19 reported on the KMA's efforts to participate in the WMO-CGMS Virtual Laboratory program. After expressing KMA's intention to participate WMO-CGMS Virtual Laboratory at the 37th CGMS, KMA has continuously attended the VLab web meetings and Virtual Laboratory Management Group (VLMG)-5 meeting in Beijing in 2010.

After the successful launch of COMS on 27 June 2010, KMA, as an operator of COMS, sent an official letter to WMO in September 2010 requesting the designation of a WMO-CGMS Centre of Excellence in Remote Sensing Application and Satellite Meteorology Training.

KMA plans to develop various online training programmes for COMS data utilisation for domestic and foreign users. These activities can be harmonised with the Virtual Laboratory and regional Centre of Excellence activities.

EUMETSAT congratulated KMA on its on-going activities to develop training in the use of COMS data and for having joined the WMO Virtual Laboratory (VL).

NOAA-WP-14 provided a summary of NOAA support for the CGMS WMO Virtual Laboratory, Virtual Laboratory Management Group (VLMG), the Environmental Satellite Resource Center (ESRC), and Focus Groups from September 2009 through September 2010.

NOAA and its partners continue to show leadership and active support in the area of education and training across WMO RA III and IV with assistance for other Regions. The Working Paper reported provides a summary of the activities conducted by NOAA and its partners in support of the WMO Virtual Laboratory (VL) for Satellite Education and Training and for the VL Management Group (VLMG).

NOAA and its partners (CIRA, CIMSS, COMET, VISIT and the Centres of Excellence in Region IV) continued to be very active in 2009 and in 2010. Key activities during this period included:

- NOAA funding and support for the Virtual Laboratory Technical Support Officer (TSO) to assist with VL Management Group activities starting in 2010 and continuing into 2011;

- Establishment of the Environmental Satellite Resource Center as an official WMO Space Programme Web Portal; and

- Monthly Regional Focus Group (RAIII and IV) discussions throughout the period (conducted since March 2004).

WMO-WP-16 reported on training activities within the Virtual Laboratory for Education and Training in Satellite Meteorology (VLab) along with future plans and directions. Important developments have taken place since CGMS-37, including the development of the roadmap towards widening the scope of VLab activities to serve the needs of emerging scientific communities in the developing countries. Among these developments were listed the funding of the TSO until March 2011, the fifth Virtual Laboratory Management Group meeting (VLMG-5) in July 2010 at CMATC in Beijing, China and the agreement with COMET to use the ESRC as the resource library for the VLab. The TSO has efficiently supported the various activities and further advanced the objectives of the VLab along the lines of the five-year strategy, but its position needs to be further funded in the long term.

A summary of the annual reports from the CoEs and sponsoring satellite operating agencies for the period from May 2009 to June 2010 is provided in the Working Paper.

CGMS was invited to note the important achievements of the VLab, to provide comments, and to consider the actions below.

Action 38.11: The WMO/CGMS Virtual Laboratory Management Group (VLMG) to liaise with the SWFDP to identify opportunities to coordinate training activities and share training resources that would allow Member

countries in SWFDP project regions, such as Southern and Eastern Africa, South-eastern Asia and the Southern Pacific, to further enhance the benefits realised through the SWFDP in better using satellite-based products in support of severe weather forecasting. Deadline: CGMS-39.

Action 38.12: CGMS Satellite Operators to provide a contact point for SWFDP, who would contribute to inform the SWFDP project on relevant satellite data and products responding to SWFDP needs, and to identify opportunities for development of improved products and services. Deadline: CGMS-39.

IMD expressed the wish to join the WMO VLab project. This was welcomed by WMO.

Action 38.13: CGMS members to respond to the updated set of GCOS needs, through the proposed space-based architecture for climate monitoring and the CEOS response (cf. CGMS-38 NOAA-WP-13), as appropriate. Deadline: CGMS-39.

H.2 Information

CMA-WP-07 informed CGMS of the Asia/Oceania Meteorological Satellite Users' Conference that was held on 1-12 November 2010, Beijing. The purpose of the conference was to promote the utilisation of meteorological satellite data; improve the supportive role of meteorological remote sensing in disaster prevention and mitigation and in response to climate change; advance the satellite observation technologies; and promote synergetic developments of meteorological satellites in the region. The conference gained support from CGMS member organisations and GEO. EUMETSAT, JMA, KMA, NOAA, ROSHYDROMET, WMO contributed by sending representatives who provided presentations. JMA, KMA, WMO, GEO provide co-sponsorship. 48 people came up with 50 reports presented in the 5 sessions of the conference which was attended by an audience of around 100 people. CMA hosted and organises this conference prior to the 7th Plenary Session of Intergovernmental Group on Earth observations (GEO) 3-4 November and the 2010 GEO Ministerial Summit 5-6 November, in Beijing.

EUM-WP-19 listed the conferences and events which had taken place since CGMS-37 in 2009 and presented those foreseen in the short- to medium-term future. EUMETSAT's recent and current publications, as well as those in preparation, were also listed.

H.3 Any other Business

The CGMS Secretariat announced the creation of a dedicated CGMS Website, which will go live in 2011. The prototype of the website was shown to the participants. The features and designs, including the uploading of Working Papers through a member restricted area, were presented.

The selected domain to host the website is www.cgms-info.org.

Action 38.14: CGMS Members are invited to nominate further representatives for the web committee and send it to cgmssec@eumetsat.int. The CGMS Secretariat will be the point of contact. The committee to receive comments/feedback/ suggestions on the website. Deadline: 31 December 2010.

I. FINAL SESSION

I.1 Nomination of CGMS Representatives at WMO, CEOS and other meetings

CGMS-38 agreed that the CGMS Secretariat (EUMETSAT) would represent CGMS at:

- the WMO Congress XVI in 2011, in Geneva, Switzerland, and
- the CEOS Plenary meeting in 2011

I.2 Nomination of Chairmen and Rapporteurs of Working Groups for CGMS-39

- **Working Group I on Telecommunications** will be chaired by Mr Marlin O Perkins, with Mr Joaquin Gonzalez as Rapporteur;

- **Working Group II on Satellite Products** will be chaired by IMD with Dr Johannes Schmetz and Dr Mitch Goldberg as rapporteurs;

- **Working Group III on CGMS Global Contingency Planning** will be chaired by NOAA, with Mr Jérôme Lafeuille as Rapporteur;

- **Working Group IV on Integrated strategy for data dissemination from meteorological satellites** will be chaired by Mr Mikael Rattenborg, with Mr Gordon Bridge as Rapporteur.

I.3 Nomination of Rapporteurs of IPWG, IROWG, ITWG, IWWG

International Precipitation Working Group (IPWG): Dr Volker Gärtner

International Radio Occultation Group: Dr Mitch Goldberg and IMD

International TOVS Working Group (ITWG): Dr Mitch Goldberg

International Winds Working Group: Dr Johannes Schmetz

I.4 Summary List of Actions from CGMS-38

Actions open from CGMS-37 (at CGMS-38)					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
ROSHYDROMET	37.01	Action 37.01: ROSHYDROMET to inform CGMS about the availability of Meteor-M calibration data. Deadline: CGMS-39		(CGMS-38) New deadline: CGMS-39	OPEN
ESA	37.04	Action 37.04: ESA to inform CGMS whether the soil moisture information derived from SMOS data is comparable to that derived from Scatterometer data. Deadline: CGMS-39		(CGMS-38) New deadline: CGMS-39	OPEN
VL Co-chairs	37.12	Action 37.12: VL Co-chairs to discuss with VL sponsoring agencies the funding of the Technical Support Officer (TSO) position from the end of 2010 onwards. Deadline: CGMS-39 (from the end of 2011 onwards)		(CGMS-38) New deadline: CGMS-39	OPEN
VL Co-chairs	37.13	Action 37.13: VL Co-chairs and WMO to convene the fifth Virtual Laboratory Management Group (VLMG-5) meeting during the first half of 2010. Deadline: CGMS-39		(CGMS-38) New deadline: CGMS-39	OPEN
WMO	37.14	Action 37.14: WMO to continue dialogue with ISRO regarding the establishment of an Indian CoE and the co-sponsoring of the CoE in Oman. Deadline: CGMS-39		(CGMS-38) New deadline: CGMS-39	OPEN
WMO + VL Co-chairs	37.15	Action 37.15: VL Co-chairs and WMO to seek an agreement between CGMS, COMET and WMO with a view of using the ESRC as a resource library for the VL. Deadline: CGMS-39		(CGMS-38) New deadline: CGMS-39	OPEN
WMO + VL Co-chairs	37.16	Action 37.16: The Co-chairs, in consultation with the WMO Space Programme and other relevant WMO Departments, to prepare a roadmap towards widening the scope of VL activities to serve the needs of emerging scientific communities in developing countries. This roadmap will be reviewed by the VLMG and presented to CGMS-38 for approval. Deadline: CGMS-39		(CGMS-38) New deadline: CGMS-39	OPEN
CGMS Members	37.17	Action 37.17: CGMS Members to complete the tables of data access information, and to provide the relevant internet links to WMO. Deadline: CGMS-39		(CGMS-38) New deadline: CGMS-39	OPEN

Actions open from CGMS-37 (at CGMS-38)					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
ESA	WGII 37.28	Action 37.28: ESA to provide a working paper on the long-term monitoring of MERIS as a reference calibration instrument. Deadline: CGMS-39		(CGMS-38) New deadline: CGMS-39	OPEN
CGMS satellite operators	WGIV 37.37	Action 37.37: All CGMS satellite operators to regularly include user statistics in their reports on current satellite systems. Deadline: CGMS-39		(CGMS-38) New deadline: CGMS-39	OPEN

CGMS-38 permanent actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Permanent 01	All CGMS Members to inform the Secretariat of any change in the status or plans of their satellites to allow the updating of the CGMS Tables e-mail, of Satellites (tables 1-6 of the plenary report). The Secretariat to review the tables of current and planned polar and geostationary satellites, and to distribute this updated information, via the WWW Operational Newsletter, via Electronic Bulletin Board, or other means as appropriate. CGMS satellite operators to update table 7 for polar-orbiting satellite equator crossing times on an annual basis. CGMS Members to update the table on polar-orbiting satellite equator crossing times as well as the table on coverage from geostationary satellites.	EUM-WP-02, NOAA-WP-02, -03, -04, -07, -08, -19, -35, -40, -43	CGMS-39	OPEN
CGMS satellite operators	Permanent 02	CGMS Members to report on spacecraft anomalies from solar events at CGMS meetings.	EUM-WP-05, NOAA-WP-05	CGMS-39	OPEN
CGMS Members	Permanent 03	CGMS Members to review the list of available list servers used by CGMS groups and update as appropriate.	Ongoing	CGMS-39	OPEN
CGMS Members	Permanent 04	CGMS satellite operators to consider the IOC satellite requirements, especially the data dissemination methods, bearing in mind the ongoing formations of GOOS Regional Alliances (GRAs).	EUM-WP-16, NOAA responded at CGMS XXXV, no update at this time.	CGMS-39	OPEN
CGMS Members	Permanent 05	CGMS should develop a coordinated approach for direct broadcast services of future polar orbiting meteorological satellite systems.		CGMS-39	OPEN
CGMS Members	Permanent 06	All CGMS satellite operators to regularly include user statistics in their reports on current satellite systems. Deadline: CGMS-39.		CGMS-39	OPEN

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
EUM	38.01	Action 38.01: EUMETSAT to report on availability of IASI Level-2 product extraction software for direct readout. CGMS-39		CGMS-39	OPEN
ROSH	38.02	Action 38.02: Roshydromet to make technical details of microwave Sounder data (meta-data, format) available to the global user community. Deadline: 31 March 2011.		31-Mar-11	OPEN
CGMS Members	38.03	Action 38.03: CGMS Members to report on their activities related toSpace Debris / collision mitigation measures by CGMS-39.		CGMS-39	OPEN
CGMS Members	38.04	Action 38.04: CGMS Members to provide information on anomalies affecting their spacecrafts and payload caused by cosmic radiation. Deadline: CGMS-39		CGMS-39	OPEN
CGMS Members	38.05	Action 38.05: CGMS Members to provide written recommendation to WMO on its proposal to develop a space-based architecture for climate monitoring by 15 December 2010.		15-Dec-10	OPEN
CGMS Secretariat	38.06	Action 38.06: CGMS Secretariat is invited to send a letter from CGMS Members to the WMO SG asking to reinstate a discussion on the WMO Space Program at the next WMO Congress in 2011.		15-Dec-10	OPEN
CGMS Satellite Operators	38.07	Action 38.07: CGMS Satellite Operators are encouraged to note the usefulness of RA II Pilot Project web pages on the WMO Space Programme (WMOSP) website providing information related meteorological satellites for NMHSs users, and to support the Project providing the information of satellite data and products answering to the questionnaire, which will be sent from the project co-coordinators.		CGMS-39	OPEN
CGMS Members	38.08	Action 38.08: CGMS Members are invited to participate in the First Workshop on Space-based Architecture for Climate, focussing on “Continuity and architecture requirements for climate monitoring”, to be held on 13 and 14 January 2011 in Geneva. Comments on Workshop outline to be received by to WMO by 1.12.2010		01-Dec-10	OPEN
WMO	38.09	Action 38.09: WMO SP to check with the GEO SEC the possibility to co-sponsor the Workshop. Deadline: January 2011.		January 2011	OPEN

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	38.10	Action 38.10: CGMS Members are invited to support the Global Cryosphere Watch (GCW) by identifying relevant operational satellite products, and developing new satellite derived climate products, which would contribute to GCW and to comment on the benefit of cryosphere reference sites that meet long-term in-situ needs as well as satellite cal/val needs.		CGMS-39	OPEN
WMO / CGMS Virtual Laboratory Management Group (VLMG)	38.11	Action 38.11: The WMO / CGMS Virtual Laboratory Management Group (VLMG) to liaise with the SWFDP to identify opportunities to coordinate training activities and share training resources that would allow Member countries in SWFDP project regions, such as Southern and Eastern Africa, South-eastern Asia and the Southern Pacific, to further enhance the benefits realized through the SWFDP in better using satellite-based products in support of severe weather forecasting.		CGMS-39	OPEN
CGMS Satellite Operators	38.12	Action 38.12: CGMS Satellite Operators to provide a contact point for SWFDP, who would contribute to inform the SWFDP project on relevant satellite data and products responding to SWFDP needs, and to identify opportunities for development of improved products and services.		CGMS-39	OPEN
CGMS Members	38.13	Action 38.13: CGMS members to respond to the updated set of GCOS needs, through the proposed space-based architecture for climate monitoring and the CEOS response (cf. CGMS-38 NOAA-WP-13), as appropriate.		CGMS-39	OPEN
CGMS Members	38.14	Action 38.14: CGMS Members are invited to nominate further representatives for the web committee and send it to cgmssec@eumetsat.int. . The CGMS Secretariat will be the point of contact. The committee to receive comments/feedback/ suggestions on the website.		31-Dec-10	OPEN
CGMS Members	WGI 38.15	Action 38.15: CGMS Members to provide to each CGMS meeting a list of frequencies used by their current and future systems in the format provided in WG I report (Annex 1) (merged version of WMO frequency reports amended with the extra fields as provided in Tables 1 and 2 of Document CGMS-38 EUM-WP-23). Deadline: CGMS-39		CGMS-39	OPEN

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	WGI 38.16	Action 38.16: CGMS members to provide to the CGMS Secretariat and IMD their operational and planned use of the data collection service (regional and international) that contains or overlap the band 402.25-402.65 in a format as provided in Annex 1 of this WG I report. Deadline: 15 December 2010 at the latest.		15-Dec-10	OPEN
CGMS Members	WGI 38.17	Action 38.17: Concerning US public enquire for sharing with 4G mobile systems of the 1675-1710 MHz band CGMS members are encouraged to provide CGMS secretariat their inputs and position regarding the impact on their current and future systems (or a more general copy of the letters submitted in response of the US public enquire). Deadline: 1 December 2010.		01-Dec-10	OPEN
CGMS Secretariat	WGI 38.18	Acion 38.18: CGMS Secretariat to draft a letter to the appropriate US officials to address the concern of the WMO and CGMS members and the implications on their systems and services based on the shared use of this band by 4G mobile systems. Deadline: 15 December 2010.		15-Dec-10	OPEN
NOAA	WGII 38.19	Action 38.19: NOAA to report on progress towards using SSMIS to extend the SSMI records on total precipitable water. Deadline: CGMS-39		CGMS-39	OPEN
CGMS Agencies	WGII 38.20	Action 38.20: CGMS agencies to provide reports on satellite calibration anomalies Deadline: CGMS-39.		CGMS-39	OPEN
NOAA	WGII 38.21	Action 38.21: NOAA to submit the current version of the AVHRR Fundamental Climate Data Record for GSICS Product Acceptance.		CGMS-39	OPEN
EUM	WG II 38.22	Action 38.22: EUMETSAT to provide to CGMS agencies information on the Convection Working Group. Deadline: 28 February 2011.		28-Feb-11	OPEN
ITWG rapporteur	WG II 38.23	Action 38.23: ITWG rapporteur will provide actions related to calibration to GSICS. Deadline: 28 February 2011.		28-Feb-11	OPEN
ITWG rapporteur	WGII 38.24	Action 38.24: ITWG rapporteur will provide actions related to climate to SCOPE-CM. Deadline: 28 February 2011.		28-Feb-11	OPEN
ITWG rapporteur and ITWG co-chairs	WGII 38.25	Action 38.25: ITWG rapporteur and ITWG co-chairs to invite IMD and ISRO to consider participation in ITWG. Deadline: 28 February 2011.		28-Feb-11	OPEN

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
EUM and NOAA	WGII 38.26	Action 38.26: Recognising limited validation data-sets and the use of SEVIRI for GOES-R and MTG algorithm development, EUMETSAT and NOAA to coordinate with South Africa for creation of validation data-sets for rainfall products and to report at CGMS 39.		CGMS-39	OPEN
All Satellites Operators	WGII 38.27	Action 38.27: All satellite operators are invited to inform the CGMS Secretariat whether they will support a second AMV intercomparison study. They are also invited to provide feedback on potential improvements and changes (due date 31 March 2011).		31-Mar-11	OPEN
Co-chairs of the IWWG	WGII 38.28	Action 38.28: Co-chairs of the IWWG should develop a workplan for a second AMV intercomparison study on the basis of lessons-learnt from the 1st intercomparison and the pertinent feedback and comments provided by CGMS members. Deadline: CGMS-39		CGMS-39	OPEN
EUM	WGII 38.29	Action 38.29: EUMETSAT to conduct an extended validation campaign for AMVs derived with the NWCSAF portable AMV software package. Deadline: 31 May 2011 and a report to CGMS-39.		31-May-11	OPEN
WMO	WGII 38.30	Action 38.30: WMO to coordinate efforts between operational data providers and NWP agencies to establish long term continuity plans, including the use of research data in operational products and optimal configurations for climate applications. Deadline: CGMS-39.		CGMS-39	OPEN
CGMS Satelitte Operators	WGII 38.31	Action 38.31: CGMS Satellite Operators are invited to report on a regular basis on their capabilities and plans to support volcanic ash monitoring, including the development of relevant products and techniques for utilisation, in order to inform the relevant ICAO and WMO bodies: the WMO/IUGG Volcanic Ash Scientific Advisory Group and the ICAO International Volcanic Ash Task Force/International Airways Volcanic Watch Operations Group (IVATF/IAVWOPSG).		CGMS-39	OPEN
CMA, IMD, NOAA, and other interested CGMS agencies	WGII 38.32	Action 38.32: Propose CMA, IMD, NOAA, and other interested CGMS agencies to support future training related to the use of satellites to monitor dust, volcanic ash, fog, and forest fires in conjunction with the WMO Virtual Laboratory. Deadline: CGMS-39.		CGMS-39	OPEN
CGMS operators	WGII 38.33	Action 38.33: Invite CGMS operators to submit to the next CGMS meeting Working Papers on nowcasting applications, including cloud analysis, fog detection and forest fires. Deadline: CGMS-39.		CGMS-39	OPEN

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
IOC	WGII 38.34	Action 38.34: IOC to provide a paper on guidance to CGMS members to improve sea surface temperature measurements. Deadline: CGMS-39.		CGMS-39	OPEN
CMA	WGII 38.35	Action 38.35: CMA is invited to provide more detailed intercomparisons of FY-3A ERB with CERES.		CGMS-39	OPEN
NOAA and IMD	WGII 38.36	Action 38.36: NOAA and IMD to better understand differences in TC intensity estimations and to inform CGMS members on the outcome. Deadline: CGMS-39.		CGMS-39	OPEN
WMO	WGIII 38.37	Action 38.37: WMO to report on the outcome of the Workshop on Continuity and Architecture Requirements for Climate Monitoring, at CGMS-39 (Due date: CGMS-39).		CGMS-39	OPEN
CGMS Satellite Operators	WGIII 38.38	Action 38.38: CGMS satellite operators to report at CGMS-39 on their user-preparation activities for the next generation geostationary satellite series.		CGMS-39	OPEN
WMO	WGIII 38.39	Action 38.39: WMO with the support of the relevant Expert Teams, to prepare an update of the baseline for the space-based component of the Global Observing System along the lines of Annex 3 to the report of CGMS-38 WG III, and circulate to CGMS Members in advance of CGMS-39.		CGMS-39	OPEN
WMO	WGIII 38.40	Action 38.40: WMO in collaboration with the atmospheric composition community and satellite experts to further refine the requirements for atmospheric composition requirements and the optimal way to address these in the revised baseline.		CGMS-39	OPEN
CGMS Satellite Operators	WGIII 38.41	Action 38.41: CGMS Satellite Operators to confirm their commitments to contribute to the updated baseline for the space-based component of the Global Observing System (Due date: CGMS-39).		CGMS-39	OPEN
WMO	WGIII 38.42	Action 38.42: WMO to take into account the revised CGMS baseline for the space-based component of the GOS in the updating process of relevant WMO Manuals and Guides, with a view of its endorsement by CBS-XV in 2012.		CGMS-39	OPEN
CGMS Members	WGIII 38.43	Action 38.43: CGMS Members to review the Draft Mapping of the gap analysis with the GCOS ECVs, and provide comments to WMO (Dr Bizzarro Bizzarri, bibizzar@tin.it) to be considered for a revised version to be submitted to the “Workshop on Continuity and Architecture Requirements for Climate Monitoring” on 13-14 January 2011. (Deadline: 15 December 2010.)		15-Dec-10	OPEN

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
NOAA	WGIV 38.44	Action 38.44: NOAA to provide a report to CGMS on its planning for the transition of users from the current GOES system to GOES-R. Deadline CGMS 39.		CGMS-39	OPEN
EUM	WGIV 38.45	Action 38.45: EUMETSAT to provide CGMS with more detailed information and the schedule of implementation for the various MTG data dissemination schemes. Deadline CGMS39.		CGMS-39	OPEN
CGMS Satellite Operators	WGIV 38.46	Action 38.46: CGMS satellite operators to inform CGMS on progress towards the achievement of future broadcast services (physical layers, formats, etc.) in the timeframe of the EPS-SG and JPSS satellites. Deadline CGMS 39.		CGMS-39	OPEN
NOAA and EUM	WGIV 38.47	Action 38.47: NOAA and EUMETSAT to present a description of joint broadcast services for EPS-SG and JPSS. Deadline CGMS 39.		CGMS-39	OPEN
CGMS Satellite Operators	WGIV 38.48	Action 38.48: CGMS satellite operators to inform CGMS on efforts to widen user access and to establish and respond to user requirements with GEONETCast. Deadline CGMS 39.		CGMS-39	OPEN
CGMS Members	WGIV 38.49	Action 38.49: GMS members to report on their measures and plans regarding interoperability and standardised online data access for archived data-sets. Deadline CGMS-39.		CGMS-39	OPEN
CGMS Members	WGIV 38.50	Action 38.50 CGMS members are invited to report on the current measures taken in their Organisation for the long-term preservation of data and indicate if a future harmonised approach (e.g. common guidelines) would be helpful. Deadline CGMS-39.		CGMS-39	OPEN
CGMS Members	WGIV 38.51	Action 38.51: CGMS Members to verify if they have been registered as a part of WIS, in particular as Data Collection or Production Centres (DCPCs) or National Centres (NCs).		CGMS-39	OPEN
Candidate DCPCs or NCs	WGIV 38.52	Action 38.52: Candidate DCPCs or NCs to review the WIS specifications to ensure they are able to support the relevant WIS interfaces, including ensuring metadata describing their products and services is available in WMO format (ISO19115) for uploading to a Global Information System Centre (GISC).		CGMS-39	OPEN
IMD and KMA	WGIV 38.53	Action 38.53: IMD and KMA are invited to nominate experts to the WMO/CGMS Task Force on Satellite Data Codes. Deadline end January 2011.		31-Jan-11	OPEN

CGMS-38 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Recommendation 38.01	Recommendation 38.01: CGMS recommended to consider the possibility to extend the IODC coverage after 2013 and after the end of life of Meteosat-7.		CGMS-39	OPEN
CGMS Members	Recommendation 38.02	Recommendation 38.02: CGMS members to examine opportunities to incorporate Severe Weather Forecasting Demonstration Project (SWFDP) required data and products in their broadcast schemes.		CGMS-39	OPEN
CGMS Members	Recommendation 38.03	Recommendation 38.03: CGMS members to consider ways and means to strengthen their support to international scientific expert teams involved in peer review of climate data records (for example, to the CGMS Working Groups IPWG, IWWG, ITWG and IROWG, and to the World Climate Research Programme Global Energy and Water Cycle Experiment Radiation Panel (WCRP GEWEX RP)).		CGMS-39	OPEN
CGMS satellite operators	Recommendation 38.04	Recommendation 38.04: CGMS Satellite Operators are invited to consider the development of new operational sensors for cryospheric variables, especially snowfall.		CGMS-39	OPEN
CGMS Members	Recommendation 38.05 WGI	Recommendation 38.05: CGMS members are invited to provide information on the planned use of the band 7750 - 7850/7900 MHz in order to facilitate an early coordination of this band among MetSat operators in the framework of SFCG. Deadline: 31 December 2010.		CGMS-39	OPEN
CGMS Members	Recommendation 38.06 WGI	Recommendation 38.06: When planning frequency use of current and future DCS systems, CGMS members are encouraged to adhere to the content of Resolution SFCG 30-1 providing the basic general partitioning of the band 401 – 403 MHz and related sharing conditions for future long-term coordinated use of DCS systems on geostationary and non-geostationary MetSat and EESS systems. If considered necessary, further coordination within the selected sub-bands should be initiated and performed within the framework of SFCG.		CGMS-39	OPEN

CGMS-38 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Recommendation 38.07 WGI	Recommendation 38.07: CGMS members planning to use the 7750-7900 MHz band investigate using the CGMS global standards for AHRPT. Deadline: CGMS-39		CGMS-39	OPEN
NOAA	Recommendation 38.08 WGII	Recommendation 38.08: NOAA to consider sharing 1 minute simulated imagery upon request from CGMS agencies planning new advanced imagers in geostationary orbit.		CGMS-39	OPEN
CMA	Recommendation 38.09 WGII	Recommendation 38.09: CMA to provide both short and long term time -series of the Qinghai and Dunhuang sites using geostationary satellites to evaluate the diurnal variation of the lake temperature and the BRDF of the Dunhuang site.		CGMS-39	OPEN
CMA	Recommendation 38.10 WGII	Recommendation 38.10: CMA to consider the use of in- situ radiometers to routinely measure the Qinghai Lake surface temperature for improved accuracy.		CGMS-39	OPEN
NOAA	Recommendation 38.11 WGII	Recommendation 38.11: NOAA to publish results on the characteristics of targets for vicarious calibration presented in NOAA-WP-26.		CGMS-39	OPEN
NOAA	Recommendation 38.12 WGII	Recommendation 38.12: NOAA to use GPS RO measurements to assess the systematic bias remaining in the MSU/AMSU intercalibrated FCDRs.		CGMS-39	OPEN
NOAA	Recommendation 38.13 WGII	Recommendation 38.13: NOAA to present results on the Stratospheric Sounding Unit (SSU) intercalibration and derived long term trends and comparisons with trends from MSU/AMSU.		CGMS-39	OPEN
JMA	Recommendation 38.14 WGII	Recommendation 38.14: JMA is invited to report on the use of high resolution AMV derived for T-PARC experiment.		CGMS-39	OPEN
CGMS Operators	Recommendation 38.15 WGII	Recommendation 38.15: CGMS operators are invited to express their interest in the portable AMV software package from the EUMETSAT 'Nowcasting SAF' for testing and internal comparisons.		CGMS-39	OPEN
ISRO and partner Agencies	Recommendation 38.16 WGII	Recommendation 38.16: ISRO and partner Agencies to provide ROSA GPS RO data from Oceansat-2 and Megha-Tropiques to operational agencies in near real-time.		CGMS-39	OPEN

CGMS-38 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS satellite operators	Recommendation 38.17 WGIII	Recommendation 38.17: Once their operational requirements are fully satisfied, CGMS Satellite Operators should consider redeployment towards less covered areas if need arises, taking advantage of available in-orbit capacity in geostationary orbit.		CGMS-39	OPEN
CGMS satellite operators	Recommendation 38.18 WGIII	Recommendation 38.18: CGMS Satellite Operators implementing new systems should provide the user community, as early as possible, with full technical details needed by users to get prepared to access and use these systems.		CGMS-39	OPEN
CGMS Members	Recommendation 38.19 WGIII	Recommendation 38.19: Orbital planes of operational sun-synchronous satellites with sounding capability (IR and MW) should be coordinated with a view to optimize the temporal distribution in order to maximize coverage.		CGMS-39	OPEN
CGMS Members	Recommendation 38.20 WGIII	Recommendation 38.20: The WG recommended to proceed with an update of the CGMS baseline for GEO, LEO and HEO satellites in advance of CBS-XV in 2012, describing the target configuration for 2015.		CBS-XV in 2012	OPEN
CGMS Members	Recommendation 38.21 WGIII	Recommendation 38.21: CGMS to keep under review the baseline for GEO, LEO and HEO satellites for 2015 with the aim to ensure, by 2025, a full implementation of the WMO Vision for the GOS in 2025.		CGMS-39	OPEN

I.5 Date and Place of Next Meeting

CGMS was pleased to accept an offer from ROSHYDROMET to host CGMS-39 in St Petersburg next year. Two options are open: either 19-23 September 2011 or 3-7 October 2011. This will be confirmed as soon as possible by ROSHYDROMET and the CGMS Secretariat.

CGMS thanked Dr Eva Oriol-Pibernat for her contribution to the discussion of the group over the years.

CGMS paid tribute to Dr Lars Prahm, participating for the last time in CGMS Meeting, and for his dedication to the success of CGMS meetings.

The Chairperson thanked all participants for their cooperation and fruitful participation in CGMS-38, adding there had been many interesting discussions and important developments during the Working Groups and Plenary session. WMO thanked IMD for hosting the meeting in New Delhi, and for the excellent organisational arrangements, as well as the Rapporteurs and Secretariat for preparing the final report in a timely manner.

The meeting adjourned at 13:45 on 12 November 2010.

CGMS-38 agreed that the final draft report would be sent via emailing the next 2-week period.

PARALLEL WORKING GROUP SESSIONS

WORKING GROUP I: TELECOMMUNICATIONS

I/0 Introduction

As agreed at the beginning of the plenary session of CGMS-38, Mr Marlin O. Perkins (NOAA) and Mr Joaquin Gonzalez (EUMETSAT) were elected as Chairperson and Rapporteur, respectively, of Working Group I (WG I) on Telecommunications. WG I comprised representatives of the satellite operators from ESA, JMA, KMA, NOAA, IMD, and EUMETSAT together with WMO. The full list of participants is available in Annex 4.

I/I Review of Actions from the Previous Meeting

Answers from different CGMS WG I members span between specific working papers submitted for CGMS-38 meeting to individualised responses in the form of e-mails or summarised in the agency action status report for CGMS-38. WG I then entered in a detailed discussion for each one of the actions using the available inputs (e-mails, direct report to WG I or particularised WPs) and concluded the following:

Action 37.20: CGMS Secretariat to develop the CGMS coordinated response on the future use of the 401-403 MHz band at the 2010 SFCG-30 meeting. Deadline: 31 January 2010.

Response: The CGMS Secretariat had prepared a coordinated response on future use of the 401-403 MHz band to be sent to the Chairman of SFCG-30. The proposal was approved.

Status: This action is closed.

Action 37.21: EUMETSAT to present the CGMS Secretariat's statement on the final outcome of the rationalisation of the frequency assignments and use of the DCS uplink band (401-403 MHz). Deadline: SFCG-30. Response: EUMETSAT provided a final statement on the coordinated outcome of frequency assignments and DCS uplinks on the use of the 401-403 MHz band to the CGMS Secretariat.

Status: The action is closed.

Action 37.22: CGMS members to present their plans for frequency bands above 275 GHz. Deadline: CGMS-38.

Response: NOAA-WP-17 stated they do not have any plans for the frequency band above 275 GHz. EUM-WP-21 identified that the sub-bands above 275 GHz intended to be used for EPS-SG (MWI for the Microwave Imaging mission). ESA

reported that the only instruments (missions) that ESA is currently planning above 275 GHz are:

- STEAMR (instrument that would be developed by the Swedish Space Coorporation for PREMIER/ Candidate EE7);
- ICI (Metop-SG);
- Cloudice (old CIWSIR); and
- and GOMAS

IMD informed WG on their planned use of frequency bands above 275 GHz.

Status: The action is closed.

Action 37.23: All CGMS members to report on their plans of utilisation for the band 7750-7850/7900 MHz (i.e. including the 7850-7900 MHz extension, if agreed in WRC-11). Deadline: CGMS-38.

Response: NOAA-WP-18, CMA-WP-08 and EUM-WP-22 reported their plans of utilisation for the band 7750-7900 MHz. ESA reported that the band is for Meteorological Services (not specifically for the Earth Exploration Satellite Service). The frequency 7800 MHz is used in MetOp-A for direct broadcast, (this is also the case for MetOp-B & C). However ESA has no plans to use this band in future missions. IMD provided information on the planned use of the frequency band 7750-7900 MHz.

Status: This action is closed.

Action 37.24: CGMS members to coordinate with CEOS in providing inputs for the report being prepared by ITU-R "The essential role and global importance of radio spectrum use for Earth observations and for related applications." In particular, for chapter 4 about the potential economical impacts of data loss due to RF interference. Deadline: 31 May 2010.

Response: NOAA, coordinated with CEOS, responded to the ITU report and provided input on chapter 4 about the potential economic impacts of data loss due to RF interference (NOAA response via e-mail in NOAA-WP-01). ESA reported that ESA initiated this action at CGMS-37 and that it has completed the action through CEOS. EUMETSAT reported that participated in the drafting of the ITU report (through its participation in the ITU SG-RFC and also provided CEOS with a designated PoC to follow on).

Note: The report was made available on the CGMS ftp server during CGMS-38.

Status: This action is closed.

Recommendation 37.07: CGMS members are encouraged to continue to inform spectrum meeting representatives on the relevance and importance of frequency agenda items of importance to CGMS.

Response: WG I encouraged CGMS members to continually inform their spectrum representatives on the importance of frequency issues important to CGMS. NOAA provided a brief insight into the necessity of coordinating the importance of the 1675-1710 MHz band to US spectrum representatives.

Action 37.25: CGMS members to review the proposed position for WRC-12 contained in WMO-WP-01 and send comments to the Chairperson of SG-RFC (philippe.tristant (at) meteo.fr) and to WMO Secretariat (jlafeuille (at) wmo.int). Deadline: 31 December 2009.

Response: In WG I, WMO-WP-01, EUM-WP-01 and NOAA had responded via e-mail. ESA reported that the paper has been distributed to CEOS SEC for potential comments.

Status: This action is closed.

Action 37.26: In the future when reporting on systems, all CGMS members are asked to expand the details to cover the use of the different frequency bands and the related services. Deadline: CGMS-38.

Response: In WG I, the two Working Papers CMA-WP-09, EUM-WP-23 brought an answer, furthermore NOAA sent a response via e-mail following discussions with IMD.

Status: This action is closed.

I/2 Coordination of Frequency Allocations: SFCG, ITU and WRC Activities

In response to **Action 37.23,** CMA-WP-08, informed WG I on the utilisation plan of the band 7750-7850/7900 MHz. CMA FY-3A satellite provides a Medium resolution Picture Transmission (MPT) direct read-out service at 7750 MHz with bandwidth 45 MHz to transmit the full information of MERSI (Medium Resolution Spectral Imager) measurements. CMA FY-3 is a new series of polar-orbiting meteorological satellites planned to cover the duration 2008-2021. The MPT transmission might be extended to 100MHz for late models with right hand circular polarization, antenna diameter ~ 3 m, G/T ~ 21.4 dB/K and a data rate of 18.7 Mbps.

CMA-WP-09 provided WG I information on its new generation of meteorological satellites to take over the FY-2. The FY-4 Program is being planned and approved. Preliminary consideration on FY-4 frequency network is given with respect to the frequency requirement for the increased amount of data in transmission. The FY-4 series of geostationary meteorological satellites is planned for launch 2014. FY-4 will be using Raw data transmission (downlink) in X-Band (7450-7550 MHz) for both CR and CL. Additionally, CMA-WP-09 provided the full FY-4 frequency list covering not only their response to **Action 37.23** but also the CMA response to **Action 37.26**.

WG I thanked EUMETSAT for presenting CMA's working papers and CMA for the update on their planned use of the 7750-7900 MHz frequency band.

EUM-WP-20 recalled the agenda of the World Radiocommunication Conference 2012 (WRC-12) that it contains a number of issues of interest and concerns to the meteorological satellite (MetSat) operators. This contribution provides an overview of the status of the preparation for WRC-12 for the most important issues related to the MetSat service and the Earth Exploration Satellite Service (EESS), namely the allocation of additional spectrum for MetSat in the frequency band 7850 – 7900 MHz under WRC-12 agenda item 1.24 and the review the bands above 275 GHz for use by EESS passive sensors under agenda item 1.6. In response to CGMS action 37.24 and 37.25, EUMETSAT contributed actively to the development of the WMO position on WRC-12 agenda items of interest as well as to the ITU-R Report on the "The essential role and global importance of radio spectrum use for Earth observations and for related applications." Furthermore, in response to CGMS recommendation 37.07, EUMETSAT released a letter dated January 2010, informing its Member States on WRC-12 positions of WMO, which was supported by EUMETSAT. It encouraged them to approach their national radiocommunications administrations in order to emphasise the importance of suitable radio-frequency bands for meteorology and their protection and to seek the support of those countries for WRC-12 agenda items of interest and concern to EUMETSAT and WMO. This has been complemented by a EUMETSAT Member State Delegate Body document presented to the EUMETSAT Scientific and Technical Group (STG) that summarises the status of preparation for WRC-12 and re-iterates the request to member states delegates to contact their national radiocommunications administrations to stress the importance of meteorological and Earth observation frequency bands and the need of support from their national agencies.

WG I thanked EUMETSAT for providing information on the WRC-12 agenda and describing a number of issues of interest and concerns to the meteorological satellite operators. Furthermore, WG I encouraged CGMS members to stress the importance of the meteorological and Earth observation bands to their spectrum managers.

NOAA-WP-16 presented a summary of radio frequency activities of the Space Frequency Coordination Group (SFCG), various ITU Radiocommunication groups and the WMO during 2009-2010 as well a summary of the frequency issues concerning meteorological satellites. This document provides information to CGMS Members regarding radio frequency management activities that could possibly affect radio frequencies used by meteorological satellites. NOAA provided information on the 30th meeting of the Space Frequency Coordination Group (SFCG-30) and the activities of the ITU-R WP7B- Space Radiocommunication Applications and the ITU-R WP7C- Remote Sensing Systems. Major topics of interest to CGMS addressed at SFCG-30 were the allocation at 7750-7850 MHz by 50 MHz from 7850 to 7900 MHz, Agenda item 1.6 (Passive bands above 275 GHz), Agenda item 1.25 (Mobile Satellite Service), Agenda item 8.1.1 (Issue C): Essential Role of Earth Observations and the protection of the passive band 31.5-

31.8 GHz.

WG I thanked NOAA for providing an overview of the activities of from SFCG-30 and identifying major topics of interest to CGMS. WG I appreciated the work of EUMETSAT and NOAA to keep CGMS informed of the frequency issues that affect the meteorological satellites.

NOAA-WP-17, in response the CGMS **Action 37.22**, informed CGMS that NOAA has no current plans to use frequencies higher than 200 GHz. At one time there was one band on the NPOESS CMIS sensor centred at 325 GHz, but CMIS was scrapped and there is no information on its replacement. In addition, NOAA has no plans to fly an instrument on a GOES satellite using such high frequencies. Presently, the current response to this action is that NOAA has no plans to use frequencies above 275 GHz.

In response to CGMS **Action 37.23**, NOAA-WP-18, provided information on ITU-R Working Party 4C (Efficient orbit/spectrum utilisation for the mobile satellite service (MSS) and Radio Determination Satellite Service (RDSS)) and WRC-12 agenda item 1.25. WP4C has removed the 7750-7900 MHz band from consideration as a candidate for use by MSS. NOAA's plans for the band include:

- NPP: 7797-7827 MHz;
- NPOESS: Last known use was expected to be 7818-7840 MHz; and
- JPSS: Unknown, but JPSS-1 is to be a clone of NPP, so it is expected that something similar to that planned for NPP. For JPSS-2 and beyond there is no decision at this time.

WG I thanked NOAA for providing information their future plan for frequencies above 275 GHz and the planned use of the 7750-7900 MHz bands.

EUM-WP-21 provided a response to CGMS **Action 37.22**. The contribution is aimed to provide information on planned frequency spectrum use in bands above 275 GHz for passive sensing in the framework of the future EUMETSAT EPS Second Generation (EPS-SG) system. The Microwave Imaging Mission (MWI) of EPS-SG is planned to perform cloud measurements in bands above 275 GHz at 325.15 GHz, 448 GHz and 664 GHz. Those frequency bands are not fully covered by the current ITU regulations in footnote RR 5.565. However, this footnote is subject to revision at WRC-12 under Agenda Item 1.6. All preparatory activities in the framework of the ITU, in regional groups (CITEL, CEPT, APT) as well as in SFCG and WMO appropriately reflect the planned frequency use of MWI in bands above 275 GHz.

WG I thanked EUMETSAT for providing information their future plan for frequencies above 275 GHz.

EUM-WP-22, in response to CGMS **Action 37.23**, provided information on EUMETSAT's current and future missions planning to use the frequency band

7750 - 7850/7900 MHz. The band 7750-7850 MHz is currently used by the EUMETSAT Polar System (EPS) for the downlink of raw instrument data over a single dedicated Earth station in Svalbard (Spitsbergen) at 7800 MHz with a data rate of the 70 Mbps (=63 MHz bandwidth). In the framework of EUMETSAT Polar System Second Generation (EPS-SG) the frequency band 7750-7850/7900 MHz is currently under consideration for direct readout services and raw instrument data downlink. However, the frequency selection for EPS-SG, currently in Phase-A of development, is not yet sufficiently mature. Therefore, merely information on the potential concepts under consideration/study within EUMETSAT for the use of the band 7750-7850/7900 MHz for EPS-SG can be provided at this stage.

WG I thanked EUMETSAT for providing information on their planned use of the 7750-7900 MHz band. Considering the different concepts for using this band by future polar-orbiting MetSat systems, such as FY-3, JPSS and EPS a coordinated approach for planning the long term use of the entire band 7750 -7900 MHz would be necessary. Following the discussions on EUM-WP-22, WG I proposed a recommendation to CGMS members for keeping and exchanging on regular basis up to date information on the planned used of X-Band (7750 - 7850/7900 MHz).

Recommendation 38.05: CGMS members are invited to provide information on the planned use of the band 7750 - 7850/7900 MHz in order to facilitate an early coordination of this band among meteorological satellites operators in the framework of SFCG. Deadline: 31 December 2010.

EUM-WP-23, in response to CGMS **Action 37.26**, provided information on frequency spectrum used by current and future EUMETSAT missions (as known at this stage). Tables 1 and 2 (in Annex 2) provide a simple but comprehensive overview of frequencies used by current and future EUMETSAT missions. Having up-to-date frequency information in such a format from all meteorological satellites operators could be very beneficial for future system planning purposes. Therefore, it is proposed to maintain a frequency inventory in the framework of CGMS in form and format as provided in Tables 1 and 2 (in Annex 2). Updates to this inventory could be provided by all meteorological satellites operators by marking the changes to the information provided in the previous year.

IMD suggested the format presented by EUM-WP-23 was too detailed and the at least the column label “Emissions” should be disregarded. WMO proposed to use the template contained in their frequency report, updated with the extra fields contained in the table format from EUM-WP-23.

NOAA informed WG I that it believed that the charts should contain enough information on the efficient use of the band and its importance to the service. In the recent response the NTIA inquiries for reallocation of the 1675-1710 MHz band in the continental US, NOAA was compelled not only to provide information in the frequency band, also they had to educate the spectrum representative on the use and importance of these bands.

WG I therefore proposed an action to keep and to exchange up to date information among CGMS members on the frequencies used by their current and future systems (for each one of the future CGMS meetings).

Action 38.15: CGMS Members to provide to each CGMS meeting a list of frequencies used by their current and future systems in the format provided in Annex 1 f the WG I report (merged version of WMO frequency reports amended with the extra fields as provided in Tables 1 and 2 of Document CGMS-38 EUM-WP-23). Deadline: CGMS-39.

EUM-WP-24, in response to **Actions 37.20** and **37.21**, the CGMS Secretariat developed and presented the CGMS coordinated response on the future use of the 401 – 403 MHz band at the SFCG-30 meeting in July 2010. At this SFCG-30 meeting no further coordination issues were raised and discussed thus SFCG concluded that the basic general partitioning and sharing conditions for the band 401-403 MHz for future long-term coordinated use of DCS systems on geostationary and non-geostationary meteorological satellites and EESS systems can be considered completed. In order to record the results of coordination between operators of DCS systems and to provide guidance for the frequency selection for future DCS systems, Resolution SFCG 30-1 was adopted.

WG I thanked EUMETSAT for its support in developing and coordinating the CGMS response on the future use of the 401-403 MHZ band. Following further discussions on EUM-WP-24, WG I proposed a recommendation on the coordinated approach to be followed by CGMS members when planning new DCS systems.

Recommendation 38.06: When planning frequency use of current and future DCS systems, CGMS members are encouraged to adhere to the content of Resolution SFCG 30-1 providing the basic general partitioning of the band 401 – 403 MHz and related sharing conditions for future long-term coordinated use of DCS systems on geostationary and non-geostationary meteorological satellites and EESS systems. If considered necessary, further coordination within the selected sub-bands should be initiated and performed within the framework of SFCG.

IMD-WP-19 informed WG I of its planned use of the 401-403 MHz band for DCP applications on their future geostationary satellites. Currently many meteorological satellites including non-geostationary satellites are using this limited spectrum for the operation of meteorological data collection platforms (DCPs). Many countries operating DCPs have planned future generation meteorological satellites programmes with capability to operate more number of DCPs to meet the requirements. ISRO has been providing meteorological services using DCPs in the band 402.65-402.85 MHz for well over past two decades. So far, this band had been used in different INSAT-1 and INSAT-2 series and is being used in the currently operational KALPANA and INSAT-3A satellites. Use of this frequency band will further be continued in the forthcoming INSAT-3D satellite. In the recent past, the number of users have increased and to meet the requirements, additional bandwidth of another 400 KHz is required.

In the advanced meteorological satellite INSAT-3DR which is being built and to be launched after INSAT-3D will carry a DRT transponder with a bandwidth of 400 KHz. ISRO proposes to use 402.25-402.65 MHz in the INSAT-3DR satellite. ISRO requests CGMS members to consider this and accord concurrence.

Following discussions on the Working Paper, WG I proposed to CMA, JMA, EUMETSAT, Russia, and any other agency with frequency interest on the DCP system in the area of coverage of INSAT, to provide to IMD and CGMS Secretariat the actual sub-band limits of the frequency bands of their regional and international DCS systems for existing and planned systems (uplink in the 401-403 MHz) in order to allow IMD to start planning their DCS system for the future INSAT-3DR satellite. CGMS Secretariat reminded all WG I participants about the contents of EUM-WP-24 and the proposal for a recommendation to adhere to SFCG Resolution 30-1 in which frequency coordination of DCS systems is to be regulated by SFCG rules and procedures before applying for ITU notification.

EUMETSAT referred WG I participants to the frequency details contained in EUM-WP-23 containing the up to date information on the bands (and frequency limits) in use by the EUMETSAT operational systems and the current frequency utilisation plans for the future systems. The following action was agreed:

Action 38.16: CGMS members to provide to the CGMS Secretariat and IMD their operational and planned use of the data collection service (regional and international) that contains or overlap the band 402.25-402.65 MHz in a format as provided in Annex 2 of this WG I report. Deadline: 15 December 2010 at the latest.

WMO-WP-01 provided information on development related to radio-frequency management and coordination, including preparation for the World Radio-communication Conference in 2012, and on the activities of the WMO Steering Group on Radio Frequency Coordination (SG-RFC). Space agencies are particularly encouraged to participate in the SG-RFC preparation process for WRC-12.

During the discussion, WMO has reminded all WG I participating agencies on the status of the US public inquiry performed by NTIA on the potential reallocation of the 1675-1710 MHz (currently allocated to meteorological satellites and radiosondes) for 4G mobile communications. WMO, EUMETSAT, NOAA have confirmed they replied to this public enquiry. But it is felt that the deliberations might not consider the full extent of the implications that allowing shared use of this band (or parts of it) will have to different services and applications provided by:

- meteorological satellites operators to governmental;
- institutional users; and
- and final users, especially on the fast track approach is the proposal for sharing of the 1695-1710 MHz band that overlaps with different satellite systems like NOAA polar satellites and Metop series for HRPT services.

Correspondingly, WG I proposed that CGMS Secretariat drafts a letter to the appropriate US officials conveying the concern of the different CGMS members and the implications for their operational (current and future) systems if such a decision to share the 1675-1710 MHz) is finally confirmed and implemented by US. For doing so, CGMS members are encouraged to provide inputs regarding the impact on their current and future systems (or a more general copy of the letters submitted in response of the US public enquiry). The following actions were proposed:

Action 38.17: Concerning US public enquire for sharing with 4G mobile systems of the 1675-1710 MHz band CGMS members are encouraged to provide CGMS secretariat their inputs and position regarding the impact on their current and future systems (or a more general copy of the letters submitted in response of the US public enquire). Deadline: 1 December 2010.

Action 38.18: CGMS Secretariat to draft a letter to the appropriate US officials to address the concern of the WMO and CGMS members and the implications on their systems and services based on the shared use of this band by 4G mobile systems. Deadline: 15 December 2010.

I/3 Telecommunication Techniques

IMD-WP-16 provided an overview of the ground station system deployed for receiving the data of INSAT – 2A (1992) and the follow-on stations established for receiving different types of meteorological data from KALPANA – I (2002) and INSAT – 3A (2003). The Working Paper also presented the system capabilities for the ground station to be used with INSAT-3D.

WG I thanked IMD for providing information on the current status of their KALPANA ground station and system capabilities for the ground station to be used with INSAT-3D.

I/3.1 Coordination of International Data Collection & Distribution

JMA-WP-02 reported on the status of MTSAT DCS. In the MTSAT system, the International Data Collection System (IDCS) is currently using the MTSAT-1R standby satellite. The IDCS system has been functioning properly since the satellite started operation (although severe interference was frequently observed on IDCS channel 33 from August 2009 to July 2010 but with no negative effect on IDCS operation because no International Data Collection Platform (IDCP) is registered on this channel. IDCPs were registered on 5 out of 33 MTSAT-IDCS channels as of 31 July 2010, but no effective data has been transmitted during the reporting period. Further information regarding MTSAT-IDCS is available under the Monthly Operations reports on the MSC website at http://mscweb.kishou.go.jp/operation/opr_report.htm. The Indian Ocean Tsunami system has increased the number of DCPs reporting tidal data through MTSAT-

1R's Regional DCS (as of 1 September 2010, tidal data are received from 24 DCPs, and four DCPs are waiting to start operation this year, with reporting intervals of 12, 15 and 60 minutes). ICG/PTWS has however recommended shorter intervals such as five minutes or less for tsunami warnings and detection, which could lead to the need to allocate one channel to two or three DCPs only. This may lead to restructure the channel allocation to make more efficient use of the frequency band.

I/3.2 Status and Problems of IDCS

NOAA-WP-19 provided a status report on the performance of the International Data Collection System (IDCS). NOAA's DCS Automated Processing System (DAPS) was replaced by the new DCS Administration and Data Distribution System (DADDS) in October 2009. DADDS began as a minimally functional system, brought online ahead of schedule due to IT Security issues. As additional modules were completed they were brought online so that the system has now reached an almost completely functional state. DADDS now provides distribution of critically needed data through the Internet, a commercial communications satellite (DOMSAT), and NOAA's National Weather Service Telecommunications Gateway (NWSTG), which feeds the Global Telecommunication System (GTS). DADDS now provides an improved user interface, better processes for managing platform assignments and will provide better system monitoring tools when those processes are completed. NOAA has finalised new Certification Standards to allow transmitters to use smaller channels, and has certified the first Version II transmitter in September 2010. NOAA has already modified demodulators set to test channels to handle the new configuration. Once several manufacturers are certified, and the demodulators have been tested with operational data the changes will be rolled out to all of the operational channels. The transition to high data rate (HDR) continues, with approximately 20,000 of the 26,000 platforms assigned reporting at 300 or 1200 bit/sec. NOAA is investigating the use of two way communications to better command and control platforms. A Phase I analysis was completed, and a Phase II effort to deliver a prototype receiver and waveform definition was demonstrated in late 2009. Several user agencies have combined resources to begin the purchase and development of a prototype ground system. NOAA is proceeding slowly with this project, since most resources are being committed to DADDS and to the Version II HDR transmitter implementation. As previously noted, a conflict in the addressing scheme makes it difficult for NOAA to include new addresses generated by EUMETSAT. There is no current plan to address this issue, as use of the international channels is minimal. NOAA has begun using the new international channels assigned to them by CGMS for their domestic use. An initial problem was encountered because many manufacturers built transmitters that could only operate in the international format for channels above number 200. Those problems are being resolved by reprogramming of the transmitters by their developers.

I/3.3 Ships, including ASAP

No working papers were presented under this agenda item.

I/4 Dissemination of DCP Messages (GTS or other means)

EUM-WP-25 described the current status of DCP operations at EUMETSAT, the status of the DCP bulletin conversion to BUFR for GTS dissemination and the upcoming High Rate DCP implementation. This new EUMETSAT service (HRDCS) is planned to enter into operations in 2011 with extensive testing being performed during 2010.

I/5 Future Use of IDCS

No working papers were presented under this agenda item.

I/6 Search and Rescue (S&R)

No working papers were presented under this agenda item.

I/7 Review of Actions, Conclusion and Preparation

WMO-WP-05 (presented to WG IV) raised attention to the lack of standardisation of new Direct Broadcast services in the 7750-7900 MHz band. WMO recalled the adoption of the LRPT/HRPT and LRIT/HRIT dissemination standards which has been among the important achievements of CGMS. WMO noted that these standards have been applied so far for L-Band services and data rates of up to a few Mbps, and enquired whether these standards were applicable to much higher data rates, and to X-Band. If it was not the case, WMO suggested that an appropriate standard be developed by CGMS.

In discussion throughout WG I, CGMS members expressed their plans to use the band for future downlink of high volumes of data.

NOAA informed the WG I that in the NPOESS era, the CGMS global specifications for AHRPT was imposed on the Low Rate Data (LRD) and the High Rate Data (HRD). Since the NPOESS program was restructured, NOAA was not sure if the Joint Polar-orbiting Satellite System (JPSS) had the same considerations.

EUMETSAT stated that the development of the direct broadcast standards were to be considered by CGMS at a global level with due consideration of the interoperability and potential impacts in the data/product access by users for both operational systems and future systems of the different CGMS members and their different timeframes for entering into service. WG I agreed that this was also of relevance for WG IV and agreed to bring to it the same discussion

during CGMS-38 with the aim to draft a common recommendation on the next generation of dissemination/product format standards to plenary.

The following recommendation was proposed:

Recommendation 38.07: CGMS members planning to use the 7750-7900 MHz band to investigate using the CGMS global standards for AHRPT. Deadline: CGMS-39.

The Working Group report was prepared and all actions were agreed upon in Plenary.

ANNEX 1 OF WG I : **FREQUENCIES OF THE DESCRIBED EUMETSAT MISSIONS**
(STATUS: 31 AUGUST 2010)

TABLE 1: EARTH – SPACE / In reference to EUM-WP-23

SATELLITE	FREQUENCY (MHz)	DIRECTION	EMISSION[1]	APPLICATION	D.B.I.U.[2]
EPS-SG (ADCS)	399.975 401.1125 401.4275 402.045 402.5855 402.925	E-S	150KG7D 225KG7D 305KG7D 710KG7D 129KG7D 150KG7D	ARGOS-4	2018
Metop-A (ADCS)	401.585	E-S	10K0G7D	ARGOS-B	IN ORBIT
Metop-B (ADCS)	401.595	E-S	10K0G7D	ARGOS-B	2012/04
Metop-C (ADCS)	401.61	E-S	20K0G7D	ARGOS-B	2016/10
MSG	402.001 – 402.435	E-S	1K50G7D 3K00G7D	DCP	IN ORBIT
IODC (Met-6, Met-7)	402.001 – 402.435	E-S	3K00G7D	DCP	IN ORBIT
MTG	401.7 – 402.85	E-S	1K50G7D 3K00G7D	DCP	2016/2017
Metop-SAR	406 – 406.1	E-S	100KG1D	SAR	IN ORBIT
MSG-SAR	406 – 406.1	E-S	100KG1D	SAR	IN ORBIT
MTG-SAR	406 – 406.1	E-S	100KG1D	SAR	2016/2017
Jason-3	2040.493	E-S	300KG2D	TC	2013/07
Metop	2053.4583	E-S	500KG1D	TC, Ranging	IN ORBIT
MSG-2 (Met-9)	2067.7313	E-S	1M00GXX	TC, Ranging	IN ORBIT
MSG-1 (Met-8)	2068.6521	E-S	1M00GXX	TC, Ranging	IN ORBIT
MSG-3	2069.5729	E-S	1M00GXX	TC, Ranging	2012/06
MSG-4	2070.4938	E-S	1M00GXX	TC, Ranging	2014/01
MTG	2060 - 2075	E-S	TBD	TC, Ranging	2016/2017
GMES Sentinel-3	2075.6504	E-S	768KG2D	TC	2013/04
Jason-2	2088.87819	E-S	300KG2D	TC	IN ORBIT
IODC (Met-6, Met-7)	2098.0000	E-S	6K30GXX	TC, Ranging	IN ORBIT
IODC (Met-6, Met-7)	2099.0000	E-S	6K30GXX	TC, Ranging	IN ORBIT
MSG	2101.5000	E-S	660KG1D	LRIT uplink	IN ORBIT
IODC (Met-6, Met-7)	2101.5000	E-S	30KG1D	WEFAX uplink	IN ORBIT
IODC (Met-6, Met-7)	2105.0000	E-S	660KG1D	HRI uplink	IN ORBIT
MSG	2105.6500	E-S	2M00G1D	HRIT uplink	IN ORBIT
EPS-SG	2025 - 2110	E-S	TBD	TC, Ranging	2018

[1] In accordance with Appendix 1 of the Radio Regulations
[2] DBIU: Date of Bringing In Use

TABLE 2: SPACE – EARTH/ In reference to EUM-WP-23

SATELLITE	FREQUENCY (MHz)	DIRECTION	EMISSION	APPLICATION	D.B.I.U.
Metop	137.1 / 137.9125	S-E	150KG1D	LRPT	NOT USED
Metop (ADCS)	465.9875	S-E	1K00G1D	ARGOS-B	IN ORBIT
EPS-SG (ADCS)	465.9875	S-E	20K0G1D	ARGOS-4	2018
Metop-SAR	1544.4 – 1544.6	S-E	200KG1D	SAR	IN ORBIT
MSG-SAR	1544.4 – 1544.6	S-E	200KG1D	SAR	IN ORBIT
MTG-SAR	1544 - 1545	S-E	200KG1D	SAR	2016/2017
MSG and IODC	1675.2810	S-E	750KGXX	DCP	IN ORBIT
IODC (Met-6)	1676.2280	S-E	2K60G1D	TM	IN ORBIT
IODC (Met-7)	1676.3280	S-E	2K60G1D	TM	IN ORBIT
MSG and IODC	1686.8330	S-E	6M00G1D	Raw Data	IN ORBIT
IODC	1691.0000	S-E	20KG1D	WEFAX	IN ORBIT
MSG	1691.0000	S-E	660KG1D	LRIT	IN ORBIT
IODC	1694.5000	S-E	660KG1D	HRI	IN ORBIT
MSG	1695.1500	S-E	2M00G1D	HRIT	IN ORBIT
Metop	1701.3000	S-E	4M50G1D	HRPT	IN ORBIT
Metop	1707.0000 (back-up)	S-E	4M50G1D	HRPT	IN ORBIT
Jason-3	2215.92	S-E	1M9G1D	TM, Raw Data	2013/07
Metop	2230.0000	S-E	500KG1D	TM	IN ORBIT
IODC (Met-7)	2242.2250	S-E	2K60G1D	TM	IN ORBIT
IODC (Met-6)	2242.5250	S-E	2K60G1D	TM	IN ORBIT
MSG-2 (Met-9)	2245.5000	S-E	1M00G1D	TM	IN ORBIT
MSG-1 (Met-8)	2246.5000	S-E	1M00G1D	TM	IN ORBIT
MSG-3	2247.5000	S-E	1M00G1D	TM	2012/06
MSG-4	2248.5000	S-E	1M00G1D	TM	2014/01
MTG	2240 - 2255	S-E	TBD	TM	2016/2017
GMES Sentinel-3	2254.1000	S-E	2M20G1D	TM	2013/04
Jason-2	2268.465	S-E	1M9G1D	TM, Raw Data	IN ORBIT
Metop	2230.0000	S-E	500KG1D	TM	IN ORBIT
EPS-SG	2200 - 2290	S-E	TBD	TM	2018
EPS-SG	7750 – 7900	S-E	TBD	TBD	2018
GMES Sentinel-3	8095.0000	S-E	140MG1D	Raw Data	2013/04
GMES Sentinel-3	8260.0000	S-E	140MG1D	Raw Data	2013/04
EPS-SG	25500 - 27000	S-E	TBD	Raw Data (TBD)	2018
MTG	26200 - 27000	S-E	TBD	Raw Data	2016/2017

ANNEX 2 OF WG I: **Tables for Frequency Plans**

Table A1. - Frequency plan of meteorological satellites in geostationary and low earth orbit (with few satellites filled in as examples)

Satellite	Period of Utilisation/ DBIU(2)	Position/LST	Service/ Application	Direction	Emission (1)	Frequency	Bandwidth	Polarisation	Data rate
Meteosat-7	1997-2013	57.5°E	to PGS			1686.833 MHz	1.3332 MHz	Linear	333 kbps
			HRI			1694.5 MHz	0.66 MHz	Linear	166 kbps
			WEFAX-1			1694.5 MHz	20 kHz	Linear	2.4 kbps
			WEFAX-2			1691.0 MHz	20 kHz	Linear	2.4 kbps
			MDD			1695.74 MHz	120 kHz (4 channels)	Linear	2.4 kbps
Meteosat-8 (MSG-1)	2002-2015	9.5°E	to PGS			1686.833 MHz	5.4 MHz	Linear	3.27 Mbps
			HRIT	S-E	2M00G1D	1695.15 MHz	2.0 MHz	Linear	1.0 Mbps
			LRIT			1691.0 MHz	0.66 MHz	Linear	128 kbps
NOAA-15	1998-2010	04.45 d 16.45 a	GAC			2247.5 MHz	5.32 MHz	LHC	2.66 Mbps
			HRPT			1702.5 MHz	2.66 MHz	LHC	665.4 kbps
			APT			1702.5 MHz	2.66 MHz	LHC	665.4 kbps
			DSB			137.5 or 137.62 MHz	38 kHz	RHC	1.7 kHz
						137.35 or 137.77 MHz	46 kHz	RHC	8.32 kbps

(1) In accordance with Appendix 1 of the Radio Regulations
(2) DBIU: Date of Bringing In Use

WORKING GROUP II: SATELLITE PRODUCTS

II/0 Introduction

Working Group II on Satellite Products was chaired by Prof Vasily Asmus of Roshydromet. Dr Mitch Goldberg, NOAA, and Dr Johannes Schmetz, EUMETSAT, assisted as rapporteurs. Mr Derek Hanson, NOAA, also helped with the real-time recording of actions. The full list of participants is available in Annex 4. More than 60 working papers were presented and discussed. In view of the somewhat large number of working papers, the agenda was very tight and special care had to be taken in regards to the time allowed for presentation and discussion of the papers.

Unfortunately CMA could not attend the meeting, so therefore their very interesting papers had to be presented (to the extent possible) by the two rapporteurs.

A factor that also contributed to the busy schedule of WG II was that all four CGMS Working Groups, namely ITSC, IPWG, IWWG and the new IROWG, held workshops in 2010. Therefore, detailed presentations on the outcome of the four workshops were made by the rapporteurs on behalf of the co-chairs of the ITSC, IPWG, IWWG and IROWG, respectively.

II/1 Review of Actions from the Previous Meeting

A review of actions from CGMS-37 was made at the end of the session of WG II. The majority of actions had been addressed and closed. The closing of the actions, together with the few actions that are still open, are recorded in the summary of actions part of the CGMS-38 report (under item I.4).

II/2 Image Processing Techniques

NOAA-WP-20 reported on imagery from NOAA's next generation Geostationary Operational Environmental Satellite - R Series (GOES-R) Advanced Baseline Imager (ABI). The ABI is a sixteen channel imager with two visible channels, four near-infrared channels, and ten infrared channels. It will provide three times more spectral information, four times the spatial resolution, and more than five times faster temporal coverage than the current system. GOES-R is scheduled for launch in 2015. Cloud and Moisture Imagery is the satellite imagery that forecasters and the public are accustomed to viewing in weather forecast offices, on the web, and in the news. Cloud and Moisture Imagery includes digital maps of the observed land, water, atmosphere and clouds. The imagery from the GOES-R ABI will be used directly, by National Weather Service (NWS) and other forecasters, as part of broadcast media, international communities and on the Internet, and also indirectly via derived products and in numerical weather prediction

models to better define the initial state. The data from the ABI will have a wide range of uses and multiple societal benefits in areas such as severe weather, energy, transportation, and commerce. ABI images for several cases have been simulated using high-spatial resolution meso-scale models, coupled with advanced 'forward' models. The simulated imagery has been very useful for testing new algorithms for deriving products such as atmospheric motion vectors and instability parameters.

Recommendation 38.08: NOAA to consider sharing 1-minute simulated imagery upon request from CGMS agencies planning new advanced imagers in geostationary orbit.

II/3 Satellite Data Calibration and Validation

KMA-WP-04 reported on KMA's GSICS activities. KMA implemented the GSICS software for IR intercalibration with LEOs (AIRS and IASI) using COMS data. Previously, KMA had implemented the GSICS software using MTSAT data before COMS data became available. KMA will also implement visible channel vicarious calibration software using the Australian Simpson desert region as a part of the CMDPS (COMS Meteorological Data Processing System). The GSICS software systems are for Near-Real-Time operation. Results will be available via a KMA/NMSC publicly accessible website which will be linked to the GSICS central website. The KMA's GSICS operation and service will start in early 2011 after finalising the COMS in-orbit tests. The WG commended KMA for their continued active participation in GSICS, which included the vice chair of the GSICS research working group. KMA's continued effort will require sustained funding in the area of both operations and research.

CMA-WP-10 described the actions on GSICS taken by CMA's GSICS Processing and Research Centre (GPRC). The progress over the last year includes the establishment of computer hardware system, an operational GEO-LEO inter-calibration for the FY-2 satellites, LEO-LEO IR intercalibration for FY-3A and also a dedicated GSICS website. GSICS GEO-LEO inter-calibration for FY-2 has been running operationally at CMA since the end of 2009 and the first results for historical FY-2C/2D recalibration have also been achieved. An effort is made on real-time monitoring of the performance of FY satellites sensors and LEO-LEO inter-calibration for FY-3A optical sensors such as MERSI, VIRR, and IRAS against AIRS, IASI, and MODIS are being established.

EUM-WP-27 reported on progress on GSICS since CGMS-37. During this period the definition of GSICS Products has been refined and a formal Procedure for Product Acceptance developed. EUMETSAT now routinely generates GSICS Corrections for Near Real-Time and Re-Analysis applications for the infrared channels of Meteosat-7, -8 and -9.
The latter have been formally accepted as demonstration products and are available from EUMETSAT's GSICS Data and Products Server

(http://gsics.eumetsat.int/thredds/catalog.html). Liaison with beta testers is continuing to improve the products, their format and distribution towards pre-operational status early in 2011. During the period, EUMETSAT has also taken over as the Chair of the GSICS Research Working Group and defined a strategy to develop similar products for the channels in the solar-band. GSICS is also working together with other groups to develop similar products for microwave imagers and sounders on Low Earth Orbit satellites. EUMETSAT is also developing mechanisms to provide public access to pre-launch characterisation, performance monitoring and logs of operating changes for its instruments on Metop and Meteosat satellites.

JMA-WP-04 reported on activities regarding GSICS and SCOPE-CM. JMA began operation of the MTSAT-1R infrared inter-calibration system on GSICS on 2 July 2008. On the occasion of the switchover to MTSAT-2 from MTSAT-1R on 1 July 2010, JMA changed the infrared inter-calibration system and modified its monitoring web page (http://www.jma.go.jp/jma/indexe.html). The GSICS correction has now entered the demonstration phase for the GSICS Procedure for Product Acceptance (GPPA). Research on the application of the GSICS Correction for the re-processing of Clear Sky Radiance (CSR) products from MTSAT data has also been performed. Furthermore, JMA has reprocessed the calibrations of GMS-5 and MTSAT-1R visible images in cooperation with the University of Tokyo and Chiba University. With the switchover to MTSAT-2, JMA started operational visible vicarious calibration and monitoring of the bias. The investigations for using homogeneous ice cloud as a new calibration target have also been performed. JMA participated in the establishment of SCOPE-CM, and will proceed with activities related to satellite products for climate analysis such as Atmospheric Motion Vectors (AMVs) and CSR as a pilot project within the framework of SCOPE-CM.

NOAA-WP-24 reported on work to further characterise two natural land calibration sites in China. The Dunhuang calibration site located in the Gobi desert, China, is one of the eight worldwide reference sites endorsed by the Committee on Earth Observation Satellites (CEOS) Working Group on cal/val (WGCV), while the Qinghai Lake has been used by the Chinese Meteorological Agency (CMA) for the cal/val of infrared sensors. The characterisation of the Dunhuang and Qinahai calibration/validation sites were completed using MODIS, Hyperion, and HJ1A/HSI observations. The sites are evaluated with respect to stability, spectral and radiometric characteristics. The Dunhuang spectra are also compared with those from the Dome C site, as well as with ground sample measurements with radiative transfer calculations. The results show that the Dunhuang and Qinghai sites have distinct characteristics that complement other cal/val sites for satellite instrument calibration in the reflective solar and infrared bands. The Dunhuang site has a reflectance variability of ~5% while the Qinghai Lake has an annual temperature variation of +/-15 K. The limitations of these two sites were also discussed. It is recommended that in-situ radiometers should routinely measure the Qinghai Lake surface temperature for improved accuracy, and the lake can be used for intercalibration using the double difference method. It is also recommended that CMA provides both short and

long term time-series of the Qinghai and Dunhuang sites using geostationary satellites to evaluate the diurnal variation of the lake temperature and the BRDF of the Dunhuang site. This study is part of the collaboration effort between the CEOS/WGCV and GSICS towards consistent satellite observations for the Global Earth Observation System of Systems (GEOSS). In the discussion, WG II expressed appreciation of the efforts of CMA put into the vicarious calibration using the two sites, and considered them a very useful complement to the other few vicarious calibration sites.

Recommendation 38.09: CMA to provide both short and long term time-series of the Qinghai and Dunhuang sites using geostationary satellites to evaluate the diurnal variation of the lake temperature and the BRDF of the Dunhuang site.

Recommendation 38.10: CMA to consider the use of in- situ radiometers to routinely measure the Qinghai Lake surface temperature for improved accuracy.

CMA-WP-11 introduced the radiometric characteristics of the China Radiometric Calibration Sites (CRCS) Dunham Gobi and Qinghai Lake. The paper contained a detailed description and evaluation of the radiometric characteristics of Dunham site and Qinghai Lake and their utility for vicarious calibration (VC) of FY sensors. VC based on the Dunham site provides the baseline for the calibration of solar satellite sensors which do lack onboard calibration in the solar reflective spectral regions, e.g. the Fengyun series of meteorological satellites and the Haiyang (HY-) series of ocean colour satellites, and the China-Brazil Earth Resources Satellites (CBERS). Clearly the sites are also most useful for the calibration of other satellite sensors.

NOAA-WP-26 included an assessment of vicarious calibration techniques for calibration of solar reflectance channels. Current operational meteorological satellites have no onboard calibration for their solar reflectance channels. These channels must be calibrated vicariously, using external references such as Earth targets (e.g. desert, clouds), celestial bodies (e.g. moon, star), or calibrated instruments (e.g. MODIS). Special considerations are required for vicarious calibration of instruments on geostationary orbit using the desert as reference. These satellites are permanently located above the equator, whereas deserts are typically in the subtropical latitude of 20° − 40°, making it impossible to obtain near nadir view of the target. This often implies larger uncertainty due to amplified effects of the bidirectional reflectance distribution function (BRDF). For the Global Space-based Inter-Calibration System (GSICS), it is critical to inter-compare among the global constellation of geostationary satellites, which do not view a common desert. To address these issues, the Working Paper compared several vicarious calibration methods applied to one geostationary satellite, and described the effort of establishing the GSICS framework for inter-comparison of visible channel calibration among geostationary satellites using desert targets. The Working Paper was done in collaboration with Professor B. J. Sohn of Korea. Noting

the importance of this recent work, WG II recommends publication in peer reviewed literature.

Recommendation 38.11: NOAA to publish results on the characteristics of targets for vicarious calibration presented in NOAA-WP-26.

NOAA-WP-23 reported that a new calibration scheme was developed for the Defense Meteorological Satellite Program (DMSP) Special Sensor Microwave and Imager (SSM/I) to correct the intersensor biases. SSM/I on board F13 satellite is used as a reference due to its longest life span. After the intersensor biases are removed, monthly averaged Sensor Data Record (SDR) time series from different SSM/I sensors display some consistent trends in all the channels. These SDR trends also result in consistent trends of SSM/I derived products. For example, atmospheric total precipitable water (TPW) trend is 1.59% per decade (or 0.34 mm decade-1) for the global ocean and 1.39% per decade (or 0.63 mm decade-1) for the tropical oceans. For a longer climate data record from DMSP satellites, the Special Sensor Microwave Imager and Sounder (SSMIS) on board F16 to F20 must be further calibrated and the biases between SSM/I and SSMIS need to be quantified. SSMIS on F16 and F17 satellites displays large anomalies in its brightness temperatures associated with their antenna and calibration subsystems. Thus, the extension of climate data record from SSM/I to SSMIS requires continuing research in SSMIS anomaly corrections.

Action 38.19: NOAA to report on progress towards using SSMIS to extend the SSMI records on total precipitable water. Deadline: CGMS-39.

NOAA-WP-25 reported on their significant progress in the development of Level-1C Fundamental Climate Data Record (FCDR) from the MSU/AMSU observations using Simultaneous Nadir Overpass (SNO) inter-satellite calibration methodology. The method largely removed inter-satellite biases and instrument calibration errors related to sun heating variability on the instrument and thus resulted in consistent, nearly identical multi-satellite observations. This FCDR has been submitted to the GSICS Product Acceptance Procedure which ensures complete documentation and independent validation of the new inter-calibrated data-set. In the Working Paper, the SNO methodology for MSU/AMSU inter-satellite calibration was reviewed and the resulting FCDR performance in terms of inter-satellite bias reduction was described. Impact of the inter-calibrated FCDR on improvement of reanalysis bias correction was also demonstrated. Once the remaining bias in the intercalibrated data-set is properly characterised, these data can serve as “anchor” points for NWP data assimilation including reanalyses.

Recommendation 38.12: NOAA to use GPS RO measurements to assess the systematic bias remaining in the MSU/AMSU intercalibrated FCDRs.

NOAA-WP-27 reported on the generation of a 31-year (1978 to the present time) upper-air temperature thematic climate data record (TCDR) from well-merged Microwave Sounding Unit (MSU) and Advance Microwave Sounding Unit (AMSU) observations for climate trend and variability detection. The products include gridded global temperatures of mid-troposphere, upper-troposphere, and lower-stratosphere. The TCDR uses SNO calibrated radiances to minimise calibration errors. In addition, algorithms for correcting other errors such as antenna pattern effect, incident angle errors, diurnal drift errors, residual inter-satellite bias, Earth-location dependent biases, and frequency differences between MSU and AMSU channels are also implemented. The data-set is planned to operationally monitor the upper-air temperature changes at NOAA.

Recommendation 38.13: NOAA to present results on the Stratospheric Sounding Unit (SSU) intercalibration and derived long term trends and comparisons with trends from MSU/AMSU.

NASA-WP-04 provided a comprehensive survey of NASA's facilities and activities focused on Earth observing satellite calibration and validation. These include instrument calibration laboratories such as the Radiometric Calibration Laboratory (RCL), the Diffuser Calibration Laboratory (DCaL), the Calibration Development Laboratory (CDL), the Airborne Sensor Facility (ASF), and the Total Solar Irradiance (TSI) Radiometer Facility (TRF).

Ground networks and ground-based calibration sites and activities include the AErosol RObotic NETwork (AERONET), the Micro-Pulse Lidar Network (MPLNET), Landsat Ground and Targets Sites, Radiometric Vicarious Validation Activities, Tropical Rainfall Measurement Mission (TRMM) Ground Validation, the Network for the Detection of Atmospheric Composition Change (NDACC), the Tropical Ozonesonde Data-set for Satellite Validation (SHADOZ), the Clouds and the Earth's Radiant Energy System (CERES) Ocean Validation Experiment (COVE), the Marine Optical Buoy (MOBY), and Mobile Instrument Suites.

Airborne instruments such as the Airborne Visible Infrared Imaging Spectrometer (AVIRIS), the MODIS Airborne Simulator (MAS), the MODIS-ASTER Simulator (MASTER), the National Polar-orbiting Operational Environmental Satellite System Airborne Sounder Testbed - Interferometer (NAST-I), the UAV-Synthetic Aperture Radar (UAVSAR), the UAS-Autonomous Modular Sensor (UAS-AMS), the Cirrus Digital Camera and Digital Mapping System (DCS/DMS), the Precision Attitude/position equipment (POS-AV), and the future High Spectral Resolution Lidar (HSRL) instrument are all focused on satellite validation.

In addition to instruments, NASA provides airborne platforms (i.e. Global Hawk, ER-2, WB-57, DC-8, P-3, G-III, B-200, etc.) to acquire observations and perform satellite validation.

Finally, satellite intercalibration with operational GEO imagers and/or AVHRR sensors has also been supported for many years for generation of consistent multiple-instrument time series observations.

IMD-WP-12 assessed the calibration of INSAT satellites including vicarious calibration. In the discussion the potential for pertinent interactions with GSICS was raised.

NOAA-WP-21 reported on satellite calibration anomalies of their sensors during 2009 and 2010. The results were derived from their web-accessible Instrument Calibration Validation System (ICVS). Instrument performance monitoring is critical for ensuring level 1B product quality for both numerical weather prediction and climate change detection. Since these products are increasingly dependent on data from the international constellation of Earth observing satellites, it is important to establish a central interface from which instrument monitoring information from all over the world can be distributed.

Action 38.20: CGMS agencies to provide reports on satellite calibration anomalies. Deadline: CGMS-39.

NOAA-WP-22 reported on the development of a long-term data-set of intercalibrated AVHRR visible and near infrared channels. NOAA/NESDIS has developed a new set of reflectance calibration coefficients for channels 1 (0.63 μm m) and 2 (0.86 μm m) of the Advanced Very High Resolution Radiometer (AVHRR) flown on the NOAA and EUMETSAT polar orbiting meteorological satellites. This method uses several approaches that are radiometrically tied to the observations from NASA's MODIS imager to make the first consistent set of AVHRR reflectance calibration coefficients for every AVHRR that has ever flown. The results indicated that the calibration coefficients presented here provided an accuracy of approximately 2% for channel 1 and 3% for channel 2 relative to that from the MODIS sensor. These new calibration coefficients have been implemented in the NOAA/NESDIS Pathfinder Atmospheres Extended (PATMOS-x). AVHRR reflectances contained in the PATMOS-x data have been delivered to the National Climate Data Centre (NCDC). Verification of the stability of the AVHRR reflectance time-series has been investigated by analysis of PATMOS-x Thematic Climate Data Records (TCDRs).

Action 38.21: NOAA to submit the current version of the AVHRR Fundamental Climate Data Record for GSICS Product Acceptance. Deadline: CGMS-39.

In the discussion the Chair Prof V. Asmus thanked NOAA, especially Dr M. Goldberg for the outstanding leadership on the GSICS work. It was also suggested that EUMETSAT considers hosting a 3rd GSICS Users Workshop during their Annual Satellite Conference in Oslo in September 2011; to follow the two previous workshops successfully held during the EUMETSAT annual conferences in 2009 and 2010, respectively.

II/4 Infrared/MicroWave sounding and ITWG Matters

CMA-WP-13 introduced the result of a collaborative project of CMA and ECMWF aimed at optimising the benefit of FY-3 data. Data from FY-3A have been introduced into the ECMWF data assimilation system to assess its quality, the initial results are encouraging and build confidence that the follow-on series of FY-3 satellites will also be widely used for NWP data assimilation. The paper stated that the processing system for FY-3A and FY-3B will be available with the release of CY36R4 which is due to become operational in autumn 2010. The WG noted the successful assimilation experiments conducted at ECMWF. A question was raised as to whether other weather forecasting centres do have Near-Real-Time access to FY-3 data, which recalled an action placed on CMA at CGMS-37.

CMA-WP-18 gave an overview of the Microwave Radiation Imager (MWRI) onboard FY-3 satellite, a ten-channel, five-frequency, linearly polarized, total power passive microwave radiometer. It receives both vertical and horizontal linearly polarised radiation at 10.65, 18.7, 23.8, 36.5 and 89.0 GHz. MWRI is designed as an end-to-end calibration system. The advantage of this kind of calibration system is that radiation from the Earth target and radiation from the warm/cold calibration target are reflected to receivers by the same main reflector. Therefore an antenna correction was not necessary. The inter-calibration between MWRI, SSM/I and WindSat shows a good result that confirmed the performance of the calibration system. The MWRI of FY-3 provides microwave radiation measurements to derive atmospheric, oceanographic, and land parameters. The NSMC/CMA has developed seven MWRI products: total precipitable water, precipitation and cloud water, sea ice concentration, a drought and flood index, land surface temperature, soil moisture, snow water equivalence and snow depth. Most of the products can be obtained twice a day on a global basis.

IMD-WP-01 dealt with a new algorithm developed for improving the retrieval of clear-sky atmospheric humidity profiles from microwave sounders operating at channels around 183.31 GHz. At these frequencies with very high atmospheric absorption, the radiation is dominantly contributed by broad atmospheric layers whose thickness and mean altitude vary with operating frequency as well as with humidity and temperature conditions of the atmosphere. Then combination of sounding channels is used for deriving humidity profiles making due consideration of the vertical overlap of the weighting functions. The algorithm has been tested with simulated data for Aqua/HSB and Megha-Tropiques/SAPHIR channels as well as with limited HSB data indicating improvements over NORM algorithm and has been shown to perform well.

IMD-WP-03 described the retrieval of profiles of atmospheric temperature and humidity from the INSAT-3D sounder. The profiles will be used to improve the quality of weather forecasts over the Indian region, especially over data sparse oceanic regions. The INSAT-3D Sounder that is scheduled for launch in early 2011 is expected to provide this vital information. A physical retrieval based algorithm has been developed to retrieve the temperature and humidity profiles

from INSAT-3D Sounder observations in clear-sky conditions. The accuracy of the retrieved products using simulated data-sets is found to be close to that obtained by similar sounding products available from GOES and NOAA-ATOVS.

In the discussion, WG II asked whether IMD would also use the sounder to derive instability products. The discussion triggered a recommendation to perform a comparison of various instability estimates being derived operationally by CGMS satellite operators. This will be discussed at the next ITWG and the Convection Working Group meeting.

Action 38.22: EUMETSAT to provide to CGMS agencies information on the Convection Working Group. Deadline: 28 February 2011.

IMD-WP-23 presented an Artificial Neural Network (ANN) technique for obtaining vertical profiles of temperature from Advanced Microwave Sounding Unit-A (AMSU-A) measurements over the Indian region. The data-sets, in the form of level 1B format (instrument counts, navigation and calibration information appended) are pre-processed by ATOVS (Advanced TIROS Operational Vertical Sounder) and (AVHRR) Advanced Very High Resolution Radiometer Processing Package (AAPP). The corresponding global analysis data generated by the National Centre for Environmental Prediction (NCEP) and AMSU-A data from April 2007 to March 2008 were used to build the neural network training data-sets and the period from April 2008 to July 2008 were used as independent data-sets. The root mean square (RMS) error of temperature profile retrieved with the ANN is compared with the errors from the International Advanced TOVS (ATOVS) Processing Package (IAPP). The overall RMS errors of ANN are found to be less than 3°C at the surface, 0.9° to 2.8° between 700-300 hPa and less than 2°C between 300-100 hPa. The comparison has also been carried out using radiosonde temperature profiles for independent data-sets to test the quality of temperature profile retrievals from ANN and IAPP. It has been observed that the neural network technique can yield remarkably better results than IAPP at the low levels and at about 200-hPa level. The highlight of the work was, however, the case study of the upper tropospheric warm core anomaly of two cyclones. It was found that the temperature anomaly at 200 hPa can be a good indicator of the intensity of tropical cyclones. It may be stated that optimised neural network can be easily applied to AMSU-A retrieval operationally and it can also offer substantial opportunities for the improvement in tropical cyclone studies. It appears to be promising for analysing a cyclone category and complements the Dvorak technique.

KMA-WP-05 reported on the current status of the satellite data assimilation in the numerical weather prediction at Korea Meteorological Administration (KMA).

NOAA-WP-28 reported on the 17th International TOVS Study Conference (ITSC XVII) held at the Asilomar State Park Conference Centre, Monterey, 14-20 April 2010. Through this forum, operational and research users of TIROS Operational Vertical Sounder (TOVS), Advanced TOVS (ATOVS) and

other atmospheric sounding data have exchanged information on data processing methods, derived products, and the impacts of radiances and inferred atmospheric temperature, moisture, and cloud fields on numerical weather prediction (NWP) and climate studies. With 146 participants representing 20 countries, the Working Paper summarised the scientific exchanges and outcomes of the meeting. The ITWG Web site (http://cimss.ssec.wisc.edu/itwg/) contains electronic versions of the conference presentations and publications, which, reflect the conduct of a highly successful meeting in Monterey. An active and mature community of TOVS and ATOVS data users exists, and considerable progress and positive results were reported at ITSC-XVII in a number of areas, including many related to direct broadcast, climate studies, NWP, validation, and to the other current and scheduled advanced sounders. The paper described the major conclusions, recommendations, and action items created during ITSC-XVII. These all affect, directly or indirectly, the polar orbiting satellite operators, operational data users, developers and international space agencies.

There were more than 50 recommendations as a result and WG II noted that many of these recommendations can be addressed by existing groups such as GSICS and SCOPE-CM.

Action 38.23: ITWG rapporteur will provide actions related to calibration to GSICS. Deadline: 28 February 2011.

Action 38.24: ITWG rapporteur will provide actions related to climate to SCOPE-CM. 28. Deadline: February 2011.

Action 38.25: ITWG rapporteur and ITWG co-chairs to invite IMD and ISRO to increase their participation in ITWG. Deadline: 28 February 2011.

Listed below are recommendations considered to be of the highest priority and of international relevance by the ITWG. There were also a number of recommendations which were found to be nearly identical to recommendations by the International Precipitation Working Group (IPWG). Those recommendations are noted in the IPWG WMO-WP-19 report.

1. Recommend the Russian Federation to make the Meteor-M mission a fully contributing component of the GOS by providing the global data sets from this mission in a timely manner with all necessary ancillary information.
2. Recommend satellite agencies operating environmental polar satellites to provide or continue to provide a Direct Broadcast capability on their polar environmental satellite systems, and make available in a timely manner the Direct Broadcast data processing (L0 to L1, and/or L1 to L2) software, documentation, and related training.
3. ITWG recommends that the constellation of at least three orbits (early morning, morning, and afternoon), each with full sounding capabilities (IR and MW), is maintained. The WG recommends coordination

between agencies of the overpass times of operational satellites with sounding capability (IR and MW) to maximise coverage (including, e.g. China, India).

4. The WG II recommends that all relevant space agencies (i.e. ESA, NASA, NOAA, JMA, EUMETSAT, CMA, KMA, etc…) send information to users, including the NWP WG mailing list, about planned changes in data processing, formats, and other issues related to data as early as possible (preferably within 6 months).
5. Satellite agencies that are considering changing the frequency or viewing geometry/resolution of heritage measures need to consider the impact on climate monitoring and particularly trend characterisation.
6. Recognising that climate change may have a diurnal cycle component ITWG recommends to CGMS that they explicitly consider the coordinated international phasing of satellites to ensure adequate sampling of diurnal cycle.
7. ITWG recommends JMA to consider a broadcast service to facilitate access to Himawari-8 and -9 data, in particular for users in Pacific islands who have limited Internet connectivity.
8. ITWG recommends CGMS satellite operators to investigate the potential use of satellite-to-satellite communication (e.g. Tracking and Data Relay Satellite System, TDRSS) as a mechanism to support timely collection and redistribution of polar-orbiting satellite data in future systems.
9. There is international frequency-spectrum allocations that guide frequency band usage and delineate restrictions placed on such use. It is recognised among the environmental satellite community; however, that there are instances in which emitters are likely to cause the loss of data that is of interest to this community. An international registry of emitters would provide advance notification for future environmental satellite missions. It is proposed that a discussion of such a registry be held within appropriate (WMO, CGMS) entities. Such a registry could contain information on emitter locations, RF characteristics, duty cycles, and anticipated time frame of emitter existence. This would expand a current initiative, a much smaller scale effort named Radiofrequency Interference Survey of the Earth (RISE).

NOAA-WP-30 reported on the NOAA Unique Cross-track Infrared Sounder (CrIS) and Advanced Technology Microwave Sounder (ATMS) Product System (NUCAPS) is under development at NOAA/NESDIS/STAR. The system will produce thinned apodised CrIS radiances, principal components of CrIS radiances, cloud-cleared CrIS radiances, temperature, moisture, and trace gas profile products for Numerical Weather Prediction (NWP) customers in Near-Real-Time. The thinned apodised radiances and the principal component data will be available once the NPP data are released (approximately 6 months after launch). The rest of the products will be released one year later.

II/5 Precipitation and IPWG Matters

IMD-WP-09 discussed two algorithms to estimate rain using Kalpana-IR measurements. In the first algorithm, an attempt has been made to analyse the Infrared (IR) radiances from Kalpana/INSAT data along with the high resolution, rainfall estimates from Tropical Rainfall Measuring Mission (TRMM)-Precipitation Radar (PR). Contrary to the IR, microwave (MW) rain rates are based on measurements that sense precipitation in clouds and do not rely on cloud top temperature. The combination of the broad coverage and frequent observations of the geostationary satellites with the sparse but more accurate active microwave rain rates has been used for the characterisation of precipitation-bearing systems over Indian land from adjoining oceans. It has been named as INSAT Multi-Spectral Rainfall Algorithm (IMSRA) as it makes use of both IR and MW sources of measurement from different satellite sensors of both geostationary and low Earth orbiting platforms.

Another new technique called Hydro-Estimator (H-E) has been developed that blends the thermal IR measurements from Kalpana/INSAT with Numerical Weather Prediction (NWP) model derived fields and surface elevation model. The H-E method provides the most precise measurement of precipitation at pixel-scale at every IR observations (presently every 30 minutes from Kalpana/INSAT). The important features of this scheme include provision to measure rain based on cloud growth and availability of moisture in the atmosphere, adjustments for orographic rain and the warm rain by using wind laced topography and atmospheric equilibrium level, and wet atmospheric correction. The scheme was presently undergoing tests for operational implementation.

Finally an overall status of rainfall estimation from IR and microwave measurements from INSAT, Megha-Tropiques, GPM, etc., was presented.

IMD-WP-22 presented the real-time three hourly Quantitative Precipitation Estimates (QPE) derived from the Kalpana-1 satellite which are useful for the determination of spatio-temporal variation of rainfall, particularly over the data sparse regions. Daily QPE values have been compared with Tropical Rainfall Measuring Mission (TRMM) rainfall as well as actual observed rainfall during southwest monsoon seasons of 2009 and 2010 over six regions of the Indian subcontinent. Results have brought out some interesting aspects of satellite precipitation estimates over the Indian region.

KMA-WP-06 reported on the current status on GPM activities in KMA/NIMR during 2009 and 2010. The focus of the activities was on the direct validation of satellite precipitation using ground-based observation data. WG II took note of the progress.

NOAA-WP-31 described the activities of the GOES-R Algorithm working Group (AWG) Hydrology Algorithm Team (AT) which has been tasked to provide demonstrated and validated algorithms for retrieving the precipitation-related parameters from GOES-R data. The first is the instantaneous Rainfall Rate at the current time, which has been an operational GOES product at NESDIS for many years. The second is the Rainfall Potential, which is a forecast of rainfall accumulation during the next 3 hours based on extrapolation from current and previous Rainfall Rate images. The third is the Probability of Rainfall, specifically, of at least 1 mm of rainfall during the next 3 hours. The Working Paper briefly described each of these algorithms.

The discussion also addressed the continued need to exploit existing opportunities to create good validation data. This sparked off the following action:

Action 38.26: Recognising limited validation data-sets and the use of SEVIRI for GOES-R and MTG algorithm development, EUMETSAT and NOAA to coordinate with South Africa for creation of validation data-sets for rainfall products and to report at CGMS-39. Deadline: CGMS-39.

WMO-WP-19 informed CGMS members on the status of activities related to the International Precipitation Working Group (IPWG) since CGMS-37.

Activities of note include:

- IPWG Validation Activities began to include numerically generated precipitation estimates, in conjunction with the Working Group on Numerical Experimentation (WGNE);

- IPWG provided leadership in the GEO Precipitation Subtask, with Co-chair G. Huffman serving as the Point of Contact.

Code and data-sets were pushed toward completion for correcting errors in the SSMIS passive microwave satellite radiances, preparing to make them useful for the precipitation community.

CGMS took note of WMO-WP-19 and expressed its appreciation on the work performed during the last months under the leadership of the outgoing co-chairs Dr George Huffman (NASA, GFFC) and Dr Christina Klepp from the Klima Campus, University of Hamburg (Germany). Especially the outcome of the IPWG-5 meeting held in Hamburg, in October 2010, was considered an important contribution for the way forward in defining needs for future satellite instrumentation and optimised use of precipitation products. CGMS endorsed the recommendations by IPWG as listed in the working paper, namely:

- Confirm the new Co-chairs for the IPWG, Paul Kucera (NCAR, USA) and Bozena Lapeta IMWM/SRSC (Poland);

- Support reprocessing activities for all available satellite precipitation product archives;

- Pursue SSMI/SSMIS data-set consistency;

- Encourage coordination of satellite overpass times with a view to optimise temporal sampling, and take advantage of backup satellites;

- Ensure the continuity of multi-channel, dual-polarisation, conically scanning microwave imagers;

- Pursue development of geostationary microwave sensors;

- Ensure the continuity of cloud/precipitation space radars;

- Ask WMO to develop an initiative, or task an existing initiative, to support the interface between providers and users to expand the use of precipitation products and opportunities for training;

- In particular, WMO is expected to facilitate access to rain gauge data in Near-Real-Time, especially in data sparse regions; and

- Consider providing financial support for selected participants in IPWG-6, which is expected to occur in October 2012 potentially in Brazil, together with a training event, and initiate budgetary planning accordingly.

It is worthwhile to note that the above list of recommendations contains particularly four recommendations which were independently identified by the ITWG as well. These are the requests for assuring the provision of future conical scanning microwave imagers in the polar orbits, the provision of microwave sensors in the geostationary orbit, the optimisation of the orbits for best temporal coverage and the consistency of SSMIS data-sets.

II/6 Atmospheric Motion Vectors and IWWG Matters

IMD-WP-05 described the operational derivation of atmospheric motion vectors from infrared (10.5-12.5 μm) and water vapour (6.3 –7.1 μm) channels of three successive geo-stationary satellite images started in the early 1970s. However, for the last decade the extraction of atmospheric motion vectors from satellite images has become a most important component for operational numerical weather prediction (NWP) and a significant contribution of atmospheric wind information are derived from satellite observations by considering the movement of cloud and water vapour tracers to determine wind operationally several times a day. In India, operational derivation of atmospheric motion vectors from Indian Geostationary satellite, Kalpana-1 has been initiated a few years back. The Working Paper focused on improvements to the existing triplet based operational derivation of atmospheric motion vectors from the observations of Kalpana-1.

KMA-WP-07 reported on changes of the KMA operational AMV algorithm and recent improvements of the quality. One of the improvements is that the number of wind vector was increased and vectors with incorrect height assignments were reduced.

JMA-WP-05 reported on the recent status of JMA's AMVs from MTSAT-1R and MTSAT-2, including responses to Recommendations from CGMS-37 (37.18, 37.22 and 37.24) on JMA plans to increase the frequency of AMV dissemination via the GTS from the end of 2010. It was planned that AMV data computed on an hourly basis, so far only used internally, would be disseminated via the GTS every hour in BUFR format and the Working Paper outlined the corresponding dissemination plan. JMA switched over from MTSAT-1R to MTSAT-2 at 03 UTC on 1 July 2010. Following the switchover, JMA/MSC has disseminated MTSAT-2 AMVs since 03 UTC on 11 August 2010. The quality difference between MTSAT-1R AMVs and MTSAT-2 AMVs as well as time series representations of AMV statistics based on the CGMS standard were shown to be consistent. In response to **Recommendation 37.18**, JMA planned to engage in future international inter-comparison for improvement of the AMV algorithm. In regard to **Recommendation 37.22**, JMA needs detailed information on stand-alone AMV derivation software for local installation as its own AMV derivation software for follow-on satellites. For **Recommendation 37.24**, JMA computed and evaluated Rapid Scan AMVs from MTSAT-2 for the THORPEX T-PARC campaign of 2008. The new algorithm has the potential to increase the spatial resolution of AMVs by applying a trade-off between this resolution and the excessive time resolution of rapid scan images. JMA was currently also developing an improved height-assignment method for low-level AMVs and performing impact tests for the assimilation of Meteosat-7 AMVs derived using JMA's AMV algorithm.

EUM-WP-29 summarised the outcomes of the 10th International Winds Workshop (IWW10). The workshop was hosted by JMA and took place in Tokyo from 22-26 February 2010. There was a good cross-spectrum of attendance (46 participants) from a wide range of producers, NWP centres and a few research centres. The paper recalled recommendations from CGMS-37 to IWW10 and highlighted the outcomes and recommendations resulting from IWW10. Concerning recommendations for work in the immediate future, CGMS-38 was invited to emphasise the following aspects:

- NWP centres to coordinate a joint AMV and scatterometer denial study, also looking at adjoint sensitivity statistics were available. Aim to summarise in a report to the WMO GOS impact workshop and IWW11, both due to be held in the first half of 2012;

- AMV producers to undertake a new AMV derivation inter-comparison using their latest software and a new study period. Plan to repeat at intervals and report results at future IWWs;

- The NWC SAF, producers and IWWG co-chairs to undertake the work outlined in CGMS-38 EUM-WP-42;

- The IWWG co-chairs to set up a wiki page and initiate discussion on improving the derivation and assimilation of high resolution winds;

- Encourage all scatterometer data producers to consider providing global data in near-real-time to support NWP;

- Encourage increased efforts to validate AMV height assignment using the A-train, model, sonde, and profiler data; and

- Encourage continued efforts to generate physically-based AMV vector and height error estimates to be sent with each wind.

In the discussion, CGMS-38 first thanked JMA for hosting the very successful 10th International Winds Workshop in Tokyo in February 2010. The discussion was deferred to after the presentation of EUMETSAT Working Papers 28 and 42.

EUM-WP-28 described how EUMETSAT and the Nowcasting Satellite Application Facility (NWC SAF) have implemented the new CCC AMV height assignment scheme jointly developed by EUMETSAT and JMA researchers (Borde and Oyama, 2008) into the NWC SAF AMV software for testing the impact of this method in the NWC SAF AMV retrieval software package. The implementation was made in June 2010 at NWC SAF, and preliminary results show some improvements on the AMV products in HRV and IR10.8 channels. The paper addressed in a very practical way the CGMS-37 Recommendation 37.22 on the development of a stand-alone software package for the derivation of AMVs from imaging satellite instruments. The major outcome of the work is that it has been shown that significant changes to the software package can be made in a reasonable amount of time. It proves that the software is modular, well-documented and well-suited as a stand-alone software package.

EUM-WP-42, on the same topic as EUM-WP-28, had been put together by the IWWG co-chairs in order to inform CGMS in detail on the deliberations of the stand-alone software package for AMV derivation. It summarised the outcomes of the 10th International Winds Workshop (IWW10) plenary discussion on corresponding plans to develop a portable AMV processing software package. The topic generated a lot of debate and addressed the following two objectives of the portable software: i) Greater involvement of research groups to help develop and test new approaches for deriving satellite-based AMVs; ii) Increased collaboration between operational AMV producers to speed up improvements to AMV derivation and move towards more consistent approaches.

WG II took the extensive input and had a longer discussion on the 'portable AMV software package.' The proposal continued to spark constructive ideas and it was agreed to consider the AMV software package from the EUMETSAT

SAF in support for Nowcasting as the prototype for the said portable software package. An important conjecture was the question on the demonstrated quality of the AMVs from the portable software package and it was agreed to address this with a specific action on EUMETSAT. Other key conclusions from IWWG10n were also supported. In conclusion WG II formulated the following actions and recommendations:

Recommendation 38.14: JMA is invited to report on the use of high resolution AMV derived for T-PARC experiment.

Action 38.27: All satellite operators are invited to inform the CGMS Secretariat whether they will support a second AMV intercomparison study. They are also invited to provide feedback on potential improvements and changes. Deadline: 31 March 2011.

Action 38.28: Co-chairs of the IWWG should develop a workplan for a second AMV intercomparison study on the basis of lessons-learnt from the 1st intercomparison and the pertinent feedback and comments provided by CGMS members (see Action 38.27). Deadline: CGMS-39.

Action 38.29: EUMETSAT to conduct an extended validation campaign for AMVs derived with the NWC SAF portable AMV software package. Deadline: 31 May 2011 and a report to CGMS-39.

Recommendation 38.15: CGMS operators are invited to express their interest in the portable AMV software package from the EUMETSAT Nowcasting SAF for testing and internal comparisons.

II/7 Radio Occultation and IROWG Matters

EUM-WP-30 reported on how GRAS operational geometric optics processing is now performed at EUMETSAT with an improved processor. This has introduced several improvements, among them deeper penetration of occultations into the troposphere, use of improved GPS orbits/clocks, and a reduction of degraded data due to orbit convergence periods. In parallel, an offline prototype has been developed that combines geometric and wave optics processing. The offline processor also has the option to include GPS Navigation Bits in the processing. Validation of the prototype was performed within a European ESA study, and different centres provided wave optics processed GRAS data. Results show generally good agreement in terms of bias, whereas standard deviations do depend on the selected smoothing/filtering of the data. The validation also confirms that GRAS is capable to track all the way down to the lowest altitudes, even under highly variable atmospheric conditions. The validation also shows that processing options do have a fairly large impact on the found bias structure at lower altitudes and that further comparisons are required to optimise the use of any radio occultation instrument in the lower troposphere. A best effort, i.e. non operational, based wave optics processed bending angle data stream from the offline processor was scheduled to be

provided close to Near-Real-Time in October 2010. This would allow for early identification of possible short-comings in the processor, which would then be fed into the in parallel ongoing development of the operational processor (scheduled to be available in 2011).

NOAA-WP-15 reported on the first workshop of the IROWG (IROW1). The workshop was hosted by the Wegener Centre/University of Graz and was organized together with the OPAC-4 (Occultations for Probing Atmosphere and Climate) and GRAS SAF (Satellite Application Facility) Climate workshops in Graz, Austria. IROW1 was held on Friday 10 September 2010 and Saturday 11 September 2010 and it was attended by more than 60 scientists, including all the major centres providing and assimilating RO data. Generally, all participants considered it a big honour to have been selected as the fourth working group under the auspices of CGMS. After a general introduction on the work of CGMS and IROWG, IROW1 participants were asked to work in sub-groups, covering the main fields of radio occultation observations: (1) Numerical Weather Prediction; (2) Climate; (3) Research to Operations/Payload Technology; (4) Innovative Occultation Techniques; (5) Space Weather; discuss activities within their field and express recommendations. The recommendations were presented and discussed in a plenary meeting. The main recommendations from each sub-group were presented in the Working Paper.

The priority recommendations are:

1. GPSRO has demonstrated to be a very important element in the global data observing system for NWP. The continuity of GPSRO observations in the future is not sufficiently guaranteed. IROWG recommends that CGMS coordinates efforts between operational data providers and NWP agencies to establish long term continuity plans;

2. Operational NWP centers should be aware of a substantial reduction of available GPSRO data in real time, that has already begun, and will continue (CHAMP down, COSMIC degrading, COSMIC II planned to be commissioned only in 2015). Processing of research data could fill the gap (TERRASAR-X, TANDEM-X, OCEANSAT-2, SAC-D, PAZ, etc, where the first 3 have already been launched). IROWG recommends that CGMS coordinates efforts between operational data providers, NWP agencies, and research agencies, to investigate and potentially support NRT infrastructure for these data (downlink, processing, dissemination and archiving);

3. Future missions should consider covering 360° in ascending node. The sampling need not be regular in ascending node, but it should definitely extend well beyond 180°. If all 360° is not covered, sinusoidal sampling biases pole wards of 50° latitude with the period of constellation precession is present due to selected local time sampling;

4. RO measurements are a valuable information source for NWP and climate. Within NWP, the number of RO instruments has not reached

saturation level. Hence IROWG recommends that operational and research organizations consider adding Global Navigation Satellite System (GNSS) RO payloads on all suitable satellite systems;

5. The value of RO data to ionospheric modeling is expected to grow as the amount of available data increases over time. A variety of science and operational missions are in the planning stages, and it seems likely that more may be planned in the near future. IROWG thus recommends to encourage missions flying RO sensors to include a robust ionospheric measurement capability without interference to collection of lower atmosphere data. IROWG also recommends to encourage the development of a standardized ionospheric scintillation measurement capability for RO sensors.

Action 38.30: WMO to coordinate efforts between operational data providers and NWP agencies to establish long term continuity plans, including the use of research data in operational products and optimal configurations for climate applications. Deadline: CGMS-39.

IMD-WP-11 discussed the Radio Occultation receiver ROSA, onboard OCEANSAT-II, which is also planned to be flown onboard MEGHA-TROPIQUES, an ISRO-CNES joint Mission. Retrieval of geophysical parameters viz. temperature and humidity from ROSA derived refractivity is an important mandate. Accordingly an iterative retrieval technique, called "Refined temperature technique" is developed and applied on a set of COSMIC refractivity profiles of January 2010 and is compared with the corresponding products retrieved by COSMIC processing software based on 1DVariational (1DVAR) technique. A significant improvement in the accuracy was expected to occur by ingesting temperature external information (at a few vertical levels) from NWP model analysis into the retrieval software. Sample plots of retrieval with the above mentioned technique and their comparison were shown. Currently, an attempt to develop 1DVAR retrieval technique was being made.

Recommendation 38.16: ISRO and partner Agencies to provide ROSA GPS RO data from Oceansat-2 and Megha-Tropiques to operational agencies in Near-Real-Time.

II/8 Cloud and Ash/Dust Related Matters

CMA-WP-14 described the project at CMA/NSMC developing an operational system for global dust storm monitoring. The project integrates multiple data from FY-2D/2E and FY-3A data, SEVIRI/MSG-2 data, and MODIS/EOS data and each individual work on software into one processing system. The system produces three quantitative dust parameters: the aerosols optical depth; the effective particle radius; and the dust loading; and releases the information along with ground measurements. The system shall enhance the

operational capability of CMA in dust monitoring and provide the public at large a web-based platform to access the dust storm information in real time.

IMD-WP-04 discussed satellite derived parameters including temperature and humidity profiles, cloud top pressure, cloud top temperature, total precipitable water, etc., which are crucial for the improvement in weather forecasting. India was scheduled to launch INSAT-3D in a geostationary orbit with 18 channel infrared (plus a visible channel) sounder. The sounder onboard INSAT-3D will play a major role in providing observations over extended regions particularly measurements over the data sparse Indian Ocean region. In addition, the INSAT-3D sounder will also give information regarding cloud cover and cloud top pressure and temperature, which in turn will be very helpful for nowcasting and for severe weather prediction.

The Working Paper was aimed at cloud detection and computation of cloud top pressure using INSAT-3D Sounder observations. For this purpose, various threshold tests have been formulated for the cloud detection and the CO2-slicing technique has been used for the computation of cloud top pressure. The algorithm has been tested with a GOES sounder data-set over the continental US region. For cloud detection, minimal use of the ancillary data-set had been tried in order to avoid the effect of ancillary data bias on the cloud flag. The cloud flag tests were validated with MODIS cloud flag and cloud top pressure had been validated with CALIPSO data.

IMD-WP-17 presented a procedure for the automatic detection of thunderstorms by means of visible and infrared Kalpana-1 images. Convective cloud is being identified by giving threshold value of Cloud Top Temperature. The Scanline Floodfill algorithm is used to detect the pixels with given range of threshold value i.e. CTT≤-30°C. On getting the number of pixels in a given convective cloud, pixel area summation is used to find area of the convective cloud, minimum CTT and latitude/ longitude range. The procedure is applied to thunderstorms that developed over the eastern and north eastern India in the pre-monsoon months of April and May. On the basis of this, IMD is identifying different types of Mesoscale Convective Systems (MCS). Different shapes of thunderstorms are also being identified to observe the severity of the thunderstorm, and MB curve enhancement is applied in IR satellite imagery.

IMD-WP-18 described the utilisation of bi-spectral technique to detect horizontal extent of night-time fog over northwest India. A bi-spectral technique for night-time detection of potentially hazardous fog and low clouds is based on difference of emissivity of cloud water droplet in two channels, shortwave Infrared (SWIR) data and long wave Infrared (LWIR) data. The 1-km resolution data from Moderate Resolution Imaging Spectroradiometer (MODIS) level-1B data over north Indian region for January 2009 and 2010 have been used for night-time fog detection. Analysis of MODIS data have been carried out by using HYDRA (HYperspectral- viewer for Development of Research Applications) software developed by the Space Science and Engineering Centre, University of Wisconsin. Analysis of bi-spectral images

from MODIS using three different SWIR channels (20, 22, and 23) revealed that the shortest SWIR band (i.e. band 20 centred near 3.7μm) provided the best night-time low cloud detection while the longer wave-length band 23 centred near 4.0μm, produced the worst fog detection. Night-time fog was successfully detected over northern India for two winter seasons (2008-09 & 2009-10) by using bi-spectral technique for two MODIS channels 20 (3.9μm) and channel 31 (11.00μm). This technique can be used in future for INSAT-3D.

EUM-WP-31 paper discussed the 14 April to 23 May 2010 explosive eruption at the Eyjafjallajökull volcano in Iceland which caused widespread and unprecedented disruption to aviation, thus having a high economic impact. A clear demand and need exists for qualitative and quantitative volcanic ash and SO_2 products, where especially ash cloud concentration and ash cloud height are important. EUMETSAT was currently conducting two science studies with external partners with the aim to assess available quantitative retrieval techniques to be applied to Meteosat Second Generation (MSG) observations. The Eyjafjallajökull event, which led to a wealth of ground based and air-borne data measured during this time period, will be used as an evaluation and validation test bed. The overall aim of these activities is to soon operationally provide users with well tested and understood volcano products.

NOAA-WP-34 described the algorithm developed for GOES-R to provide quantitative information on volcanic ash clouds, including volcanic ash cloud height and mass loading (mass of ash per unit area) products, are needed to nowcast and forecast volcanic ash clouds. Unlike traditional aerosol products, the volcanic ash products are required day and night. As such, the algorithm is an infrared-based approach to retrieve information on ash cloud height, mass loading, and particle size. The GOES-R volcanic ash algorithm was applied to the MSG SEVIRI observations and were found to be very useful to providing quantitative information on the Icelandic volcano Eyjafjallajökull. During this time, the GOES-R product was compared with data from the Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP) on board NASA's Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) satellite. Comparisons to CALIOP data show that the GOES-R ash cloud heights were consistently within 1- 2 km of the lidar depicted cloud tops, even though the ash clouds observed by the lidar were very optically thin.

During this event the GOES-R algorithm was also applied to MODIS data. A time sequence of key highlights are listed below:

- From 14-21 April 2010 the GOES-R volcanic ash products were generated regularly in near-real time using SEVIRI and MODIS and distributed to the user and research committee via a "volcanic clouds" e-mail list;

- On 19 April 2010, the UK Met Office (London Volcanic Ash Advisory Centre) requested real-time access to these products;

- Beginning on 22 April 2010 the GOES-R volcanic ash products were automatically generated in real-time using SEVIRI and were provided to the UK Met Office via the web;

- The UK Met Office utilised the GOES-R volcanic ash products in their daily briefings; and

- The GOES-R volcanic ash products were also provided to several modelling groups for use in model validation and data assimilation studies.

WMO-WP-02 discussed the need to provide a constellation of LIDAR instruments in Low Earth Orbit and hyperspectral infrared measurements in geostationary orbit to optimise the generation of quantitative volcanic ash products. The recent eruption of the Icelandic volcano Eyjafjallajökull with the ensuing severe disruption to air traffic over Europe and the North Atlantic has highlighted the need for an improved composite observing system for volcanic ash clouds. Given the remote location and patchy monitoring of many active volcanoes, satellite detection of new eruptions is a key factor to maintain safe aviation operations, given the fact the highest danger to aviation is considered to be in the first 48 hours after the eruption. For this purpose, the high observing frequency of geostationary systems at lower latitudes and frequent overpasses of polar-orbiters at higher latitude, where viewing angle of geostationary systems becomes less favourable, is crucial to success. For later tracking and identification of ash clouds, satellite-based detection based on multispectral imagery and split-window techniques, but even more so by hyperspectral sensors and active LIDAR systems, is seen as a vital component of the overall warning and advisory system together with ground-based remote sensing (LIDAR) and in-situ systems carried by research and in-service aircraft. These data are important to establish the 4d-location of ash cloud, may be used to infer eruption source parameters by inverse modelling, and are crucial for the validation of transport and diffusion model output.

Action 38.31: CGMS Satellite Operators are invited to report on a regular basis on their capabilities and plans to support volcanic ash monitoring, including the development of relevant products and techniques for utilisation, in order to inform the relevant ICAO and WMO bodies: the WMO/IUGG Volcanic Ash Scientific Advisory Group and the ICAO International Volcanic Ash Task Force/International Airways Volcanic Watch Operations Group (IVATF/IAVWOPSG). Report at CGMS-39. Deadline: CGMS-39.

Action 38.32: Propose CMA, IMD, NOAA, and other interested CGMS agencies to support future training related to the use of satellites to monitor dust, volcanic ash, fog, and forest fires in conjunction with the WMO Virtual Laboratory. Report at CGMS-39. Deadline: CGMS-39.

Action 38.33: Invite CGMS operators to submit to the next CGMS meeting Working Papers on nowcasting applications, including cloud analysis, fog detection and forest fires. Report at CGMS-39. Deadline: CGMS-39.

II/9 Ocean Parameters

EUM-WP-33 provided an overview of satellite-based ocean products, including specifications of the current operational and planned products. These include sea surface temperature, sea surface winds, sea ice and sea surface height. The paper also includes reference to their operational needs and the availability of the products, primarily from the EUMETSAT SAF on Ocean and Sea Ice.

IMD-WP-10 described the Oceansat-2 satellite, which was successfully launched on 23 September 2009 with a two-day repeat cycle, carrying three instruments, namely a Ku-band Wind Scatterometer (SCAT), an Ocean Colour Monitor (OCM), and a Radio Occultation Sounder for Atmosphere (ROSA) developed by the Italian Space Agency ASI). Oceansat-2 aims at providing a unique suite of meteorological, physical and biological ocean applications with the Scatterometer and the Ocean Colour Monitor. The availability of ROSA will supplement the meteorological parameters of the overlying atmosphere. Subsequent to the completion of the commissioning phase also involving initial quality assessment and preliminary verification, the ocean surface wind vector products are being operationally generated and made available on the NRSC-ISRO website. At present, the wind products are available at 50 km wind-cells in orbit-wise product and the day-wise product at 0.5° global grid, as well as, daily means of backscatter data at 0.5° global grid. The data was presently updated twice a day and envisaged to be updated more frequently after the commissioning of links with other Space Agencies under different Memorandua of Understanding.

IMD-WP-21 reported on ISRO establishment of a facility known as the Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC) to facilitate and promote the exchange of satellite data (various products, metadata and other information) to the research and academic users. It also has an objective to disseminate quality data products from ISRO Satellite missions for meteorology and oceanography on Near-Real-Time basis. Currently the MOSDAC access is through a web-based portal and provides KALPANA 1 images, 3ACCD images and MOSDAC metadata information.

KMA-WP-10 described KMA activities in developing blended sea surface temperature (SST) products. KMA/NIMR has produced GEO-LEO based sea surface temperature (SST) by using MTSAT-1R and NOAA satellites. The blended products provide improved spatial and temporal resolutions and reduce the gaps due to cloud coverage. NIMR retrieved high resolution multi-sensor SST composite map over East Asia considering different spatial and

time resolution as well as sensor characteristics. It is planned to apply the methodology for COMS within the international framework of GHRSST.

KMA-WP-11 reported on KMA/NIMR implemented real-time sea ice monitoring system using Aqua/AMSR-E sensor data. Small-scale surface roughness and refractive index are estimated from TB to determine the properties of sea ice and snow over the ice in the polar region. The methods for the small-scale surface roughness and refractive index were developed at KMA/NIMR in 2009 and the variation of surface roughness value can help estimating sea ice extent variation.

IMD-WP-26 presented space based ocean observations for meteorology. It was pointed out that the progress of any meteorological research or forecast heavily relies upon in-situ observations, particularly, over the data sparse oceans. Space based oceanographic observations have given a tremendous impetus to meteorological applications. Observations that are available from these sensors include sea surface temperature (SST), sea surface height anomaly (SSHA) and surface winds which are presently amenable to satellite sensors. Sensors operating at microwave frequencies can make measurements of the ocean surface day and night under nearly all weather conditions. The MIRAS satellite carried a SMOS sensor (Soil Moisture and Ocean Salinity) sensor which is also capable of measuring ocean salinity and soil moisture required for water cycle budget as the key parameters for meteorology.

In the discussion it was concluded that SSHA obtainable from satellite altimetry would be a better parameter than SST because cyclones interact primarily with the upper ocean (represented by SSHA) rather than with surface alone (represented by SST). The workshop on “utilisation of satellite derived ocean heat content for cyclone studies” conducted at ISRO, Hyderabad, concluded that altimeter derived ocean heat content improves cyclone predictions. The summary of this workshop is available at Eos, Vol. 91, No. 43, 26 October 2010.

Action 38.34: IOC to provide a paper on guidance to CGMS members to improve sea surface temperature measurements. All CGMS agencies are invited to report on ocean activities at next CGMS. Deadline: CGMS-39.

II/10 Other Parameters and Products

CMA-WP-12 provided a preliminary assessment of their efforts to monitor the Earth’s radiation budget. Global monitoring of the Earth radiation was one mission of FY-3 satellites to be carried out by two instruments: the Solar Irradiance Monitor (SIM) and the Earth Radiation Measurement (ERM). Two products include the solar constant, and the Earth reflected shortwave and emitted long-wave radiative flux at the top of the atmosphere. After a briefing

on the FY-3/ERM instrument, measurement, and intercomparisons with CERES the paper gave an example of usage to monitor the *El Niño* events.

Action 38.35: CMA is invited to provide more detailed intercomparisons of FY-3A ERB with CERES. Deadline: CGMS-39.

EUM-WP-26 responded to CGMS **Action 37.02**: "EUMETSAT and NOAA to inform CGMS about the cooperative scientific studies being carried out as part of the preparations for MTG and GOES-R," and to CGMS Recommendation 37.25: "On the basis of existing software for product retrievals, NOAA and EUMETSAT offer to other satellite operators existing prototype algorithm software for testing and further development." The interest and need for satellite products for nowcasting are high, it is therefore a field of very active research and development. In many application areas, the multi-spectral capabilities of Meteosat Second Generation (MSG) have significantly improved nowcasting products, thus paving the way to future geostationary missions with similar or even better spectral resolution. Nowcasting products can be either simple qualitative products like spectral composites (RGBs), dedicated to a certain phenomenon, or more advanced quantitative products like air mass analysis or the retrieval of cloud microphysical properties. Convection nowcasting is one of the most important nowcasting areas. International coordination and collaboration exists through the Convection Working Group, where again many new concepts for future geostationary missions are tested with MSG data. The Working Paper provided a short overview of all these activities. Taking a specific nowcasting application (convection) as an example, the Working Paper suggested further scientific cooperation on "Nowcasting Applications from Geostationary Satellites" among CGMS operators, where the existing Convection Working Group is an appropriate forum. Such cooperation is also useful with a view to develop consistent nowcasting products from future geostationary imagers (e.g. Himawari-8/-9, GOES-R ABI and MTG-FCI).

EUM-WP-32 reported on the first workshop on “MSG land surface applications: Drought & Fires,” held in Sofia, 7-12 September 2009. The organisation of the Workshop was initiated by the Bulgarian National Institute of Meteorology and Hydrology (NIMH) and supported by the Land Surface Analysis Satellite Application Facility (LSA SAF) recognising the need for strengthening the use of satellite data for land surface applications over the drought prone area of South Eastern Europe (SEE).

IMD-WP-06 discussed land-atmosphere interaction processes at regional, continental and global scales, which are extremely important in understanding impacts of climatic variability and climate change. Five core land products such as normalised difference vegetation index (NDVI), land surface temperature (LST), active fire, surface albedo and surface insolation have been targeted to derive from the suite of INSAT satellites. The status related to algorithm principles and validation results were highlighted for all five geophysical parameters. In addition, the methodology and results on

estimating evapotranspiration (ET) using these land products from a demonstrative study was mentioned.

IMD-WP-07 reported on the two satellite missions for weather and climate studies ISRO will be launching in. One of them is INSAT-3D which will ensure continuation of operational meteorological services in the country with enhanced capabilities from two advanced onboard meteorological payloads, viz., a 6-channel imager and a 19-channel sounder. The other satellite mission is a joint India-France (ISRO-CNES) mission called Megha-Tropiques (MT), which is designed to study the convective system, and their influence on tropical weather system and climate. The MT satellite payloads include a microwave radiometer called Microwave Analysis and Detection of Rain and Atmospheric Structures (MADRAS), a millimetre wave humidity profiler, SAPHIR, an optical-IR radiometer for radiation budget (ScaRAB) and an Integrated GPS Occultation Receiver (GPS-RO). The MT mission has been planned for a specific coverage of tropical region (within ±30° latitudes), enabling higher sampling frequency than the normal twice a day. The MT sensors are planned to complement the existing/or about to be available observations from geostationary satellites and other polar orbiting satellites by national and international space agencies. Detailed validation activities were planned to be undertaken during pre-launch and post-launch periods. These include the careful selection of observations needed, instruments to be used, selection of validation sites, and the approach for validation. The geophysical parameters from INSAT-3D imager include the Atmospheric Motion Vectors (AMV), Outgoing Longwave Radiation (OLR), Upper Troposphere Humidity (UTH), Rain, Sea Surface Temperature (SST), Fire, Snow, Fog, etc. Similarly, the INSAT sounder will provide the vertical profiles of temperature and humidity, and total ozone content. The INSAT data products will be available at about 10 km spatial resolution. On the other hand, the MT retrieved parameters (data products) are integrated water vapour, humidity and temperature profiles, cloud liquid water content, wind speed, precipitation, and short and long wave radiations. The validation of the parameters from these two satellite missions will include intense observation periods (IOPs) to collect in-situ and other ancillary data. The results of validation will be useful for the fine-tuning of the retrieval algorithms, and for providing accuracy of the parameters for various applications. Since a number of international satellites would also be providing some of these parameters, an inter-satellite comparison would be conducted to provide results on performance of MT and INSAT vis-à-vis other sensors.

KMA-WP-08 reported on plans for Communication, Ocean, and Meteorological Satellite (COMS) products services. Currently, KMA carried out functional test of COMS Meteorological Data Processing System (CMDPS). CMDPS can produce 16 meteorological parameters from COMS raw data for various applications such as nowcasting, numerical weather prediction model, climate monitoring, etc. It is planned that COMS meteorological products will be distributed sequentially in 2011 after the validation procedure through the CMDPS performance tests.

KMA-WP-09 reported on the current status of weather forecast support for nowcasting and very short range forecast. KMA improved the satellite image analysis technique through introduction of new advanced skills (from the EUMETSAT NWC SAF).

IMD-WP-24 reported on activities for better prediction of tropical cyclone (TC) characterisation. Satellite based observations have opened up new research areas for improved forecasting of intensity and track of TC. Some of the emerging research areas are:

1. The 'warm core approach' using the advanced microwave sounder unit (AMSU) data to analyse warm temperature anomalies in the upper troposphere and correlate to central pressure fall and maximum winds;

2. The objective Dvorak technique (ODT) for intense cyclones and Advanced Objective Dvorak technique (AODT) for weak systems;

3. Storm surge prediction using satellite derived radius of maximum winds, intensity, direction and speed of cyclones;

4. Use of satellite data for synthetic vortex generation in numerical models; and

5. Assimilation of satellite data.

Recent results have shown discrepancies in TC intensity with similar products derived by NOAA.

Action 38.36: NOAA and IMD to better understand differences in TC intensity estimations and to inform CGMS members on the outcome. Report at CGMS-39. Deadline: CGMS-39.

IMD-WP-25 reported on efforts to expand IMD's Numerical Weather Prediction (NWP) activities to meet the growing operational demands of multi-scale forecasts ranging from nowcasting to medium range and extended range. With the commissioning of High Performance Computing System (HPCS IBM P6), IMD has implemented the National Centre for Environmental (NCEP), USA-based Global Forecast System (GFS) with Grid Statistical Interpolation (GSI) as the global data assimilation for the forecast up to 7 days. Using the initial and boundary condition of GFS, WRF (ARW) with 3DVAR the data assimilation scheme is made operational at the resolution of 27 km and 9 km resolutions for two domains applying a two-way nesting technique. Applying a nest down technique, WRF at 3 km resolution had been implemented to generate location specific forecasts over Delhi and its neighbourhood. Forecast products were available on the IMD website (www.imd.gov.in).

NOAA-WP-32 responded to **Action 37.34:** "On the basis of existing scientific prototype software for GOES-R, NOAA to report on the availability of software

to other satellite operators with similar planned geostationary instruments." NOAA had always advocated science collaboration and open and access information, including algorithms and software. However, the availability of such software is contingent to the bilateral agreement between NOAA and the interested agency and the completion of a license agreement which specifies that the use of the software is restricted to the interested agency with no distribution to any other interested party.

NOAA-WP-33 provided an update report on the NOAA Products Validation System (NPROVS) and responds to **Recommendation 37.27**: "NOAA is encouraged to include GRUAN radiosondes into NPROVS and to provide regular performance statistics of satellite products with GRUAN." NPROVS provides NOAA STAR with a centralised validation protocol for the routine monitoring and inter-comparing derived atmospheric weather products from polar orbiting and GOES environmental satellites. This was primarily achieved through the compilation and analysis of collocated radiosonde, NWP and independently processed satellite product systems. Currently 19 operational and experimental products systems were included. NPROVS compiles collocations on a daily basis with all collocations routinely archived at STAR. As described, NPROVS includes a variety of analytical interface and sampling options (EDGE) including satellite and Raob QC, space and time windows, terrain designation, individual and common denominator sampling, radiosonde instrument type selection, regional (i.e. GOE Conus) designation and more. Analysis on real-time weather (daily, weekly) and climate scales (monthly, seasonal, annual) are facilitated. Plans for expanded access and validation against GCOS Reference Upper Air Network (GRUAN) reference radiosonde and selected ground observations were also outlined in the Working Paper.

II/11 Conclusion and Preparation of WG Report

The Chairperson thanked all participants for concise discussions and for adhering to the allocated time. WG II returned the thanks to Professor Vasily Asmus for the excellent Chairmanship keeping the Working Group on schedule.

WG II covered a vast range of activities, notably discussing reports from all four CGMS sub-groups which met in 2010. WG II noted with pleasure the progress and enthusiasm that had been conveyed by the detailed scientific and technical reports from the four working groups. It thanked the co-chairs of the four working groups for their dedication and conscientious leadership. WG II was also very pleased about the very informative papers from IMD and ISRO.

As a final activity WG II reviewed the actions from CGMS-37. It was noted that **Actions 37.28** (on ESA) and **37.20** (on GSICS participants) remained open and needed to be followed up at CGMS-39.

WORKING GROUP III: CONTINGENCY PLANNING

III/0 Introduction

Working Group III on Contingency Planning was convened on Monday 8 November 2010 at 16:00. The meeting was chaired by Ms Suzanne Hilding (NOAA), replacing Mr Gary Davis whose longstanding engagement for CGMS and for this WG in particular is well known, but who had been unable to come to this session. The meeting was attended by participants from Environment Canada (Observer), EUMETSAT, IMD, ISRO, JMA, KMA, NASA, NOAA, ROSHYDROMET and WMO (see the list of participants in Annex), Mr Jérôme Lafeuille from WMO served as Rapporteur.

The Chairperson recalled that the main scope of the WG to provide a high-level overview of the status of CGMS satellite programmes and related continuity issues, with the aim to highlight possible risk areas that would require contingency action, and if relevant, to discuss the planning of such contingency actions. She highlighted that, since CGMS-36, it has been agreed that the discussion in this WG should not be limited to the continuity of weather monitoring missions in geostationary or low Earth orbit, but should encompass as well the additional missions conducted or planned by CGMS members for climate or environment monitoring. Since these additional missions were not yet part of the CGMS agreed baseline, the Chaiperson proposed, and it was agreed, to address the agenda items in the following order:

1. Review of actions from previous meetings;

2. Continuity and contingency matters for geostationary satellite missions, with reference to the current baseline;

3. Continuity and contingency matters for low Earth orbit satellite missions, with reference to the current baseline;

4. Possible revision of the CGMS baseline to include additional missions contributing to climate monitoring, along the WMO Vision of the GOS to 2025;

5. Continuity of operational oceanographic missions and other missions contributing to climate monitoring; and

6. Summary of actions and recommendations.

III/1 Review of Actions from the Previous Meeting

The Working Group recalled **Action 36.24** that had been confirmed at CGMS-37:

Action 36.24: WMO to convene a contingency planning workshop [in the second half of 2009] in order to investigate critical missions and associated potential contingency actions regarding the new missions implied by the Vision for the GOS in 2025. New deadline: 30 June 2010.

This action was focussing on climate monitoring missions, since the criteria for contingency situation on these climate missions have not yet been defined, noting that the continuity requirements for climate records may differ from the operational weather forecasting continuity requirements, with differences in spatial and temporal scales. This was discussed in April 2010 by the WMO Expert-Team on Satellite Systems (ET-SAT) who considered that a prerequisite for developing a contingency planning approach for climate missions was to have a detailed understanding of the continuity requirements of climate monitoring missions, of the risk and potential impact of gaps, which would allow recommending some architecture guidelines to mitigate such risk of gaps. Action was thus taken by WMO to prepare in collaboration with GCOS a Workshop on Continuity and Architecture Requirements for Climate Monitoring, which is the subject of WMO-WP-13. The workshop will be held on 13 and 14 January 2011 in Geneva. The expected outcome of this workshop will inform the definition of the space-based architecture for climate monitoring (see WMO-WP-09) and should contribute to further revision of the baseline for the space-based GOS (see WMO-WP-03). The WG recommended to close **Action 36.24** and proposed a new action:

Action 38.37: WMO to report on the outcome of the Workshop on Continuity and Architecture Requirements for Climate Monitoring, at CGMS-39 . Deadline: CGMS-39.

The Working Group then reviewed the response given to recommendations included in the report of its previous meeting.

NOAA had been encouraged “to consider a replacement for GOES-10 at 60°W, until the full GOES-R, S configuration allows frequent coverage of both North and South America”.

In May 2010, NOAA made GOES-12 available at 60°W to resume the 15 minute coverage of South America in replacement of GOES-10. This fully responds to the recommendation. WMO thanked NOAA on behalf of the South American user community.

The WG had also stated that “if Elektro-L1 was delayed, extension of the EUMETSAT IODC mission would be particularly critical”.

EUMETSAT confirmed that in December 2009, decision was made to extend the IODC mission until the end of 2013, and that the situation will be reassessed by the EUMETSAT Council at the end of 2011. This support from EUMETSAT was also very much appreciated.

CGMS Members were "highly encouraged to cooperate" on an initiative to establish a radio-occultation sounder constellation.

In this regard, the WG was informed that an International Radio-occultation Working Group (IROWG) had been established following CGMS-37, as reported in NOAA-WP-15. The IROWG has recommended that CGMS coordinates efforts between operational data providers and NWP agencies to establish long term continuity plans. Several new initiatives were noted: KMA-WP-12 reported on Korea's plan to fly a radio-occultation mission as part of KOMPSAT-5 programme developed in collaboration among KARI and KASI; NOAA-WP-11 reported on NOAA's plans regarding a COSMIC-follow-on ROS constellation by 2014.

The Chairperson underlined that all actions and recommendations from the previous meeting had been addressed.

III/2 Continuity and Contingency Matters for Geostationary Satellite Missions

(with reference to the currently agreed baseline)

WMO referred to WMO-WP-18 in which the current geostationary configuration is compared with the CGMS baseline, as decsribed below.

Table 1: Status of the operational geostationary constellation in November 2010.

	BASELINE		ACTUAL (November 2010)		
AREA	Operators	Nominal Location	Operators	Location	Spacecraft
Americas & East Pacific	USA USA	135° W 75° W	USA USA	135° W 75° W 60°W	GOES-11 GOES-13 GOES-12
Europe & Africa	EUMETSAT	0°	EUMETSAT	0° 9.5°E	Meteosat-9 Meteosat-8 (rapid scan)
Indian Ocean Asia & West Pacific	Russian Fed. China Japan	76° E 105° E 140° E	EUMETSAT India China India China Korea Japan	57.5° 74° 86.5°E 93.5°E 123°E 128° E 145°E/140°E	Meteosat-7 Kalpana FY-2D INSAT-3A FY-2E COMS-1 (commissioning) MTSAT-2/MTSAT-1R

WMO noted that the actual configuration was different from the agreed baseline, although basically satisfying the requirements (at least six evenly space geostationary satellites providing 15/30 mn multispectral imagery, IR sounding (currently only on GOES), DCP support and data dissemination). KMA was congratulated for the successful launch of COMS-1 in June 2010.

WMO underlined that over the Pacific the interval between two adjacent satellites is 85°. Meanwhile, over Asia, thanks to the successful implementation and operation of geostationary satellites by China, EUMETSAT, India, Japan and Korea, there are seven satellites for a similar interval of 85°. This had led the WMO Expert Team on Satellite Utilization and Products in March 2010 to recommend "that WMO further encourage satellite operators and CGMS to optimize the global coverage when making decisions about satellite locations, for instance to increase the overlap of satellite footprints over the central Pacific for a better coverage of the North and South Pacific".

The WG took note of this comment for future programmes. It was acknowledged that geostationary satellites were responding to national requirements in addition to contributing to the global observing system. The WG however considered that the additional observation capacity over Asia increased the robustness of the constellation and may offer flexibility in the future for possible back-up arrangements if need arises, as had been the case with American and European satellites in the past. It was also noted that satellite systems could complement each other in carrying diversified payloads that would serve different missions (e.g. ocean colour and aerosol monitoring in the case of COMS and COMS follow-on). The following recommendation was agreed:

Recommendation 38.17: Once their operational requirements are fully satisfied, CGMS Satellite Operators should consider redeployment towards less covered areas if need arises, taking advantage of available in-orbit capacity in geostationary orbit.

For the medium-term, the attention of the WG was raised to the forthcoming transition to new generations of geostationary satellites in the 2015-2017 time frame with Himawari-8, FY-4A, GOES-R, MTG-I1, and to the need to plan user preparedness activities to avoid any disruption. NOAA reported on the special information provided on GOES-R preparation at the GOES Users' Conference (Madison, 1-5 November 2009) and the GOES Direct Readout Conference (Miami, 4-8 April 2011). JMA recalled the first Asia-Oceania Meteorological Satellite Users' Conference held in Beijing, China the preceding week. The participants in the conference felt that similar conferences should be held in the region on a routine basis and welcomed the idea of co-sponsorship of CMA, JMA and KMA. The co-sponsors also agreed that JMA would host the second conference in Japan.

Action 38.38: CGMS satellite operators to report at CGMS-39 on their user-preparation activities for the next generation geostationary satellite series. Deadline: CGMS-39.

III/3 Continuity and Contingency Matters for Polar-Orbiting Satellite Missions

(with reference to the currently agreed baseline)

NOAA-WP-35 NOAA provided updates on the POES and Joint Polar-orbiting Satellite System (JPSS), formerly NPOESS, data formats and frequencies. This table contains the latest information on the current and planned operations of the NOAA polar constellations.

WG III discussed the status of core operational missions (multispectral VIS/IR imagery, IR hyperspectral sounding, microwave sounding) with reference to the three nominal categories of orbital planes (Morning, afternoon, early morning orbits) as summarised below.

Table 2: Status of the meteorological polar-orbit constellation in November 2010.

Orbit type (per ECT range)	**Satellite series**	**ECT** (ascending)	**Satellite Operator**	**Comments**
Morning (07:00-12:00/ 19:00-24:00)	Metop-A,B,C	21:30	EUMETSAT	
	FY-3 A, C, E	20:00-22:30	CMA	IR hyperspectral as of FY-3 E
	Meteor-M 1, 2	21:30	Roshydromet	New generation, M1 partly functional
Afternoon (12:00-17:00/ 00:00-05:00)	NPP, JPSS-1,2	13:30	NOAA	New generation
	FY-3B, D, F	14:00	CMA	IR hyperspectral as of FY-3D
Early morning (05:00-07:00/ 17:00-19:00)	DMSP DWSS-1,2	17:30	USA DOD	Timely availability to be confirmed

Referring again to WMO-WP-18, WMO noted that the polar-orbit constellation was in accordance with the baseline (two spacecrafts on a morning orbit, two on an afternoon orbit, ensuring multispectral VIS/IR imagery, IR and MW sounding, data collection and dissemination). It underlined however that after NOAA-19 the afternoon orbit will entirely rely on new generation satellites that are not yet in operational series, and for which data accessibility by all WMO Members has not been fully established (FY-3B, FY-3D, NPP, JPSS-1).
Unlike NOAA-19, METOP, FY-3A, and Meteor-M, NPP will have no L-band LRPT or HRPT service but will transmit High Resolution Data (HRD) in X-Band.

In addition, it is expected that US defence satellites will continue to be available on the early morning orbit with no open direct broadcast but a planned

redistribution of sensor data via NOAA's common ground system for early morning and afternoon US spacecraft.

Discussions held by CBS Expert Teams and the International TOVS Working Group (ITWG) had revealed strong interest for the utilisation of data from the new generation satellites launched by China (FY-3A) and Russian Federation (Meteor-M1). These groups had stressed the need for detailed and open information enabling access to Direct Readout and global data from these missions. Generally speaking, early information of the user community on every new generation system would enable a wide utilisation, provide the opportunity of greater feedback and maximise the benefit from its data.

In conclusion, WG III felt confident that the morning orbit would be covered by the current and planned missions. It highlighted a higher risk on the afternoon orbit for which the implementation of current plans and the availability of data should be carefully monitored by WG III in the coming years.

EUMETSAT confirmed that for METOP-B, to be launched early 2012, the AHRPT/LRPT Direct Readout service is planned to operate globally. The current geographical restrictions to AHRPT/LRPT operation are due to a technical outage on METOP-A and to the resulting need to reduce the exposure to critical space environment conditions. It was clarified that IASI Level 1 processing software was openly available as part of the AAPP package distributed by the EUMETSAT SAF on NWP, the availability of a Level 2 processing software for local use is to be discussed with the user community (ITWG).

Recommendation 38.18: CGMS Satellite Operators implementing new systems should provide the user community, as early as possible, with full technical details needed by users to get prepared to access and use these systems.

III/4 Proposed Revision of the CGMS Baseline for Satellite Missions

The Chairperson recalled that CGMS should agree on long-term commitments from satellite operators in order to ensure the required continuity of service not only for operational weather forecasting, but also for climate monitoring. She highlighted two factors that would justify reviewing and updating the current baseline:

1. Need to optimise the benefit from the overall in-orbit capacity;

2. Need to satisfy the needs and challenges of climate monitoring.

The Working Papers presented by EUMETSAT and WMO addressed these two aspects respectively.

In EUM-WP-41 EUMETSAT indicated that data from a large number of instruments flown on sun-synchronous polar platforms are currently used in numerical weather prediction, nowcasting and climate applications. In many cases the platforms are flown in similar orbital planes, which does not result in the best temporal sampling. In order to increase the impact of this data in the future, an optimised configuration of the relevant platforms would be desirable, in line with the Vision for the GOS in 2025. In order to demonstrate the benefit of such optimisation, EUMETSAT and ECMWF have investigated the impact of several polar satellite configurations and conducted, in particular, a study on "ATOVS Orbit Constellation Observation System Experiments" that was performed under a EUMETSAT fellowship at ECMWF. The study confirmed the positive impact of assimilating data from three sounders instead of two. Furthermore, it showed that this impact was larger for well distributed orbital planes (approx 13:30, 16:30 and 21:30 ECT for NOAA-19, NOAA-15 and METOP in the current study). This difference was mainly significant for limited area models that have a short cut-off, and for which the geographical coverage achieved by the satellites in the assimilation window is therefore limited.

The WG thanked EUMETSAT for this study, which supported a recommendation from the ITWG stating that "the constellation of at least three orbits (early morning, morning, and afternoon), each with full sounding capabilities (IR and MW), is maintained. The ITWG recommends coordination between agencies of the overpass times of operational satellites with sounding capability (IR and MW) to maximize coverage" (Recommendation 10 from ITSC-17). The CGMS WG III endorsed the following recommendation, which should be taken into account when revising the baseline for polar-orbiting satellites:

Recommendation 38.19: Orbital planes of operational sun-synchronous satellites with sounding capability (IR and MW) should be coordinated with a view to optimise the temporal distribution in order to maximise coverage.

The WG then discussed the proposal submitted by WMO in WMO-WP-03 to review and update the CGMS agreed baseline of satellite missions supporting the WMO Global Observing System.

WMO recalled that the "Vision for the GOS in 2025", which expands the Global Observing System (GOS) to serve the needs of climate monitoring, has been finalised and adopted by the WMO Executive Council in 2009. The Vision describes both the surface and space-based observing system, as well as cross-cutting aspects such as interoperability, intercalibration, and quality assurance. For the space-based component, the Vision calls for major enhancements of the traditional missions, as well as new missions that have been performed so far in an experimental mode and should be, in the future, regarded in an operational or sustained perspective. In the past few years, new satellite series have been launched, plans for future missions have been developed or redefined, and progress has been made towards the continuation of some R&D missions in a more operational mode. Some

features of the Vision for 2025 have been implemented already or are in a good track to be implemented, and it is expected that, by 2015, a very significant part of the way will have been covered towards its full implementation. WMO therefore proposed to take 2015 as an intermediate milestone for implementing the Vision for 2025, and that the baseline configuration of the space-based GOS be updated taking into account the capabilities that are achievable by 2015. This would help to capitalise the efforts already made towards the 2025 vision, to strengthen the status of these new missions, and to highlight the remaining gaps. A revised baseline to be agreed by CGMS-39 could be endorsed by CBS in 2012 and incorporated in an update of the relevant WMO Manuals and Guides. It would be taken as a new reference for CGMS contingency planning. Further updates would be considered in due time, with the aim to ensure by 2025 a full implementation of the Vision.

The WG III supported the view that intermediate milestones should be defined and the baseline updated on a regular basis. It would provide useful guidance for satellite mission and related financial planning. It would provide visibility on the plans of the CGMS community. The WG acknowledged that several operational programmes are expected to fly some of the new missions identified in the Vision for 2025. Furthermore, several R&D agencies are contributing or planning to contribute to the future system through sustained missions. For example, ISRO will provide land surface observation with the Resourcesat series and ocean surface scatterometry with Oceansat-2 and follow-on series; KARI/KASI will implement Radio-occultation receivers on the Kompsat series. Having these important developments in mind, the WG felt that the intermediate goal should remain ambitious while achievable. It reviewed the proposed updated baseline for geostationary satellites, sun-synchronous satellites deployed around three orbital planes, and other LEO missions on appropriate orbits, as contained in Annex 3.The WG however expressed the view that the atmospheric composition requirements were not sufficiently addressed in the proposed revision of the baseline and needed further investigation.

The following actions and recommendations were agreed.

Recommendation 38.20: The WG recommended to proceed with an update of the CGMS baseline for GEO, LEO and HEO satelllites in advance of CBS-XV in 2012, describing the target configuration for 2015.
Deadline: CGMS-39.

Action 38.39: WMO with the support of the relevant Expert Teams, to prepare an update of the baseline for the space-based component of the Global Observing System along the lines of Annex 3 to the report of CGMS-38 WG III, and circulate to CGMS Members in advance of CGMS-39. Deadline: CGMS-39.

Action 38.40: WMO in collaboration with the atmospheric composition community and satellite experts to further refine the requirements for atmospheric composition requirements and the optimal way to address these in the revised baseline. Deadline: CGMS-39.

Action 38.41: CGMS Satellite Operators to confirm their commitments to contribute to the updated baseline for the space-based component of the Global Observing System. Deadline: CGMS-39.

Action 38.42: WMO to take into account the revised CGMS baseline for the space-based component of the GOS in the updating process of relevant WMO Manuals and Guides, with a view of its endorsement by CBS-XV in 2012. Deadline: CGMS-39.

Recommendation 38.21: CGMS to keep under review the baseline for GEO, LEO and HEO satellites for 2015 with the aim to ensure, by 2025, a full implementation of the WMO Vision for the GOS in 2025.

The meeting also recalled the importance of operational pathfinders and demonstrators, although not specified in the baseline.

III/5 Continuity of Operational Oceanographic Satellite Missions and the Missions Supporting Climate Monitoring

WMO introduced WMO-WP-04 containing a draft mapping of the existing "Gap Analysis of GOS satellite programmes" to the GCOS Essential Climate Variables (ECVs) as defined in the framework of the "Implementation Plan for the Global Climate Observing System in support of the United Nations Framework Convention on Climate Change (UNFCCC)- "(GCOS IP). This analysis was performed upon request of the WMO Expert Team on Satellite Systems (ET-SAT) with a view to inform the "Workshop on Continuity and Architecture Requirements for Climate Monitoring" being planned for mid-January 2011 (see CGMS-38 WMO-WP-13). It should allow the workshop, in particular, to rapidly identify the variables for which continuity issues may be the most critical in the coming years, and to focus the variables on the analysis of continuity requirements and architecture implications.

Many of the ECVs involve in fact the observation of several elementary geophysical variables either by ground systems, or from space. This preliminary study, being conducted within the WMO Space Programme, focuses on the possible contribution of satellites. The starting point is to split each ECV into a set of observations of elementary variables, and identify those that can be provided by satellites. Thereafter, the gap analysis is applied to these satellite observations. The study heavily relies on the GOS Dossier. For current and future activities (2008-2025) the gap analysis is rather detailed, extracted from Vol. III of the Dossier (Gap Analysis). For past periods, the information is based on the historical parts of Vol. I (Programmes). The availability of historical records varies with observations. Considering the overall status of information

available, it was decided to start the analysis with the year 1975. Therefore, this gap analysis spreads over 50 years (1975-2025).

The preliminary outcome of the study suggests that 40 out of the 60 ECVs can be supported by satellite observation, to some extent. For many observations, data records exist since at least 1975, and there is a long-term commitment to continuity until at least 2025. The potential contribution of satellites to monitoring the ECVs is rather extensive, however, it has to be stressed that the contribution of observational data sets is only effective when the corresponding product has been retrieved and archived.

Systematic gaps appear:

- Discontinuation of limb sounding missions after the conclusion of the current ones, implies future gaps in data records for the middle and high stratosphere;

- Large measurement capabilities uneasy to accommodate on operational satellites.

The WG welcomed the proposed approach and thanked its author, Dr B. Bizzarri. It was agreed to review and provide comments. It was also suggested to compare the outcome of this study with the analysis being performed by the NASA Systems Engineering Office in the context of the support to the CEOS constellations.

Action 38.43: CGMS Members to review the Draft Mapping of the gap analysis with the GCOS ECVs, and provide comments to WMO (Dr Bizzarro Bizzarri, bibizzar (at) tin.it) to be considered for a revised version to be submitted to the "Workshop on Continuity and Architecture Requirements for Climate Monitoring" on 13-14 January 2011. Deadline: 15 December 2010.

III/6 Conclusion and Preparation of WG Report

The actions and recommendations were summarised.

The Chairperson thanked the participants for their contribution and the meeting was closed at 10:12 on Tuesday 9 November 2010.

WORKING GROUP III: CONTINGENCY PLANNING

ANNEX 1: Elements for updating the CGMS baseline

Missions to be performed by operational GEO and LEO satellites

(Draft elements for updating the Manual on the GOS, Part IV)

At least six geostationary satellites shall be operated at evenly distributed locations with in-orbit redundancy, and perform the following missions:

1. Visible and infrared imagery over the full disc at least every 15 minutes;
2. Infrared sounding (hyperspectral on some locations);
3. Lightning detection;
4. Data collection; and
5. Other missions as appropriate, e.g. Earth Radiation Budget monitoring, high spectral resolution UV sounding, Space environment monitoring, Solar activity monitoring, Data Dissemination.

All passive instruments should be inter-calibrated on a routine basis against reference instruments or calibration sites.

Operational sun-synchronous satellites shall be deployed around three orbital planes in mid-morning (“am”, nominally 21:30 ascending ECT), afternoon (“pm”, nominally 13:30 ascending ECT) and early morning (nominally 17:30 ascending ECT) and, as a constellation, should be optimized to perform the following missions:

1. Visible and infrared imagery;
2. Microwave imagery;
3. Microwave sounding;
4. Infrared hyperspectral sounding (at least am and pm);
5. Wind scatterometry over sea surfaces;
6. Radio-occultation sounding (at least am and pm, supplemented by a constellation in specific orbits);
7. Broadband VIS/IR radiometer for Earth Radiation balance (at least am and pm);
8. Total Solar Irradiance (at least one spacecraft);
9. Space environment monitoring;
10. Data collection;
11. Direct Broadcast; and
12. Other missions as appropriate, e.g. atmospheric composition.

The following missions shall be performed on an operational basis by Low Earth Orbit satellites on appropriate orbits:

1. Ocean surface topography by radar altimetry (A reference mission on high-precision, inclined orbit, and two instruments on sun-synchronous orbit am and pm);
2. Radio-Occultation sounding (constellation of sensors on appropriate orbits);
3. Narrow-band Vis/NIR imagers (at least one sun-synchronous, am spacecraft) for ocean colour, vegetation and aerosol monitoring;
4. High-resolution multi-spectral Vis/IR imagers (constellation of sun-synchronous satellites, preferably in am); and
5. Infrared imagery for high-accuracy SST (one am spacecraft).

All passive instruments should be inter-calibrated on a routine basis against reference instruments or calibration sites.

All passive instruments should be inter-calibrated on a routine basis against reference instruments or calibration sites.

WORKING GROUP IV: GLOBAL DATA DISSEMINATION

IV/0 Introduction

As agreed at CGMS-36, Dr Mikael Rattenborg from EUMETSAT was elected Chairperson of Working Group IV (WG IV) on global data dissemination, with Mr Gordon Bridge, also from EUMETSAT, appointed as Rapporteur. WG IV comprised representatives of the following satellite operators: EUMETSAT, KMA, NOAA, and WMO.

IV/1 Review of Actions from the Previous Meeting

WG IV first reviewed the list of Actions from the Previous Meetings:

Action 36.27: CGMS Task Force on Satellite Data Codes to propose a permanent framework for the activity by CGMS-37. Deadline: CGMS-37. **Status: the Action is closed** with WMO-WP-05 report and discussion at this meeting.

Action 37.36: NOAA is invited to develop a simplified current GOES/GOES-R user data access scheme, for use especially during the period of transition from the current GOES system to the operational GOES-R and S system. Deadline: CGMS-38.

Status: the Action is closed with NOAA-WP-37 report and discussion at CGMS-38.

Action 37.37: All CGMS satellite operators to regularly include user statistics in their reports on current satellite systems. Deadline: CGMS-38. EUM-WP-03/04 refers, other inputs awaited.

Status: the Action is closed, has become a Permanent Action 06.

Action 37.38: CMA to inform CGMS about its upgraded FENGYUNCast service. Deadline: CGMS-38.

Status: the Action is closed with CMA-WP-15 report to CGMS-38.

Action 37.39: NOAA to report on its plans for the full integration of GEONETCast Americas into the global GEONETCast system and service all GEO Societal Benefit Areas. Deadline: CGMS-38.

Status: the Action is closed with NOAA-WP-39 report and discussion at CGMS-38.

Action 37.40: CGMS satellite operators to consider using the layout of the table of satellite data requirements for South and Central America presented in document ET-SUP-RED-1/Doc. 6.2, (24.IX.2009) as a template for the

collection of user requirements in other WMO Regions. Deadline: CGMS-38. NOAA-WP-42 refers. Other inputs are awaited.

Status: the Action is closed.

Action 37.41: WMO to consider including Metop-IASI data within the RARS. Deadline: CGMS-38.

Status: the Action is closed with WMO-WP-05 report and discussion at CGMS-38.

Action 37.42: The Chairman of the Task Force on Satellite Data Codes should write to the CGMS Secretariat explaining the rationale behind the WMO-requested actions and provide full supporting documentation to allow CGMS to formulate possible further actions on Members concerning the categorisation of their products. Deadline: 30 April 2010.

Status: the Action is closed with WMO-WP-07 and discussion at CGMS-38.

KMA-WP-13 recalled that COMS was successfully launched on 26 June 2010 from Kourou, in French Guyana, with an Ariane 5 rocket. The COMS In-Orbit-Test (IOT) started on 10 July 2010. The first COMS visible image was received on 12 July and IR images were received on 11 August 2010. Major parts of the radiometric correction are completed and are now in the phase of optimisation in readiness for the switch-over to normal operations. The Image Navigation and Registration subsystem is being tuned. All tests of Satellite Ground Control System (SGCS) at the Satellite Operations Centre at KARI were successfully finished and the switch-over to backup SGCS at NMSC will be tested at the end of this year. L/HRIT generation and dissemination system tests started at the beginning of September 2010. Interface and functional tests for direct broadcasting to user stations were successfully completed.

COMS IOT will be completed by January 2011 and COMS meteorological data are expected to be provided to users in the first quarter of 2011.

KMA-WP-15 informed CGMS that NMSC/KMA are trying to provide help to developing countries to promote the utilisation of COMS data by using Korea's official development assistance (ODA). In October 2010, the Government of the Republic of Korea announced the "Development of COMS data receiving/analysis system in Sri Lanka" as part of the East Asia Climate Partnership. The project will be technically supported by NMSC/KMA and carried out by Korea's grant aid organisation, Korea International Cooperation Agency (KOICA). The project aims to assist in building Sri Lanka's meteorological monitoring and forecast infrastructure, enhance workforce capacity in the related fields minimising the damage caused by weather related natural disasters. The project will develop a COMS data receiving/analysis system tailored to Sri Lanka's needs and the project will be implemented in the Department of Meteorology in Colombo, Sri Lanka.

KOICA shall provide assistance as a grant of US$2,000,000 for the project to implement the following activities of the project:

- Develop and install COMS data receiving/analysis system that consists of COMS data acquisition system, processing system, analysis system, service system and archiving system ;

- Dispatch Korean experts to Sri Lanka to provide necessary technical and administrative training; and

- Invite Sri Lankan officials and specialists to Korea to provide them with knowledge and skills necessary for the project.

NMSC/KMA will also provide technical support for the system development and training.

NOAA-WP-37 provided a status of its Geostationary Operational Environmental Satellite Series R (GOES-R). The first of the GOES-R series of satellites is scheduled for launch in 2015. The GOES-R sensors are making great progress in their development. The ABI Prototype model is in its final stages of environmental testing and the other sensors have completed their Critical Design Reviews (CDRs). Also, the Ground Segment continues to develop well having completed the System Requirements Review and is now working towards Preliminary Design. The Ground Segment also awarded a contract to Harris Corporation for the development of a new Antenna System for GOES-R. The Government Algorithm Development team has also made enormous progress having recently delivered 100% of ATBDs and 80% of option 2 ATBDs. Lastly, the GOES-R Proving Ground activities continue to show progress towards ensuring GOES-R readiness.

NOAA-WP-36 provided an overview of the planned GOES-R Access Sub-System (GAS). The GAS architecture is still being defined, the intent is to take advantage of standard formats and technologies. GAS consists of user terrestrial access points. It is responsible for receiving and storing GOES-R data and products in a 7-day temporary storage. The system provides real-time distribution of GOES-R Level-2+ products and making them available to authorized users. The GAS facility will be an integral part of the GOES-R ground system and will provide both push and pull product delivery to support product subscriptions as well as ad-hoc product queries. The baseline GAS will support 1000 simultaneously connected users, 200 simultaneous subscription requests, 100 simultaneous ad-hoc requests, and provide an initial continuous data delivery capability of 500 Mbps. GAS will be developed and integrated as a part of an enterprise NESDIS Data Processing and Distribution operational capability; i.e. as a part of the NESDIS Environmental Satellite Processing Center (ESPC).

On the subject of user transition to GOES-R data, the following action was agreed.

Action 38.44: NOAA to provide a report to CGMS on its planning for the transition of users from the current GOES system to GOES-R. Deadline: CGMS 39.

NOAA recalled that the GOES Direct Readout Conference, to be held in Miami, 4-8 April 2011 will provide valuable user feedback on current planning for this transition.

IV/2 Direct Readout and Direct Dissemination

EUM-WP-34 reported on the staus of Meteosat Third Generation (MTG) Data Dissemination. EUMETSAT is operating a multi-mission dissemination system consisting of EUMETCast, RMDCN and Internet. The baseline for MTG is to use this multi-mission dissemination system to provide data to the end users in Near-Real-Time.

The Working Paper also provided CGMS with more detail on the planned evolution of the EUMETSAT multi-mission dissemination system to accommodate the high data volume demand of MTG. The upgrade of EUMETCast Europe to the DVB-S2 standard will provide the flexibility to add the MTG Near-Real-Time data in a cost efficient way to the satellite dissemination. This will make MTG data available to all users in the EUMETCast Europe footprint. A subset of these products will be available to users in the EUMETCast Africa footprint. RMDCN is still the appropriate network for operational dissemination of WMO coordinated data for global exchange. EUMETSAT's dissemination system will continue to be able to use a variety of dissemination means and be flexible to adapt to changing needs.

Action 38.45: EUMETSAT to provide CGMS with more detailed information and the schedule of implementation for the various MTG data dissemination schemes. Deadline: CGMS-39.

EUM-WP-35 reported on the status of EPS-Second Generation (SG), direct broadcast. The EPS Metop Direct Readout Service provides real-time transmission to local user stations of all instrument data in the Advanced High Resolution Picture Transmission (AHRPT) format, using the 1698 – 1710 MHz frequency band (L-band). For the transmission of all instrument data of EPS-SG to be deployed in the 2020 timeframe, the baseline is to use the 7750-7850/7900 MHz frequency band (X-band), due to the increased data rate and bandwidth limitation of the L-band. As an EPS-SG direct readout service in L-band would allow the transmission of only a subset of the instrument data, it is proposed with EPS-SG to provide exclusively the baseline service in X-band.

NOAA-WP-41 presented a summary of the direct readout plans for future NOAA environmental spacecraft. The transition of the NOAA direct readout services is taking place across several spacecraft constellations. This will encompass many years of development, coordination and implementation. In

2005, replacement of the analog Weather Facsimile (WEFAX) with the new digital LRIT started a transition period that will culminate with the implementation of the High Rate Information Transmission/Emergency Managers Weather Information Network (HRIT/EMWIN) service combined with the transition from today's GOES Variable (GVAR) retransmission format to the GOES Re-Broadcast (GRB) service on the GOES-R spacecraft constellation. NOAA's current direct broadcast services will change dramatically in data rate, data content, and frequency allocation, and driving changes to the field terminal configurations. The geostationary and polar-orbiting environmental satellite constellations will employ higher data rates, larger bandwidths, and new downlink frequency allocations. Environmental data users must employ new field terminal receivers unique to each particular broadcast service.

Recalling the proposed EPS-SG transition to the use of X-band, and the uncertain implementation of L-band on JPSS-1 the Chairman commented that at the present time this change could seem incompatible with other future satellite systems making up the CGMS global polar meteorological satellites constellation in that time frame. WMO added that, from the user viewpoint, there is a request for standardisation of broadcast systems on these satellites and commonality of services should be sought by CGMS as the design of both the EPS-SG and JPSS systems had already started. The Chairman remarked that the responses from other CGMS satellite operators on this issue were also very important.

Recognising the critical importance of the direct readout services from the polar orbiting meteorological satellites, as reaffirmed by the ITWG at ITSC-17, Monterey, 2010, and recalling that the adoption of CGMS standards had been a notable and successful achievement of CGMS, the following Permanent Action was agreed:

Permanent Action 05: CGMS to develop a coordinated approach for direct broadcast services of future polar orbiting meteorological satellite systems.

On the basis of this recommendation:

Action 38.46: CGMS satellite operators to inform CGMS on progress towards the achievement of future broadcast services (physical layers, formats, etc.) in the timeframe of the EPS-SG and JPSS satellites. Deadline: CGMS-39.

Action 38.47: NOAA and EUMETSAT to present a description of joint broadcast services for EPS-SG and JPSS. Deadline: CGMS-39.

IMD-WP-08 gave an insight of INSAT-3D Near-Real-Time Data Processing. The INSAT-3D Meteorological Satellite is planned to be launched in the first quarter of 2011. One of the ground segment systems is the data processing and Products Generation system. The Data Processing System will cater to

the requirements of a Near-Real-Time INSAT-3D Meteorological Data processing System (IMDPS) which includes data acquisition and quick look processing (DAQLS) of all data transmitted by the Imager and Sounder payloads of INSAT-3D (6 channels Imager : VIS,SWIR, MIR, WV, TIR1, TIR2; A Sounder with 19 Channels), VHRR (VIS, WV, TIR) and CCD (VIS, NIR, SWIR) payloads of INSAT-3A and VHRR payload of KALPANA-1 satellites.

The proposed system will acquire raw data from serial data streams, producing quality Data Products (DP) and generate various quantitative Geo-Physical products (GPR) from the processed data for operational utilisation by various users. The products thus produced are being operationally displayed for the current KALPANA-1, INSAT-3A missions by the indigenous designed Satellite Imagery Display System throughout the campus of IMD, Delhi, SAC-BOPAL, and Ahmedabad on a 24 x 7 basis for every half hour images processed. Additionally, the system is capable of processing, ingesting and analysing Automatic Weather Station (AWS) and Global Telecommunication System (GTS) data. A large number of meteorological parameters and application products are required to be derived from the raw data of satellite-sensors, AWS and GTS data as well as conventional meteorological data. Some of the application specific retrievals and validation exercise are necessary and being carried out in operational meteorology.

The deliverables will include Data acquisition quick display system, Data products generation, Parameter retrieval and image processing and Visualisation display system solutions, data visualisation comprising of both hardware and software systems for the Near-Real-Time Data Processing and dissemination of Meteorological Data Products on the WEB. Radiometric calibration, as part of data pre-processing, is carried out based on the extensive ground calibration data supported by ground and on-board calibration techniques, which tracks changes in the instrument response due to in-orbit thermo-mechanical environment, radiation effects and aging. The geometric correction, resampling is performed on the radiometric corrected pixel-data based on static and dynamic models of the instrument and satellite as well as orbit and attitude parameters available simultaneously with the imaging data and produces various levels of data products. A further precision/improved accuracy is necessary which requires in registering the image-pixels on fixed lat-long grids would be achieved through image navigation and registration algorithm in an automatic/interactive approach. The Data Products Software providing the capability for generation of Various levels of Data Products (LEVEL-0, LEVEL-1 , LEVEL-2 and LEVEL-3) on the user requested media and in the required formats HDF-5 and also in the generic binary format.

KMA-WP-16 briefed CGMS on the planned data dissemination methods of COMS data through direct broadcast. The dissemination is scheduled for start during the first half of 2011, upon successful completion of In-Orbit Tests.

KMA will directly broadcast the High Rate Information Transmission (HRIT) for Medium-scale Data Utilization Stations (MDUSs) and Low Rate

Information Transmission (LRIT) for Small-scale Data Utilization Stations (SDUSs). HRIT will be broadcast from COMS to user stations equipped with 3.7 meter antenna with 3 Mbps data rate. LRIT will be broadcast from COMS to user stations equipped with 1.2-Meter antenna with 256 kbps data rate. The HRIT/LRIT is free of charge; however user station needs to be registered with the National Meteorological Satellite Centre (NMSC) to receive the decryption key of the direct broadcasting data.

IV/3 DVB-Based Dissemination Services

CMA-WP-15 was presented by the CGMS Secretariat, on behalf of CMA, and was prepared in response to **Action 37.38**. The Working Paper informed CGMS that CMA started building CMACast in 2008, which is a multimedia dissemination system based on the second-generation Digital Video Broadcast (DVB-S2) technology with both file and multimedia transmission capability. It uses a 36 MHz C-band transponder of AsiaSat-4 and transmission capacity is increased to 70Mbps from the FENGYUNCast's 9Mpbs. CMACast shall have enhanced user management and improved interoperability with EUMETCast and GEONETCast Americas. CMA states that the CMACast will be operational by the end of 2010. All data broadcast services on FENGYUNCast will be consolidated into CMACast that it will replace FENGYUNCast as CMA's contribution to the GEONETCast.

NOAA commented that at the present time several of the Pacific Islands lay outside the footprint of current GEONETcast beams and CGMS should perhaps consider mechanisms to rectify this situation, such as imagery over the RMDCN. WMO commented that this gap in DVB-S broadcast coverage over The Pacific was being discussed by IGDDS and possible scenarios of collaboration between the USA, Australia and Japan were being explored.

IMD-WP-20, together with a Power Point presentation, presented a technical overview of the satellite based Indian Meteorological Data Casting System (IMETCAST). ISRO has established a facility known as Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC) to facilitate and promote the exchange of satellite data (various products, metadata and other information) to the research and academic users. It also has an objective to disseminate quality data products from ISRO Satellite missions for meteorology and Oceanography on Near-Real-Time basis. Currently the MOSDAC access is through a web-based portal and provides KALPANA 1 images, INSAT-3A CCD images and MOSDAC metadata information.

There is a need to provide the latest KALPANA 1 images and INSAT-3A CCD images to the researchers and to the general public. The researchers should be able to use the computer for viewing and further analysis on the data and the common man to view the latest images on his TV. The solution provided here will meet the needs of both the researchers and the common man. The solution is realised using Digital Video Broadcast via Satellite (DVB-S) based IP transmission and is titled Satellite based Indian Meteorological Data Casting system (IMETCAST). Using this System the researchers in general

and weather forecasters in particular will be able to get access to real time image files via their PCs which will immensely help their ongoing research and drastically increase the utilisation of the satellite images which at present is restricted to a group of organisations. Moreover, considering the widespread deployment of DVB-S based TV service and the percentage of population to which it is accessible, it has been decided to provide a hybrid platform in which the Met Data can be simultaneously be available to TV users also.

IV/4 Internet-Based Dissemination Services

EUM-WP-36 presented the status of the EUMETSAT Earth Observation Portal. EUMETSAT initiated the Earth Observation Portal to improve data access for users to EUMETSAT Earth Observation (EO) data and products. Through the use of industry standards (e.g. OGC, INSPIRE), it aims to provide partner agencies with interoperable access to EO data.

The collection discovery service (known as Product Navigator) is a EUMETSAT provided service for the discovery of EO Products and Data. This service is operational, since 2008. The EO Product search and ordering, including federated user management has been developed, but not integrated with ESA's HMA project. The integration of those services would allow partner agencies to perform a round trip from discovery, search and ordering using interoperable standards. The integration of the remaining services is expected at the beginning of 2011.

EUMETSAT is currently developing a pilot Web Map Service (WMS) to facilitate open access to visualise EUMETSAT data sets using GIS technologies.

The EUMETSAT Earth Observation Portal offers a harmonised user interface to facilitate the discovery and access to Earth Observation data. Through interoperable standards, it aims to provide inter-organisational access to these data.

EUM-WP-37 provided information on enhancements to the EUMETSAT user Notification Service. Providing the correct level of service notification to a diverse user community is a challenge. EUMETSAT hopes that through its planned enhancements these diverse user needs will be met.

EUMETSAT plans to centralise all service notification information through the use of a common message generation tool, which incorporates common templates and terminology and by developing central web applications to display service status information. The enhanced UNS incorporates the following modifications:

1. User Messaging System (UMS) – a new central tool for generating service messages (alert notifications and planned operational activities);

2. Web-based message archive to display current and historical service messages generated by the UMS;

3. Operational Service Status Indicator (OSSI) – an enhanced traffic-light indicator to show in near real-time the status of all the data and product services generated by the EUMETSAT Application Ground Segment.

Through the consolidation of user message generation and a central web display, EUMETSAT expects to maximise the benefits for the user community whilst streamlining the internal procedures and mechanisms used to generate and maintain multi-mission service news and notifications.

The above enhancements to the UNS are currently in development with close out expected by mid-2011.

JMA-WP-06 reported on the status of JMA's ADDE (Abstract Data Distribution Environment) server. JMA has operated a new service using an ADDE server to enable the provision of training environments using client viewer software since April 2010. JMA is currently considering the feasibility of integrating the ADDE service into a future JMA data distribution mechanism.

KMA-WP-17 reported on the planned data dissemination methods of COMS through the Internet. On 30 July 2009, KMA opened the website (https://nmsc.kma.go.kr/eng) of the National Meteorological Satellite Centre (NMSC) to provide not only the remote sensing imagery (and data) of the COMS Meteorological Imager (MI) but also the operations information and the calibration information of COMS MI, the remote sensing imagery of COMS Geostationary Ocean Color Imager (GOCI). KMA will also improve the website in the first quarter of 2011. The COMS data service via Internet, therefore, will be available during the second quarter of 2011. Detailed information will be posted on the website during January 2011.

In NOAA-WP-39 CGMS was presented with an overview of GEONETCast Americas. As a regional component, GEONETCast Americas serves North, Central, and South America and the Caribbean Basin. NOAA stated that the regional service is operating very well and took the opportunity to inform CGMS about its customers/providers, products and finally an outline of its future plans. NOAA acknowledged GEONETCast America customers are mostly providers at this point. The list of customers/providers consist of INPE (Brazil), IMN (Costa Rica), CONAE (Argentina), SERVIR (Panama), CATHALAC (Panama), Chile Meteorological Service (military) and NOAA's CREST programme. NOAA commented that Costa Rica is putting in a small network of three stations as part of its flood project while the Chilean meteorological service is buying a station this year. The NOAA CREST programme is providing two stations for Bowie State University in Maryland and the University of Puerto Rico. NOAA mentioned several other countries in Central America having revealed a sincere interest in GEONETCAST Americas during the CAFTA-DR seminars with CATHALAC and SERVIR. In

addition, NOAA informed WG IV that GEONETCast Americas has products from several providers.

NOAA added that whilst it would be continuing its direct read-out services which clearly did support the meteorological community, it considered that GEONETCast Americas should be more general in product content. If WMO and CGMS members considered that this remained an issue, then any concerns should be addressed to the GEONETCast Coordinator in NOAA, who was responsible for developing the GEONETCast Americas service. The Chairperson recalled that whilst the EUMETSAT Council had agreed the extension of the EUMETCast support to much of the region until end 2013, this was on the basis of a clearer picture of the use of such data in the region and the long term support to be provided by NOAA.

The Chairman, recalling that the Actions requested by CGMS-37 had been achieved, and noted that a GEONETCast user requirements workshop targeting central and South American users held 1-3 March 2010 had identified several new products required by that region. NOAA remarked that efforts were being made to increase the number of products available on GEONETCast Americas, accordingly. Responding to a query from WMO, on the compliance of the end-to-end GEONETCast-Americas with operational standards, EUMETSAT, as a member of the GEONETCast Implementation Team, reported that the GEONETCast System with its three key operators was now regarded as an operational system. Ease of access by users currently varied somewhat between the three operators but efforts were ongoing in the area of user consultation to coordinate and facilitate user access globally and to ensure that user consultation was taking place.

Action 38.48: CGMS satellite operators to inform CGMS on efforts to widen user access and to establish and respond to user requirements with GEONETCast. Deadline: CGMS-39.

WG IV also noted that NOAA-WP-42 on Considerations for using the layout of the table of satellite data requirements had been in response to CGMS **Action 37.40.**

IV/5 Global Data Exchange

EUM-WP-38 reported on its data centres, archives and long-term data preservation. The importance of historic data and products derived from meteorological satellites, e.g. for Climate Monitoring and for improvements of numerical weather prediction models, has many implications for the archives of the meteorological organisations regarding the easy access and the secure storage of data.

Easy access to the historic, archived meteorological satellite data, often in large amounts and across organisations, is necessary to fulfil the need of a growing number of users. Interoperability between partner organisations as

well as efficient, standardised discovery, search, ordering and delivery of the data can help to meet this demand. A stronger cooperation between partners might also provide some leverage to the exponential growth rates of archive ingestion and access.

Sharing global data-sets between Archives could e.g. improve data access and increase data redundancy, the latter aspect being of great importance in the long-term preservation of archive data. The historic data needs to be well preserved and maintained in order to provide and extend long Climate Data Records. It also stated that best practices need to be in place to ensure the availability and integrity of the archived data at an economic rate.

The following actions, proposed the above document, were agreed:

Action 38.49: CGMS members to report on their measures and plans regarding interoperability and standardised online data access for archived data-sets. Deadline: CGMS-39.

Action 38.50: CGMS members are invited to report on the current measures taken in their organisation for the long-term preservation of data and indicate if a future harmonised approach (e.g. common guidelines) would be helpful. Deadline: CGMS-39.

EUM-WP-39 reported on GEONETCast, which consists of a network of three dissemination systems - GEONETCast Americas operated by NOAA, FENGYUNCast operated by CMA and EUMETCast operated by EUMETSAT, has reached a nearly global coverage. The three GEONETCast Network Centres (GNC) operated by NOAA, CMA and EUMETSAT are interconnected with data exchange links for the exchange of GEONETCast relevant data. All three GNCs are disseminating their GEONETCast contributions in their respective footprints operationally. The next step is to include these data exchange contributions of the other GNCs into the respective regional dissemination. EUMETSAT is already disseminating these contributions from NOAA and CMA on all EUMETCast footprints covering Europe, Middle East, Africa and South and Central America.

The paper also presented in more detail the actual status of the GEONETCast system as regards the respective participating dissemination systems, data exchange and data services supported, with an outlook into the near term evolution. Additional focus is given to the actual status and intended evolution of the EUMETCast services, as a significant contributor to GEONETCast, by presenting the data services provided by EUMETCast dissemination and an overview of the GEONETCast Product Navigator which provides one-stop-shop access to GEONETCast data collection discovery.

Following a query from the Observer from Environment Canada (EC), EC commented that it had started to consider a turnaround system that could allow access to GEONETCast Americas data to the more northern Canadian regions outside the current footprint. The EC stated that if the need arises,

Environment Canada could use their satellites to re-broadcast GEONETCast data to the northern latitudes. Currently, the footprint of the broadband vendors do not cover northern Canada.

KMA-WP-14 summarised COMS operation plan and data service/exchange policy of NMSC.

NASA-WP-03 reported on NASA data availability. One of the primary objectives of NASA's Earth science programme is to develop a scientific understanding of Earth's interrelated systems and its response to natural and anthropogenic changes.

NASA's Earth Science Division (ESD) comprises a series of satellites, a science component and a data system called the Earth Observing System Data and Information System (EOSDIS). EOSDIS provides data processing, data archiving, and data distribution services for Earth science missions on a multi-mission operations framework. EOSDIS is a distributed system of many interconnected nodes (Science Investigator-led Processing Systems and distributed data centres) with specific responsibilities for production, archiving, and distribution of Earth science data products. Twelve data centres across the United States distribute many Earth system science data products, data information, services and tools unique to each centre's particular science discipline.

IV/6 Integrated Global Dissemination Service (IGDDS) Development

WMO-WP-05 reported on the Integrated Global Data Dissemination Service (IGDDS) and the Regional ATOVS Retransmission Services (RARS) initiatives. Significant progress was made both in IGDDS, in particular as the enhancement of DVD-S dissemination services and the formulation of data access requirements by some regional user communities are concerned. Also progress was made in RARS, with the increased coverage of the RARS network, the standardisation of RARS coding and file naming, and the preparation for advanced sounders.

Through their participation in IGDDS and RARS, CGMS satellite operators and WMO Members contribute to further the integration of satellite data and data management practices, for the benefit of the user community and in accordance with the goals of the WMO Integrated Global Observing Systems (WIGOS) and the WMO Information System (WIS).

Effort should be continued to develop an updated strategy for satellite data dissemination, to consolidate the regional data access requirement gathering process, to keep under review the coding issues, and to complete the RARS network for ATOVS data. Issues have been identified, that will require particular attention, including:

- Completing the global coverage of DVB-S dissemination services by filling some current gap over the Pacific;
- Ensuring compliance and recognition of satellite data providing centres as DCPCs;
- Possible standardization of X-Band dissemination services; and
- Development of a new RARS network for advanced sounders.

The Chairman recalled the active participation of many CGMS satellite operators in this scheme.

WMO-WP-06 provided an update on the status of the WMO Information System (WIS), which although a continuously evolving system, has reached the end of its development stage and is now going operational. The report includes some key areas of activities for meteorological satellite service providers to address to ensure the Integrated Global Data Distribution System (IGDDS) functions effectively as a core component of WIS for distributing satellite data and products. Being aware that WIS has moved from development to implementation, the following actions, proposed in the document, were agreed:

Action 38.51: CGMS Members to verify if they have been registered as a part of WIS, in particular as Data Collection or Production Centres (DCPCs) or National Centres (NCs). Deadline: CGMS-39.

Action 38.52: Candidate DCPCs or NCs to review the WIS specifications to ensure they are able to support the relevant WIS interfaces, including ensuring metadata describing their products and services is available in WMO format (ISO19115) for uploading to a Global Information System Centre (GISC). Deadline: CGMS-39.

IV/7 Coordination of Code Forms for Satellite Data

WMO-WP-07 provided an update on satellite data code forms. Amendments to the Manual on Codes (WMO No. 306), including those related to the satellite data and products, were implemented on 15 September 2010, and since CGMS-37.

The second meeting of the WMO/CBS Inter-Programme Expert Team on Data Representation and Codes (IPET-DRC) (31 August - 3 September 2010) recommended amendments to the Manual, including those related to satellite data and products, and based upon the work of the Task Force on Satellite Data Codes.

The Chairman recorded the appreciation by CGMS of the work achieved by the Task Force and the results would clearly facilitate the evolution of satellite data exchange in the years to come. CGMS encouraged the Task Force to continue its valuable work and agreed with its proposal, representing a slight change in its Terms of Reference, that it was not mandatory that it has a physical meeting at least once per year. This was because much of its

business was successfully carried out via email or web conferences. It was agreed that for the sake of completeness, nominations of suitably qualified persons from IMD and Korea should be invited to join the Task Force.

Action 38.53 IMD and KMA are invited to nominate experts to the WMO/CGMS Task Force on Satellite Data Codes. Deadline: 31 January 2011.

ANNEXES:

Annex 1

AGENDA OF THE CGMS-38
08-12 November 2010

- Plenary Session -

A. Introduction
A.1 Welcome
A.2 Election of Chairmen
A.3 Adoption of Schedule
A.4 Nomination of Drafting Committee
A.5 Review of Action Items from the Previous Meetings

B. Report on the Status of Current Satellite Systems
B.1 Polar Orbiting Meteorological Satellite Systems
B.2 Geostationary Meteorological Satellite Systems
B.3 Research and Development Satellite Systems
B.4 Other LEO Satellites
B.5 Spacecraft Anomalies from Solar and other Events

C. Report on Future Satellite Systems
C.1 Future Polar-Orbiting Meteorological Satellite Systems
C.2 Future Geostationary Meteorological Satellite Systems
C.3 Future Research and Development Satellite Systems
C.4 Future other LEO Satellites
C.5 Future HEO or Combinations of LEO and GEO Missions

D. Operational Continuity and Reliability
D.1 Global Planning, including Orbital Positions and Reconfiguration of the Space-based Component of the GOS
D.2 Inter-regional Contingency Measures
D.3 Long-term Global Contingency Planning

E. CGMS Response to WMO and other International Requirements
E.1 Support to WMO Meteorological Programmes and Projects
E.2 Support to GCOS and other Climate Monitoring Activities
E.3 Support to IOC, JCOMM and other Ocean Monitoring Activities
E.4 Support to GAW and other Atmospheric Chemistry Monitoring Activities
E.5 Support to Satellite Requirements of other International Programmes

F. Interaction with international partners
F.1 GEO
F.2 CEOS
F.3 Other International Partners

G. Working Group Reports

AGENDA OF THE CGMS-38

- Plenary Session continued -

H. Other Items of Interest

H.1 Training
H.2 Information
H.3 Any other business

I. Final Session

I.1 Nomination of CGMS Representatives at WMO, WMO STG, CEOS and other Meetings
I.2 Nomination of Chairmen and Rapporteurs of Working Groups for CGMS-39
I.3 Nomination of Rapporteurs of IPWG, IROWG, ITWG, IWWG
I.4 Summary List of Actions from CGMS-38
I.5 Data and place of next meeting

Annex 1

AGENDA OF THE CGMS-38

- Working Group Sessions -

WORKING GROUP I: TELECOMMUNICATIONS	
I/0	Introduction
I/1	Review of actions from the Previous Meeting
I/2	Coordination of Frequency Allocations: SFCG, ITU and WRC Activities
I/3	Telecommunication Techniques
I/3.1	Coordination of International Data Collection & Distribution
I/3.2	Status and Problems of IDCS
I/3.3	Ships, including ASAP
I/4	Dissemination of DCP messages (GTS or other means)
I/5	Future Use of IDCS
I/6	Search and Rescue (S&R)
I/7	Review of Actions, Conclusion and Preparation
WORKING GROUP II: SATELLITE PRODUCTS	
II/0	Introduction
II/1	Review of Actions from the Previous Meeting
II/2	Image Processing Techniques
II/3	Satellite Data Calibration and Validation
II/4	Infrared/MicroWave sounding and ITWG Matters
II/5	Precipitation and IPWG Matters
II/6	Atmospheric Motion Vectors and IWWG Matters
II/7	Radio Occultation and IROWG Matters
II/8	Cloud and Ash/Dust Related Matters
II/9	Ocean Parameters
II/10	Other Parameters and Products
II/11	Conclusion and Preparation of WG Report
WORKING GROUP III: CONTINGENCY PLANNING	
III/0	Introduction
III/1	Review of Actions from the Previous Meeting
III/2	Continuity and Contingency Matters for Geostationary Satellite Missions
III/3	Continuity and Contingency Matters for Polar-Orbiting Satellite Missions
III/4	Proposed Revision of the CGMS Baseline for Satellite Missions
III/5	Continuity of Operational Oceanographic Satellite Missions and other Missions Supporting Climate Monitoring
III/6	Conclusion and Preparation of WG Report
WORKING GROUP IV: GLOBAL DATA DISSEMINATION	
IV/0	Introduction
IV/1	Review of Actions from the Previous Meeting
IV/2	Direct Readout and Direct Dissemination
IV/3	DVB-based Dissemination Services
IV/4	Internet-based Services
IV/5	Global Data Exchange
IV/6	Integrated Global Dissemination Service (IGDDS) Development
IV/7	Coordination of Code Forms for Satellite Data

Annex 2

LIST OF WORKING PAPERS SUBMITTED TO CGMS-38

CMA

WP Number	Title	Agenda Item
CMA-WP-01	CMA Review of Action Items	A.5
CMA-WP-02	CMA Input to CGMS satellite tables	A.5
CMA-WP-03	Status of CMA Polar-orbiting Meteorological Satellite System	B.1
CMA-WP-04	Status of CMA Operational Geostationary Satellite System	B.2
CMA-WP-05	User Requirement and Plan for Future FY-3 Instrument Payloads	C.1
CMA-WP-06	Future FY-2 VISSR Improvement	C.2
CMA-WP-07	Asia / Oceania User Conference	H.2
CMA-WP-08	CMA utilization of the band 7750-7850/7900MHz	I/1
CMA-WP-09	Updated information on FY-4 Frequency Utilization	I/1
CMA-WP-10	CMA Update on GSICS Activities	II/3
CMA-WP-11	Evaluation of Dunhuang and Qinhai Lake for Calibration /Validation	II/3
CMA-WP-12	FY-3A Earth Radiation Budget Measurement and Use	II/ x
CMA-WP-13	Progress of FY-3A Data Assimilation	II/4
CMA-WP-14	Fengyun Operational Dust Storm Monitoring	II/8
CMA-WP-15	CMACast: Upgraded System from the FENGYUNCast	IV/1
CMA-WP-16	CMA Activities in Climate Monitoring	E.2
CMA-WP-17	CMA Activities in Space Weather Observation	B.5
CMA-WP-18	FY-3/MWRI Sensor and Data Use	II/x

CNES

WP Number	Title	Agenda Item
CNES-WP-01	CNES climate activities	E.2

ESA

WP Number	Title	Agenda Item
ESA-WP-01	Status of Current ESA Earth Observation Missions	B.3
ESA-WP-02	Status of the Future ESA Earth Observation Missions	C.3
ESA-WP-03	Status of ESA Actions	A.5

EUMETSAT

WP number	Title	Agenda Item
EUM-WP-01	Status of actions and recommendations resulting from CGMS-37	A.5
EUM-WP-02	Current and future leo/geo/R&D satellite tables	A.5
EUM-WP-03	Status of EUMETSAT Polar System (EPS)	B.1
EUM-WP-04	Status of the Meteosat System	B.2
EUM-WP-05	Report on spacecraft anomalies from solar events	B.5
EUM-WP-06	Status of preparations for Metop B	C.1
EUM-WP-07	Plans for Post-EPS	C.1

EUMETSAT

WP number	Title	Agenda Item
EUM-WP-08	Status of preparations for MSG-3 and MSG-4	C.2
EUM-WP-09	Plans for Meteosat Third Generation (MTG)	C.2
EUM-WP-10	Status of Jason-3 and follow-on	C.4
EUM-WP-11	Status of EUMETSAT Programmes in GMES, Sentinel 3	C.4
EUM-WP-12	Coordinated input by CGMS on Space matters to WMO EC/Congress	E.1
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KMA

WP Number	Title	Agenda Item
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NASA

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NOAA

WP Number	Title	Agenda Item
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NOAA-WP-16	NOAA Plans for Frequency Bands Above 275 GHz	I/1
NOAA-WP-17	NOAA Plans for Utilization for the Band 7750-7850/7900 MHz	I/1
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WP Number	Title	Agenda Item
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NOAA-WP-22	Special Sensor Microwave/Imager (SSM/I) Intercalibration	II/3
NOAA-WP-23	Radio Frequency Activities of the Space Frequency Coordination Group (SFCG) and International Telecommunication Union (ITU) Radiocommunication Sector (ITU-R)	I/1
NOAA-WP-24	GSICS Report on Work with CEOS WGCV to Assess Dunhuang and Qinghai Lake as Reference Sites (Response to Action 37.27)	II/3
NOAA-WP-24	GSICS Report on a Consensus Algorithm for Achieving a GSICS version-1 MSU and AMSU Inter-calibrated data-set	II/3
NOAA-WP-25	GSICS Report on Comparison of Vicarious Calibration Methods and a Strategy to Use Various Land Sites for Inter-Comparison (Response to Recommendation 37.08)	II/3
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Annex 2

ROSCOSMOS/ROSHYDROMET

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Annex 4

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OPENING CEREMONY ADDRESSES

Inaugural Ceremony of
CGMS- 38
08-12 November 2010 New Delhi

Welcome Address by

AVM Dr. Ajit Tyagi , Director General of Meteorology, Ministry of Earth Sciences, Government of India

Honourable Chief Guest Prof. Roddam Narsimha, FRS, Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences, Government of India, Dr. Lars Prahm, Director General of EUMETSAT, Dr. Mikael Rattenborg (or Mr. Paul Counet) of EUMETSAT, Distinguished participants of CGMS-38 from various countries, guests, ladies and gentlemen, I extend a very warm welcome to you all from myself and on behalf of India Meteorological Department.

First of all I am thankful to CGMS forum to give IMD an opportunity to host its 38th meeting .In the past two such meetings were hosted by India in 1986 by IMD and in 2002 by ISRO.
As CGMS is an informal group functioning on a best efforts basis where EUMETSAT runs the Secretariat. As the Secretariat, EUMETSAT is responsible for organizing the annual CGMS meeting with the support of the local host, which is a CGMS Member designated on a rotating basis. Between sessions of the annual CGMS Plenary meetings, the Secretariat is also in charge of facilitating the communication between CGMS Members and of ensuring that actions agreed during CGMS Plenary meetings are fulfilled. Finally, the CGMS Secretariat represents CGMS Members in a number of International bodies.

CGMS meeting indeed in a very important meeting as it deals with the biggest observing system on the Earth that is the Satellite. The regular meetings of the group have permitted a gathering and exchange of results during the course of the development of each system and a considerable measure of coordination has already been achieved. As is known, today the satellite data is the biggest input to Numerical weather forecasting models. The correct and timely satellite observations can play a vital role in weather forecasting and in my opinion maximum efforts should be made in this field as this can only lead us to a situation where satellites and NWP models alone can serve the most of job of accurate forecasting. Manual observations are not possible from every part of the Earth but satellites can provide the observations of several parameters from every part of the Globe and its upper atmosphere at much higher temporal scale.

Through this platform I request the satellite meteorology community, who is here to deliberate, to make concerted efforts to provide improved satellite meteorological data and products for providing better meteorological services to

different users at a time when challenges and expectations from meteorological services have increased tremendously. The money invested in satellites development and its successful launch never goes waste rather it is paid back by many times.
This year is also the Golden Jubilee year of the Satellite Meteorology as the first satellite for meteorological purposes TIROS-1 was launched on 1st April, 1960 .The satellite meteorology have progressed very fast not only by adding more satellites in the Geosynchronous and Polar orbits but by derivation of new products and their proper calibration and Validation techniques resulting in increased faith in the measurements made by satellites. Today almost everything hitherto measured by in-situ instruments can be easily measured by a satellite e.g. Vertical structure of the Atmosphere, Ocean salinity, Sea Surface Temperatures and land Surface Temperatures etc.
In my opinion particular focus needs to be given to make the satellite observations most useful for weather forecasting which is a big challenge today in the scenario of climate change.
India Meteorological Department has an ambitious plan of modernization of Meteorological Services to provide timely and accurate forecast in different ranges and expects the desired level of accuracy in short span of time by extensive use of Satellite data in all forecasting models. Satellite data being the major input for the NWP model, the trend is increasing day by day and I am sure the future belongs to this area.
The year 2011 is a landmark year for the satellite meteorologists in India as three satellites namely:

- INSAT 3D
- MEGHA TROPIQUES
- SARAL

are slated to be launched this year. I am sure valuable data collected through these satellites shall be of tremendous use to the meteorological community and Data assimilation group. Understanding of Global climate will also get a boost by getting more satellite data of better spatial and temporal resolution of Indian region.
Although the satellites are providing lot of data and products which are used in meteorological and other services but there are still some challenges like Vertical Profile of winds which at present is not possible to be derived by satellites data. I call upon this learned gathering to discuss this in this meeting for finding a solution to this requirement of forecasters at the earliest.

My colleagues mainly of Satellite-Meteorology division have been working very hard for the preparation of this meeting as per the guidance of EUMETSAT secretariat and I hope everything will be fine and we all will be much richer in knowledge after the conclusion of this meeting. If there is any concern kindly do speak to my colleagues for its solution.
I wish very fruitful discussions amongst all participants during next five days and CGMS-38 meeting a great success.

Vote of Thanks by Mr. A. K. Sharma, Deputy Director General of Meteorology (Satellite-Meteorology), India Meteorological Department

1. First of all I am grateful to Prof. Roddam Narsimha, FRS who has taken pains of travelling about 2000 km. all along from Bangalore to Delhi for inaugurating CGMS-38. Inspite of his utmost busy schedule and other commitments he agreed to do this because of his attachment to satellites throughout his long career. His inspiring words to this gathering will be very useful for coming five days. I on my behalf and on behalf of IMD and CGMS-38 participants thank you very much for inaugurating CGMS-38 and lighting the lamp of knowledge.

2. Secondly, I extend my sincere thanks to Dr. Shailesh Nayak, Secretary, MoES for sparing his valuable time for presiding over this function .In fact he gave the approval for hosting this meeting over telephonic conversation without even seeing the file . He always takes keen interest in satellite meteorology as it is his favourite subject and has always been a source of inspiration to Satellite -Meteorology in IMD.

3. I extend my thanks to AVM Dr. Ajit Tyagi , Director General of Meteorology for valuable guidance throughout the preparation of this meeting. Satellite-Meteorology division were only executing on his behalf. He always has been a source of guidance to improve the working and making Satellite-Meteorolgy products user oriented.

4. I extend my sincere thanks to Dr. Lars Prahm, Director General of EUMETSAT and Dr. Paul Counet, Director International Division EUMETSAT for giving an opportunity to IMD for hosting CGMS-38 which in my opinion is a wonderful opportunity for IMD and ISRO scientists in knowing state-of-art in GEO and LEO satellites and will go a long way in the development of Satellite–Meteorology in India or any other use of satellite in communication or environmental monitoring .

5. I extend my thanks to all the participants and guests for travelling from far off places for making this meeting a success.

6. My thanks are due to Scope Complex authorities for providing this Auditorium, halls and catering facilities. I am very thankful to media and press for attending it and at the same time request them to give it a wide coverage in media and press.
   I am thankful to Dr. A.S.Kiran Kumar, Associate Director Space Application Centre , Co-Chairman of National Organizing Committee(NOC) for CGMS-38 and other members of NOC for their valuable guidance . Last but not the least my sincere thanks to all the members of Local Organizing Committee (LOC) and IMD officers and staff who have worked very hard continuously even beyond office hours and on holidays for making CGMS-38 meeting to happen and shall work similarly in future also.

Although me and my team has tried to do their best by all possible means but inadvertently if any mistake is done I seek sincere apology for that.

CGMS-38 Address by the Director-General of EUMETSAT,
Dr. Lars Prahm

Monday, 8 November 2010 – Opening Session
Scope Complex, New Delhi, India

Distinguished Delegates and Observers,

Ladies and Gentlemen,

On behalf of the CGMS Secretariat I am pleased and honoured to welcome all the participants to the 38th Meeting of the Coordination Group for Meteorological Satellites.

CGMS welcomes that India is hosting the CGMS meeting this year, and I would like to express my sincere thanks to Dr Ajit Tyagi, Director-General of IMD, for kindly inviting us to the meeting here in New Delhi. IMD joined CGMS in 1979 and the last CGMS meeting in India took place in the year 2002.

A special welcome to the representatives from Canada who attend CGMS as Observers for the first time.

Due to its distinctive international nature, EUMETSAT has been able to fully appreciate the importance of CGMS, its success over the years as a dedicated global forum for the coordination of operational meteorological satellite systems, and its efforts to ensure the exchange of key information on operational meteorological satellite systems and research and development missions. The extensive attendance to CGMS-38 can be regarded as a shared acknowledgment to the achievements of CGMS and to its central role in addressing issues associated with meteorological satellite operations, products, data delivery and data exchange.

CGMS is fostering the harmonisation of meteorological satellite mission parameters, and encouraging complementarity, compatibility and possible mutual backup in the event of system failure. CGMS is thus complementary to other multilateral cooperation mechanisms such as the Space Programme of the World Meteorological Organisation (WMO), the Committee on Earth Observation Satellites (CEOS) and the Group on Earth Observations (GEO).

Meteorological satellites represent a key component of the Global Observing System. The crucial task of enabling operational satellite operators, research and development institutions and WMO to ensure efficiency and sustainability, through technical and operational coordination, lies within CGMS.

CGMS activities and initiatives appear to become more and more crucial. The continuous evolution of Earth observation systems and the related effort for international coordination and information exchange are leading to improved data and products and better services to the citizens at large.

The constant attention to climate change and extreme weather events by the international public opinion is increasing the awareness for the possibilities provided by Earth Observation for protecting life and property, and advancing living standards and social and economic development. There is evidence of an ongoing attitude and policy change, and consequently, a dedicated CGMS agenda item has been included to address this issue.

To build a stronger CGMS, I believe that we need to continue to evolve, cooperate, exchange data, and ensure data availability and continuity.

Furthermore, we also need to ensure the coordination of resources and global observation coverage to minimise observational gaps as far as possible. We are already doing this to a certain extent between the continents but we have to improve it further.

In this respect there are two points I would like to highlight for this meeting: Global data exchange and orbit coordination. Both are key issues for responding to user requirements and I would like to thank WMO for having addressed orbit coordination in one of the Working Papers to be presented later this week. I encourage active discussions and hope that we can come to beneficial conclusions for both the space agencies and - in particular - our users.

Concluding my address, I wish to confirm EUMETSAT's long-standing commitment to CGMS, as well as the aspiration to continuing our support to CGMS by running its Secretariat.

In addition, I would like to give my special thanks to the IMD organising committee for the excellent organisational arrangements.

EUMETSAT is looking forward to constructive discussions throughout the week, as an excellent opportunity for advancing international cooperation on satellite meteorology, Earth observation, and its contribution to climate change monitoring.

I wish you fruitful discussions and a successful CGMS meeting.

Thank you for your attention.

APPENDIX: GENERAL CGMS INFORMATION

1. Charter for CGMS
2. CGMS Membership
3. Addresses for Procuring Archive Data
4. Contact List for Operational Engineering Matters
5. Address List for Distribution of CGMS Documents
6. E-mail List Servers
7. Glossary

CHARTER FOR THE COORDINATION GROUP FOR METEOROLOGICAL SATELLITES (CGMS)[3]

PREAMBLE

RECALLING that the Coordination on Geostationary Meteorological Satellites (CGMS) has met annually as an informal body since September 1972 when representatives of the United States (National Oceanic and Atmospheric Administration), the European Space Research Organisation (now the European Space Agency), and Japan (Japan Meteorological Agency) met to consider common interests relating to the design, operation and use of these agencies planned meteorological satellites,

RECALLING that the Union of Soviet Socialist Republics (State Committee for Hydrometeorology), India (India Meteorological Department) and the People's Republic of China (State Meteorological Administration) initiated development of geostationary satellites and joined CGMS in 1973, 1978, and 1986 respectively,

RECOGNISING that the World Meteorological Organisation (WMO) as a representative of the meteorological satellite data user community has participated in CGMS since 1974,

NOTING that the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) has, with effect from January 1987, taken over responsibility from ESA for the METEOSAT satellite system and the current Secretariat of CGMS,

CONSIDERING that CGMS has served as an effective forum through which independent agency plans have been informally harmonised to meet common mission objectives and produce certain compatible data products from geostationary meteorological satellites for users around the world,

RECALLING that the USA, the USSR, China and Europe have launched polar-orbiting meteorological satellites, and that the polar and geostationary meteorological satellite systems together form a basic element of the space based portion of the WMO Global Observing System,

BEING AWARE of the concern expressed by the WMO Executive Council Panel of Experts over the lack of guaranteed continuity in the polar-orbit and its recommendation that there should be greater cooperation between operational meteorological satellite operators world-wide, so that a more effective utilisation of these operational systems, through the coordination and standardisation of many services provided, can be assured,

[3] This Charter was amended at CGMS-31 to take into account new membership of the R&D agencies ESA, NASA, JAXA and Rosaviakosmos. It was further amended at CGMS-34 to take into account the new membership of CNES (since CGMS-32), KMA (since CGMS-33), and CNSA.

RECOGNISING the importance of operational meteorological satellites for monitoring and detection of climate change,

RECOGNISING the expansion of the space-based component of the WMO's World Weather Watch Global Observing System to include Research & Development missions and the commitment of the National Aeronautics and Space Administration (NASA), European Space Agency (ESA), Russian Aviation and Space Agency (Rosaviakosmos) and the National Space Development Agency of Japan (NASDA) to make observations from its missions available to the world community at the 2nd session of the WMO Consultative Meetings on High Level Policy on Satellite matters in February 2002,

NOTING the expansion of CGMS at CGMS-31 to include NASA, ESA, Rosaviakosmos and the Japan Aerospace Exploration Agency (JAXA) as full members to improve coordination between operational meteorological and R&D satellite operators,

NOTING the further expansion of CGMS at CGMS-32 to include CNES, at CGMS-33 to include KMA, and at CGMS-34 to include CNSA, following to their commitment to make observations from their missions available to the world community in full adherence with the space-based component of the WMO's World Weather Watch Global Observing System,

AND RECOGNISING the need to update the purpose and objectives of CGMS,

AGREE

I. To change the name of CGMS to the Coordination Group for Meteorological Satellites

II. To adopt a Charter, establishing Terms of Reference for CGMS, as follows:

OBJECTIVES

a) CGMS provides a forum for the exchange of technical information on geostationary and polar-orbiting meteorological satellite systems and research & development missions, such as reporting on current meteorological satellite status and future plans, telecommunications matters, operations, intercalibration of sensors, processing algorithms, products and their validation, data transmission formats and future data transmission standards.

b) CGMS harmonises to the extent possible meteorological satellite mission parameters such as orbits, sensors, and data formats and downlink frequencies.

c) CGMS encourages complementarity, compatibility and possible mutual back-up in the event of system failure through cooperative mission planning, compatible meteorological data products and services and the coordination of space and data related activities, thus complementing the work of other international satellite coordinating mechanisms.

MEMBERSHIP

d) CGMS Membership is open to all operators of meteorological satellites, to prospective operators having a clear commitment to develop and operate such satellites, and to the WMO, because of its unique role as representative of the world meteorological data user community. Further CGMS Membership is open to space agencies operating R&D satellite systems that have the potential to contribute to WMO and supported programmes.

e) The status of observer will be open to representatives of international organisations or groups who have declared an intent, supported by detailed system definition studies, to establish a meteorological satellite observing system. Once formal approval of the system is declared, membership of CGMS can be requested by the observer.

Within two years of becoming an observer, observers will report on progress being made towards the feasibility of securing national approval of a system. At that time CGMS Members may review the continued participation by each Observer.

f) The current Membership of CGMS is listed in Appendix 2 to this charter.

g) The addition of new Members and Observers will be by consensus of existing CGMS Members.

ORGANISATION

h) CGMS will meet in plenary session annually. Ad hoc Working Groups to consider specific issues in detail might be convened at the request of any Member provided that written notification is received and approved by the Membership at least 1 month in advance and all Members agree. Such Working Groups will report to the next meeting of CGMS.

i) One Member, on a voluntary basis, will serve as the Secretariat of CGMS.

j) Provisional meeting venues, dates and draft agenda for plenary meetings will be distributed by the Secretariat 6 months in advance of the meeting, for approval by the Members. An agreed Agenda will be circulated to each Member 3 months in advance of the meeting.

k) Plenary Meetings of CGMS will be chaired by each of the Members in turn, the Chairperson being proposed by the host country or organisation.

l) The Host of any CGMS meeting, assisted by the Secretariat, will be responsible for logistical support required by the meeting. Minutes will be prepared by the Secretariat, which will also serve as the repository of CGMS records. The Secretariat will also track action items adopted at meetings and provide CGMS Members with a status report on these and any other outstanding actions, four months prior to a meeting and again at the meeting itself.

PROCEDURE

m) The approval of recommendations, findings, plans, reports, minutes of meetings, the establishment of Working Groups will require the consensus of Members. Observers may participate fully in CGMS discussions and have their views included in reports, minutes etc., however, the approval of an observer will not be required to establish consensus.

n) Recommendations, findings, plans and reports will be non-binding on Members or Observers.

o) Once consensus has been reached amongst Members on recommendations, findings, plans and reports, minutes of meetings or other such information from CGMS, or its Working Groups, this information may be made publicly available.

p) Areas of cooperation identified by CGMS will be the subject of agreement between the relevant Members.

COORDINATION

q) The work of CGMS will be coordinated, as appropriate, with the World Meteorological Organisation and its relevant bodies, and with other international satellite coordination mechanisms, in particular the Committee on Earth Observation Satellites (CEOS) and the Earth Observation International Coordination Working Group (EO-ICWG) and the Space Frequency Coordination Group (SFCG).

Organisations wishing to receive information or advice from the CGMS should contact the Secretariat; which will pass the request on to all Members and coordinate an appropriate response, including documentation or representation by the relevant CGMS Members.

AMENDMENT

r) These Terms of Reference may be amended or modified by consensus of the Members. Proposals for amendments should be in the hands of the Members at least one month prior to a plenary meeting of CGMS.

EFFECTIVE DATE AND DURATION

s) These Terms of Reference will become effective upon adoption by consensus of all CGMS Members and will remain in effect unless or until terminated by the consensus of CGMS Members.

MEMBERSHIP OF CGMS

The current Membership of CGMS is:

CMA	joined 1989
CNES	joined in 2004
CNSA	joined in 2006
ESA	re-joined in 2003
EUMETSAT	joined 1987 (currently CGMS Secretariat)
IMD	joined 1979
IOC/UNESCO	joined in 2001
JAXA	joined in 2003
JMA	founder member, 1972
KMA	joined in 2005
NASA	joined in 2003
NOAA	founder member, 1972
ROSCOSMOS	joined in 2003
ROSHYDROMET	joined 1973
WMO	joined 1973

In some cases delegates are supported by other Agencies, for example SRC Planeta (with Roshydromet), and ISRO (with IMD).

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GLOSSARY

AAPP	AVHRR and ATOVS Processing Package
AATSR	Advanced Along Track Scanning Radiometer
ABI	Advanced Baseline Imager (GOES-R)
ABS	Advanced Baseline Sounder (GOES-R)
ACARS	Automated Communications Addressing and Reporting System
ACC	ASAP Coordinating Committee
ACRIMSAT	Active Cavity Radiometer Irradiance Monitor Satellite (NASA)
ADC	Atlantic Data Coverage
ADDE	Abstract Data Distribution Environment
ADEOS-II	Advanced Earth Observing Satellite-II (JAXA)
ADM	Atmospheric Dynamics Mission (ESA)
ADM	Alternative Dissemination Methods
ADM	Advance Dissemination Means (WMO)
AERONET	Remote-sensing aerosol monitoring network programme
AIRS	Advanced IR Sounder
AIT	Assembly Integration and Test
AHRPT	Advanced High Rate Picture Transmission
ALOS	Advanced Land Observing Satellite (JAXA)
AMDAR	Aircraft Meteorological Data Relay
AMR	Altimetry Microwave Radiomete
AMS	American Meteorological Society
AMSR	Advanced Microwave Scanning Radiometer
AMSR-E	Advanced Microwave Scanning Radiometer (modified version on ADEOS-II)
AMSU	Advanced Microwave Sounding Unit
AMV	Atmospheric Motion Vectors
AOCE	Attitude and Orbit Control Electronics
AOPC	Atmospheric Observation Panel for Climate (GCOS)
APSATS	Asian-Pacific Satellite Training
APT	Asia-Pacific Telecommunity (WRC)
APT	Automatic Picture Transmission
Aqua	Earth's water cycle observing mission (NASA)
Aquarius	global sea surface salinity measuring mission (NASA)
ARGOS	Data Collection and Location System
ARINA	scientific payload on Resurs-DK1 for earth quake prediction
ASAP	Automated Shipboard Aerological Programme
ASCAT	C-band dual swath scatterometer (Metop)
ASCII	American Standard Code for Information Interchange
ASDAR	Aircraft to Satellite Data Relay
ASICs	Application Specific Integrated Circuits
AT	Hydrology Algorithm Team (NOAA)
ATMS	Advanced Technology Microwave Sounder
ATOVS	Advanced TOVS
ATSR	Along Track Scan Radiometer (ERS, ESA)
Aura	Mission measuring atmospheric chemistry and trace gases (NASA)
AVHRR	Advanced Very High Resolution Radiometer

AVNIR	Advanced Visible and Near Infrared Radiometer type 2 (ALOS, JAXA)
AWG	Algorithm Working Group (NOAA)
Baumanets	R&D space technology satellite primarily for students (Roscosmos)
BBC	Black Body Calibration (Meteosat)
BCCP	Business Continuity and Contingency Plan (USA)
GMD	Basic Meteorological Data
BMTC	Australia Bureau of Meteorology Training Centre
BTD	Brightness Temperature Differences
BUFR	Binary Universal Form for data Representation
BSS	Broadcasting Satellite Service
CAL	Computer Aided Learning
CALIPSO	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite (NASA/CNES)
CONAE	Argentine Commission on Space Activities
CART	Cloud and Radiation Test-bed
CAS	Commission for Atmospheric Sciences (WMO)
CboM	Commonwealth Bureau of Meteorology Australia
CBS	Commission for Basic Systems
CCD	Charged Couple Device (INSAT-2E)
CCIR	Consultative Committee on International Radio
CCRI	Climate Change Research Initiative
CCSDS	Consultative Committee on Space Data Systems
CD	Compact Disc
CDAS	Command and Data Acquisition Station
CDMA	Code Division Multiple Access
CDOP	Continuous Development and Operations Phase
CDRs	Climate Data Records
CDS	Climate Data Set (EUMETSAT)
CEOS	Committee on Earth Observation Satellites
CEPT	Conference Européenne des Postes et Télécommunications/European Conference of Postal and Telecommunications Administrations
Cg	WMO Congress
CGMS	Coordination Group for Meteorological Satellites
CHAMP	German EO Satellite
CHRIS	Compact High Resolution Imaging Spectrometer (PROBA, ESA)
CHRPT	Chinese HRPT (FY-1C and D)
CI	Convective Initiation (NOAA)
CIIS	Common Instrument Interface Studies
CIMS	GOES Channel Interference Monitoring System
CIMSS	Cooperative Institute of Meteorological Satellite Studies, Univ. Wisconsin
CIRs	Climate Information Records
CIS	Commonwealth of Independent States
CITEL	Inter-American Telecommunication Commission

CLARE	Cloud Lidar And Radar Experiment
CLASS	Comprehensive Large-Array Stewardship System (NOAA)
CloudSat	Global cloud property measuring satellite (NASA/CSA)
CLS	Collecte Localisation Satellites (Toulouse)
CM	WMO Consultative Meetings on High-Level Policy on Satellite Matters
CMA	China Meteorological Administration
CMACast	CMA Data Dissemination System
CMD	Cyclone Warning Dissemination Service
CME	Coronal Mass Ejections
CMIS	Conical Scanning Microwave Imager/Sounder
CM-SAF	Satellite Application Facility on Climate Monitoring (EUMETSAT)
CMS	Centre de Météorologie Spatiale (France)
CMV	Cloud Motion Vector
CMW	Cloud Motion Wind
CNR	Consiglio Nazionale delle Ricerche (Italy)
CNSA	China National Space Administration
COCTS	10-band Chinese Ocean Colour and Temperature Scanner
COEs	Centres of Excellence (WMO)
COMS	Communication, Ocean and Meteorological Satellite (KMA)
CONAE	Comisión Nacional de Actividades Espaciales (Argentina)
COOP	Coastal Oceans Observations Panel (GOOS)
COP	Conference of the Parties (GCOS)
COSPAR	Committee on Space Research
COSPAS/ SARSAT	International satellite system for search and rescue (SAR)
CPM	Conference Preparatory Meeting (WRC)
CR	CGMS Consolidated Report
CrIS	Cross track Infrared Sounder
CRYOSAT	Polar Ice Monitoring Programme (ESA)
CSR	Clear Sky Radiance
CZI	4-band Coastal Zone Imager (HY-1B).
DADDS	DCS Administration and Data Distribution System (NOAA)
DAPS	DCS Automated Processing System (USA)
DCP	Data Collection Platform
DCPC	Data Collection or Production Centre (WIS, WMO)
DCRS	Collaboration on Global Frequency Allocation harmonization
DCS	Data Collection System
DCWDS	Digital Cyclone Warning Dissemination System (India)
DIF	Directory Interchange Format
DMSP	Defense Meteorological Satellite Program (USA)
DOD	Department of Defense (USA)
DOMSAT	Domestic telecommunications relay Satellite (NOAA)
DPC	Directional Polarisation Camera (CNSA)
DPI	Derived Product Images (USA)
DPM	WMO Natural Disaster Prevention and Mitigation Programme
DPT	Delayed Picture Transmission

DR	Direct Readout services (ADM)
DRS	DCP Retransmission System (Meteosat)
DRT	Data Relay Transponder (INSAT)
DSB	Direct Soundings Broadcast
DSCOVR	Deep Space Climate Observatory (NASA)
DUS	Data Utilisation Station (USA) (Japan)
DVB	Direct Video Broadcast
DWS	Disaster Warning System (India)
EARS	EUMETSAT ATOVS Retransmission Service
EarthCARE	Cloud & aerosol mission (ESA)
EBB	Electronic Bulletin Board
EC	Executive Council (WMO)
ECP	European Common Proposal (CEPT)
EC-PORS	Executive Council Panel of Experts on Observations, Research and Services
ECT	Equator crossing time
ECV	Essential Climate Variables
ECMWF	European Centre for Medium-Range Weather Forecasts
EDR	Environmental Data Records (NPOESS)
EDU	Engineering Development Unit
EEIS	EUMETSAT External Information System
EESS	Earth Exploration Satellite Service (Frequency Management)
EIRP	Effective isotropically-radiated power
ELEKTRO	Geostationary meteorological satellite
EMWIN	Emergency Manager Weather Information Network (NOAA)
ENVISAT	ESA polar satellite for environment monitoring
EO	Earth Observation
EOS	Earth Observation System
EPA	US Environmental Protection Agency
EPS	EUMETSAT Polar System
EPS-SG	EPS Second Generation
ERBE	Earth Radiation Budget Experiment
ERBS	Earth Radiation Budget Satellite (NASA)
ERS	ESA Remote Sensing Satellite
ESA	European Space Agency
ESCAP	Economic and Social Commission for Asia and the Pacific, UN
ESJWG	Earth Sciences Joint Working Group
ESOC	European Space Operations Centre (ESA)
ET-ODRRGOS	Expert Team on Observational Data Requirements and Redesign of the GOS
ET-EGOS	Expert Team on Evolution of the Global Observing System (WMO)
ET-SAT	Expert Team on Satellite Systems (WMO)
ET-SUP	Expert Team on Satellite Utilisation and Products (WMO)
EU	European Union
EUCOS	EUMETNET Composite Observing System
EUMETCast	EUMETSAT Satellite Data Dissemination System
EUMETNET	The Network of European Meteorological Services
EUMETSAT	European Organisation for the Exploitation of Meteorological

	Satellites
EURD	End User Requirements Document (EUMTETSAT)
FAA	Federal Aviation Authority (USA)
FAO	Food and Agriculture Organisation (UN)
FCDR	Fundamental Climate Data Record FENGYUNCast FENGYUN Satellite Data Dissemination System
FOV	Field of View (NOAA)
FTP	File Transfer Protocol
FWIS	Future WMO Information Systems (CBS Inter-Programme Task Team)
FXTS	Facsimile Transmission System (USA)
FY-1	Polar-orbiting Meteorological Satellite (PRC)
FY-2	Future Geostationary Meteorological Satellite (PRC)
FY-3	Second generation of Polar-orbiting Meteorological Satellite (PRC)
GAW	Global Atmosphere Watch (WMO Atmospheric Research Environment Programme)
GCMP	GCOS Climate Monitoring Principles (GCOS)
GCOM	Global Change Observation Mission (NASDA)
GCOS	Global Climate Observing System
GCW	Global Cryosphere Watch
GDPT	Chinese Delayed Picture Transmission Format (Global Data) (FY-1C)
GDS	Ground Data System
GEO	inter-governmental Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GERB	Geostationary Earth Radiation Budget (MSG, EUMETSAT)
GESN	Global Education and Science Network
GEWEX	Global Energy and Water Cycle Experiment (WCRP)
GII	Global Instability Index (JMA)
GIFTS	Geosynchronous Imaging Fourier Transform Spectrometer (NASA)
GISC	Global Information System Centre (WIS, WMO)
GIMTACS	GOES I-M Telemetry and Command System
GLI	Generation Global Imager (GCOM)
GLM	Geostationary Lightning Mapper (GOES, NOAA)
GLOBUS	multichannel scanning radiometer (Meteor-3M N2)
Glory	CCRI global distribution of natural and anthropogenic aerosols mission (NASA)
GMES	Global Monitoring for Environment and Security (EU)
GMR	GOES-Meteosat Relay
GMS	Geostationary Meteorological Satellite (Japan)
GNOS	GNSS Occultation Sounder
GNSS	Global Navigation Satellite System
GOCE	Gravity Field and Steady State Ocean Circulation Explorer (ESA)
GOES	Geostationary Operational Environmental Satellite (USA)
GOES-R	Geostationary Operational Environmental Satellite - R Series (NOAA)
GOME	Global Ozone Monitoring Experiment (Metop, ERS)

GOMS	Geostationary Operational Meteorological Satellite (Russ. Fed.)
GOMAS	Geostationary Observatory for Microwave Atmospheric Sounding (WMO)
GOOS	Global Ocean Observing System (IOC, UNEP, WMO, ICSU)
GOS	Global Observing System (WMO)
GOSAT	Greenhouse Gases Observing Satellite (JAXA/Jap. Min. of Environment)
GPCP	Global Precipitation Climatology Project
GPM	Global Precipitation Measurement (JAXA/NASA)
GPPA	Procedure for Product Acceptance (GSICS)
GPRC	GSICS Processing and Research Center (CMA)
GPS	Global Positioning System
GRA	GOOS Regional Alliances
GRACE	Gravity Recovery and Climate Experiment (NASA/DLR)
GRAS	GNSS Receiver for Atmospheric Sounding
GRIB	Data representation form for General Regularly-distributed Information in Binary (WMO)
GRP	GEWEX Radiation Panel (GEWEX, WCRP)
GSICS	Global Satellite Intercalibration System
GSLMP	Global Sea Level Monitoring Programme
GTS	Global Telecommunication System (WMO)
GRUAN	GCOS Reference Upper Air Network (GCOS)
GVAR	GOES Variable (data format) (USA)
GIIPSY	Global Interagency IPY Polar Snapshot Year project
HAPS	High Altitude Platform System
HDF	Hierarchical Data Format
HDFS	High Density Fixed Service
HDFSS	High Density Fixed Satellite Systems
HDR	High Data Rate
HEO	Highly Elliptical Orbit
HES	Hyperspectral Environmental Suite (GOES, NOAA)
HiRID	High Resolution Imager Data
HIRS	High Resolution Infrared Sounder
HR	High Resolution
HRD	High Rate Data (NPOESS, USA)
HRDCP	High Rate DCP
HRPT	High Rate Picture Transmission
HRV	High Resolution Visible (EUMETSAT)
HSRS	High Spectral Resolution Sounder (MSG)
HWR	Hydrology and Water Resource Programme (WMO)
HYDROS	Hydrosphere State Mission (NASA)
IAMAP	International Association of Meteorology and Atmospheric Physics (NOAA)
IASI	Infrared Atmospheric Sounding Interferometer (EUMETSAT)
ICESat	Ice Cloud and Land Elevation Satellite (NASA)

ICI	Inversion Coupled with Imager (Meteo-France)
ICSC	CAS International Core Steering Committee (THORPEX)
ICWG	International Coordination Working Group (EO)
IDCP	International DCP
IDCS	International Data Collection System
IDDI	Infra-red Difference Dust Index
IDN	International Directory Network (CEOS)
IDPS	Interface Data Processing Segment (NPOESS)
IFRB	International Frequency Registration Board
IGACO	Integrated Global Atmospheric Chemistry Observations (IGOS)
IGDDS	Integrated Global Data Dissemination Service
IGEOLab	International Geostationary Laboratory concept
IJPS	Initial Joint Polar-orbiting Operational Satellite System
IKFS-2	advanced IR atmospheric sounder
IMT-2000	International Mobile Telecommunication 2000 (before FPLMTS)
INSAT	Indian geostationary satellite
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IODC	Indian Ocean Data Coverage
IOP	Initial Operations Phase (SAF, EUMETSAT)
IOTWS	Indian Ocean Tsunami Warning Service
IPD	International Polar Decade
IPO	Integrated Program Office (NOAA)
IPOMS	International Polar-orbiting Meteorological Satellite Group
IPWG	International Precipitation Working Group
IPY	International Polar Year (ICSU, WMO)
IQGSE	Image Quality Ground Support Equipment (EUMETSAT)
IR	Infrared
IRC	International Radiation Commission
IRAS	Infrared Atmospheric Sounder (FY-3, CMA)
IROWG	International Radio Occultation Group
IRTS	Infrared Temperature Sounder (EPS)
IRW	Infrared Window
ISS	Information Systems and Services; International Space Station
ISCCP	International Satellite Cloud Climatology Project (GEWEX, WCRP)
ISADP	Integrated System for the ATOVS Data Processing
ISWMR	SAF Integrated Satellite Wind Monitoring Report (EUMETSAT)
ISY	International Space Year
ITSC	International TOVS Study Conference
ITT	Invitation to Tender
ITU	International Telecommunication Union
ITWG	International TOVS Working Group
IVOS	Infrared and Visible Optical System Calibration (CEOS WGCV)
IWW	International Winds Workshop
IWWG	International Winds Workshop Group
JASON	Ocean surface Topography follow-on mission to TOPEX/POSEIDON (CNES/NASA)
JAXA	Japan Aeronautic Exploration Agency (name change of NASDA)

JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JCSDA	Joint Centre for Satellite Data Assimilation (USA)
JMA	Japan Meteorological Agency
JPSS	Joint Polar-orbiting Satellite System (NOAA)
JRA-25	“Japanese Re-Analysis 25 years" JMA research project of long-range re-analysis of global atmosphere
JSC	Joint Scientific Committee (WCRP)
KARI	Korea Aerospace Research Institute
KLIMAT	scanning Infrared radiometer on Meteor-3M N1 (Russia)
KMA	Korea Meteorological Administration
KNMI	the Royal Dutch Meteorological Institute
KOMPAS	Microsatellite, earthquake investigations (Roscosmos)
LAN	Local Area Networks (Telecommunication)
Landsat	NASA Earth observing Satellite (NASA/USGS)
LSA SAF	Land Surface Analysis Satellite Application Facility (EUMETSAT)
LBR	Low Bit Rate
LCL	Latch Current Limiter
LDCM	Landsat Data Continuity Mission (NASA/US Geological Survey)
LDPT	Chinese Delayed Picture Transmission Format (Local Data Coverage) FY-1C
LEOP	Launch and Early Operations Phase
LR	Low Resolution
LRD	Low Rate Data (NPOESS, USA)
LRIT	Low Rate Information Transmission
LRPT	Low Rate Picture Transmission
LSPIM	Land Surface Processes and Interactions Mission (ESA)
LST	Local Solar Time
MAP	Mesoscale Alpine Experiment
MAP-SST	Merged Atlantic Product - Sea Surface Temperature (SAF, EUMETSAT)
MARF	Meteorological Archive and Retrieval Facility (EUMETSAT)
MBWG	MSG Biosphere Working Group
MCP	Meteorological Communications Package
MCUT	Multi-Constellation User Terminal (NOAA)
MDD	Meteorological Data Distribution (Meteosat)
MDUS	Medium-scale Data Utilization Station (for GMS S-VISSR)
MEGHA-TROPIQUE	CNES/ISRO mission
MERIS	Medium Resolution Imaging Spectrometer (ENVISAT)
MERSI	Medium Resolution Spectral Imager (FY-3, CMA)
MetAids	Meteorological Aids Service (frequency regulation)
Metop	European meteorological polar-orbiting satellite
METEOR	Polar-orbiting meteorological satellite (Roshydromet)
Meteosat	Geostationary meteorological satellite (EUMETSAT)
METSAT	Indian geostationary meteorological satellite

MetSat	meteorological satellite systems (frequency regulation)
MHS	Microwave Humidity Sounder (EPS)
MIEC	Meteorological Information Extraction Centre (ESOC)
MIMR	Multi-frequency Imaging Microwave radiometer
MIVZA	microwave scanning radiometer (Meteor 3M N1)
MOCC	Meteosat Operational Control Centre (ESOC)
MODIS	Moderate Resolution Imaging Spectroradiometer (NOAA)
MOP	Meteosat Operational Programme
MONITOR-E	Land Observing Satellite (Roscosmos)
MOSDAC	Meteorological and Oceanographic Satellite Data Archival Centre
MPEF	Meteorological Products Extraction Facility (EUMETSAT)
MSC	Meteorological Satellite Centre (Japan)
MSC-CAL	Computer Aided Learning system by JMA/MSC
MSG	Meteosat Second Generation
MSM	Meso-Scale Model
MSMR	Multichannel Scanning Microwave Radiometer (OCEANSAT-1)
MSS	Mobile Satellite Services (frequency regulation)
MSU	Microwave Sounding Unit
MTG	Meteosat Third Generation
MTP	Meteosat Transition Programme
MTS	Microwave Temperature Sounder (EPS)
MTSAT	Multi-functional Transport Satellite (Japan)
MTVZA	microwave scanning radiometer (Meteor 3M N1)
MVIS	Multi-channel VIS and IR Radiometer (FY-1C and D of PRC)
MWHS	Microwave Humidity Sounder
MWI	Microwaver Imaging Mission (EUMETSAT)
MWR	Microwave Radiometer (ERS, ESA)
MWRI	Microwave Radiation Imager (FY-3, CMA)
MWRS	Microwave Radiometers
MWTS	Microwave Temperature Sounder (FY-3, CMA)
NASA	National Aeronautics and Space Agency
NASDA	National Space Development Agency of Japan (changed to JAXA in 2003)
NCDC	National Climate Data Center (NOAA)
NCSW	National Centre for Space Weather
NEDT	Noise Equivalent Delta Temperature
NESDIS	National Environmental Satellite Data and Information Service
NGDC	National Geophysical Data Centre (USA)
NGSO	Non-geostationary systems
NIMH	National Institute of Meteorology and Hydrology (
NIST	US National Institute of Standards and Technology
NMC	National Meteorological Centre
NMHS	National Meteorological & Hydrological Service
NMP EO-1	New Millennium Program Earth Observing Mission (NASA)
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service (USA)
NPOESS	National Polar-orbiting Operational Environmental Satellite System (USA)

NPP	NPOESS Preparatory Project
NSMC	National Satellite Meteorological Center of CMA (PRC)
NTIA	National Telecommunications and Information Agency (USA)
NWC SAF	Nowcasting Satellite Application Facility (EUMETSAT)
NWP	Numerical Weather Prediction
NWS	National Weather Service (USA)
NWSTG	NOAA's National Weather Service Telecommunications Gateway
OCAP	Operational Consortium of ASDAR Participants
OCEANSAT	Indian satellite for ocean applications
OCO	Orbiting Carbon Observatory (NASA)
OLR	Outgoing Longwave Radiation
OOPC	Oceans Observations Panel for Climate (GOOS)
OPAG-IOS	Open Programme Area Group in Integrated Observing Systems (successor of CBS WG on Satellites)
OSE	Operational System Experiments (ET-ODRRGOS)
OSSE	Observing System Simulation Experiments (ET-ODRRGOS)
OSTM	Ocean Surface Topography Mission (Jason-2) (CNES/NASA/ NOAA/EUMETSAT)
OWSE-AF	Operational WWW Systems Evaluation for Africa
PALSAR	Phased Array type L-band Synthetic Aperture Radar ((ALOS, JAXA)
PAMELA	AntiMatter Exploration and Light-nuclei Astrophysics
PATMOS	AVHRR Pathfinder Atmosphere (NOAA)
PATMOS-x	Pathfinder Atmospheres Extended (NOAA)
PC	Personal Computer
PMW	Passive Microwave
POEM	Polar-orbiting Earth Observation Mission (ESA)
POES	Polar-orbiting Operational Environmental Satellite (USA)
PR	Precipitation Radar (on TRMM, JAXA)
PRR	Preliminary Requirements Review
PRC	People's Republic of China
PRISM	Panchromatic Remote-sensing Instrument for Stereo Mapping (ALOS, JAXA)
PROBA	Project for On-Board Autonomy (ESA EO satellite)
PTT	Post Telegraph and Telecommunications authority
PTWC	Pacific Tsunami Warning Centre
QA4EO	Quality Assurance Framework for Earth Observation
QI	Quality Indices (EUMETSAT)
QuikSCAT	Quik Scatterometer (NASA)
RA	Regional Association of WMO
RARS	Regional ATOVS Re-transmission System (WMO)
RAMSDIS	Menu-driven system for analysing digital satellite imagery (McIDAS, USA)
RAOBS	Radiosonde Observations
RASA	Russian Aviation and Space Agency
RDCP	Regional DCP (Japan)

RDR	Raw Data Records (NPOESS)
Resurs-DK	Russian land observing satellite (Roscosmos)
RFI	Radio Frequency Interference
RLAN	new wireless LANs
RMS	Root Mean Square
RMTC	Regional Meteorological Training Centre (WMO)
Roscosmos	[Russian] Federal Space Agency
Roshydromet	Russian Federal Service for Hydrometeorology and Environmental Monitoring
RSB	Reflective Solar Bands (MODIS NOAA)
RSMC	Regional Specialised Meteorological Centre
RSO	Rapid Scan Operations (NOAA)
RSS	Rapid Scan Service (EUMETSAT)
RT	Radiative Transfer
S&R	Search and Rescue mission
SAC-C	Satellite de Aplicaciones Cientificas-C
SAF	Satellite Application Facility (EUMETSAT)
SAFISY	Space Agency Forum on the ISY
SAGE III	Stratospheric Aerosol and Gas Experiment (NASA)
SAM	Satellite Anomaly Manager
SAR	Synthetic Aperture Radar (ERS ESA)
SARA	Short Range Automotive Radar (frequency management)
SARSAT	Search And Rescue, Satellite supported facility
SAST	Shanghai Academy of Space Technologies.
SATAID	Satellite Animation and Interactive Diagnosis (Japan)
SATOB	WMO code for Satellite Observation
SBA	Societal Benefit Area
SBSTA	UNFCCC Subsidiary Body for Scientific and Technology Advice
SBUS	Solar Backscatter Ultraviolet Sounder (FY-3, CMA)
SBUV	Solar Backscattered Ultra Violet (ozone)
SCOPE-CM	Sustained, Co-Ordinated Processing of Environmental Satellite Data for Climate Monitoring
SD	Solar Diffuser (MODIS)
SDR	Sensor Data Records (NPOESS)
SEAS	Shipboard Environmental (data) Acquisition System
SEC	Space Environment Center (NOAA)
SEE	South Eastern Europe (
SEISS	Space Environmental In-Situ Suite (GOES, NOAA)
SEM	Space Environment Monitor (GOES)
SEVIRI	Spinning Enhanced Visible and Infrared Imager (MSG)
S-FAX	S-band facsimile broadcast of FY-2 (PRC)
SFCG	Space Frequency Coordination Group
SGLI	Second Generation Global Imager (CGOM-B1)
SG-RFC	Steering Group on Radio Frequency Coordination
SICH-1M	Russian oceanographic satellite (Roscosmos)
SIS	Solar Imaging Suite (GOES, NOAA)
SMA	State Meteorological Administration (PRC)
SMD	Stored Mission Data (NPOESS)

SMOS	Soil Moisture and Ocean Salinity (ESA)
SNO	Simultaneous Nadir Overpass (GSICS)
SOCC	Satellite Operations Control Center (NOAA)
SORCE	Solar Radiation and Climate Experiment (NASA)
SOT	Ship Observation Team (JCOMM)
SP	Space Programme (WMO)
SRR	Automotive Short-Range Radars (frequency management)
SRF	Spectral Response Function
SRS	Space Research Service (frequency regulation)
SRSO	Super-Rapid-Scan Operations
SRTM	Shuttle Radar Topography Mission (NASA)
SSM/I	Special Sensor Microwave/Imager (NOAA)
SSMI/S	Special Sensor Microwave Imager/Sounder (NOAA)
SSMR	Scanning Multispectral Microwave Radiometer
SSMT1	microwave temperature sounder (NOAA)
SSMT2	microwave water vapour sounder (NOAA)
SSP	Sub-Satellite Point
SST	Sea Surface Temperature
SSU	Stratospheric Sounding Unit
STC	Semi-Transparent Correction (NOAA)
STG	Scientific and Technical Group (EUMETSAT)
S-VISSR	Stretched VISSR
SWARM	Earth Observation mission (ESA)
SXI	Solar X-Ray Imager (GOES-12)
TANSO-CAI	Thermal And Near infrared Sensor for carbon Observations - Cloud and Aerosol imager
TANSO-FTS	Thermal And Near infrared Sensor for carbon Observations - Fourier Transform Spectrometer
TCDRs	Thematic Climate Data Records (
TERRA	Earth climate measuring satellite (NASA)
TD	Technical Document (WMO)
THORPEX	International global atmospheric R&D programme (WMO CAS)
TIGGE	THORPEX Interactive Grand Global Ensemble
TIROS	Television Infrared Observation Satellite
TMI	TRMM Microwave Imager
TOMS	Total Ozone Mapping Spectrometer (NASA)
TOR	Terms of Reference
TOU	Total Ozone Unit (FY-3, CMA)
TOVS	TIROS Operational Vertical Sounder
TPW	Total Precipitable Water (NOAA)
TRMM	Tropical Rainfall Measuring Mission (NASA, JAXA)
TTC	Telemetry Tracking Control
TPW	Total Precipitable Water
UARS	Upper Atmosphere Research Satellite (NASA)
U-MARF	United Meteorological Archive Retrieval Facility (EUMETSAT)
UHF	Ultra High Frequency

UK	United Kingdom
UMTS	Universal Mobile Telecom System
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNISPACE	United Nations Space Conference
UN-OOSA	UN Office of Outer Space Affairs
USA	United States of America
UPS	Unified Propulsion Subsystem
UTC	Universal Time Coordinated
UWB	Ultra Wide Band
VAS	VISSR Atmospheric Sounder
VGT	Vegetation
VHF	Very High Frequency
VHRR	Very High Resolution Radiometer
VIIRS	Visible Infrared Imaging Radiometer Suite
VIRSR	Visible and Infrared Scanning Radiometer (EPS)
VIS	Visible channel
VISITView	VL tool
VISSR	Visible and Infrared Spin Scan Radiometer
VL	Virtual Laboratory (training concept)
VL-FG	VL Focus Group Meeting
VLMG	Virtual Laboratory Management Group
VLSI	Very Large Scale Integrated circuit
VPN-PP	WIS Virtual Private Network Pilot Project
VTX	VHF transmitter (NOAA)
V&V	Verification and Validation
WALEX	WAter vapour Lidar EXperiment
WARC	World Administrative Radio Conference
WCRP	World Climate Research Programme (WMO/ IOC/ ICSU)
WCS	WMO Core Standards
WEFAX	Weather facsimile
WG	Working Group
WGCV	CEOS Working Group on Calibration and Validation
WGNE	Working Group on Numerical Experimentation
WHyCOS	World Hydrological Cycle Observing System (HWR, WMO)
WIS	WMO Information System
WMO	World Meteorological Organization
WP	Working Paper
WRC	World Radio Conference (ITU)
WV	Water Vapour
WVMW	Water Vapour Motion Winds
WWW	World Weather Watch (WMO)
X-ADC	Extended Atlantic Data Coverage
XRS	X-ray Spectrometer
Y2K	Year 2000 compatibility
ZAP	Z-axis Precession Mode (GOES)
ZAMG	Zentralanstalt für Meteorologie und Geodynamik (Austrian NMHS)