



Report from WG II (Satellite data and products)

JV Thomas, Xu Na
(Co-Chairs)

Paolo Ruti, Andrew Heidinger
(Rapporteurs)

Presented to CGMS-52 Plenary Session, agenda item 5.1

Status on Chairs and Rapporteurs

- JV Thomas - ISRO Confirmed Chair, to step down by CGMS53
- Dr. XU Na – CMA Confirmed Chair
- Andy Heidinger – NOAA Rapporteur
- Paolo M Ruti - EUMETSAT Rapporteur

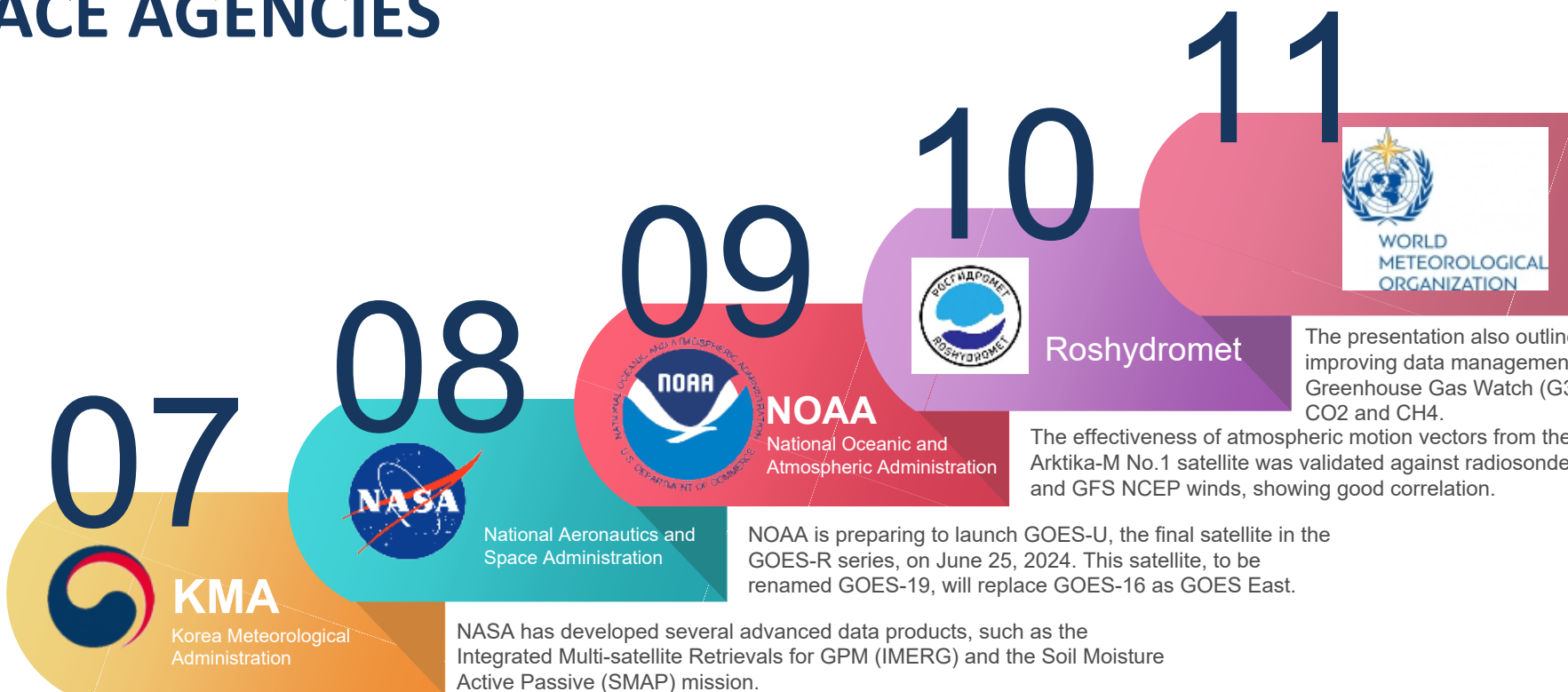
Co-chairs – Rapporteur status

ISWGs	Co-chairs	Rapporteur	Status
ICWG	Martin Stengel, DWD Kerry Meyer, NASA/Goddard	Andrew Heidinger/ NOAA	OK
IPWG	Takuji Kubota (JAXA), Chris Kummerow (Colorado State Univ., US)	Joseph Turk, NASA	OK
IROWG	Ulrich Foelsche/Univ. Graz Hui Shao/ JCSDA/UCAR	Tony Manucci/NASA	OK
ITWG	Fiona Smith, BoM Reima Eresmaa, FMI	Ms Lihang Zhou/NOAA	New rapporteur recommended by WGII to CGMS-52 plenary
IWWG	Iliana Genkova, NOAA Feng Lu, CMA	Jaime Daniels/NOAA	OK
IESWG	Sam Pullen, Clara Draper - NOAA Federal, Ben Ruston UCAR	Clara Draper - NOAA Federal	
WGClimate	Jeff Privette/NOAA (Chair) Dr Wenying Su/NASA (Vice Chair) Handover from Chair to Vice Chair will take place in November 2024.	Reporting done by Chair	WGII recommended Vincent-Henri Peuch, ECMWF, as new Vice-Chair pending endorsement by CGMS and CEOS plenaries
GSICS EP	Bojan Bojkov, EUMETSAT, (Chair)		GSICS EP to address the need for a CGMS rapporteur

HIGHLIGHTS FROM SPACE AGENCIES



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Utilizing model-simulated satellite images and AI-based detection algorithms to improve forecasting accuracy for events like typhoons and convective initiation.

Perspectives and updates - EO commercial sector

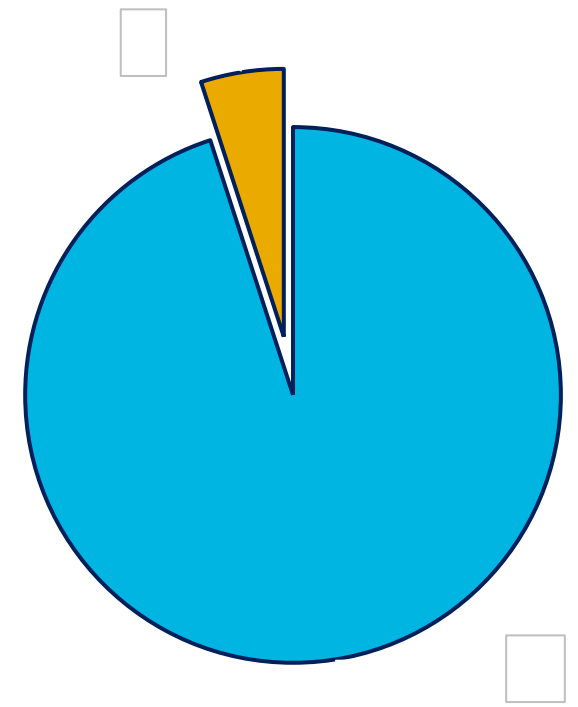
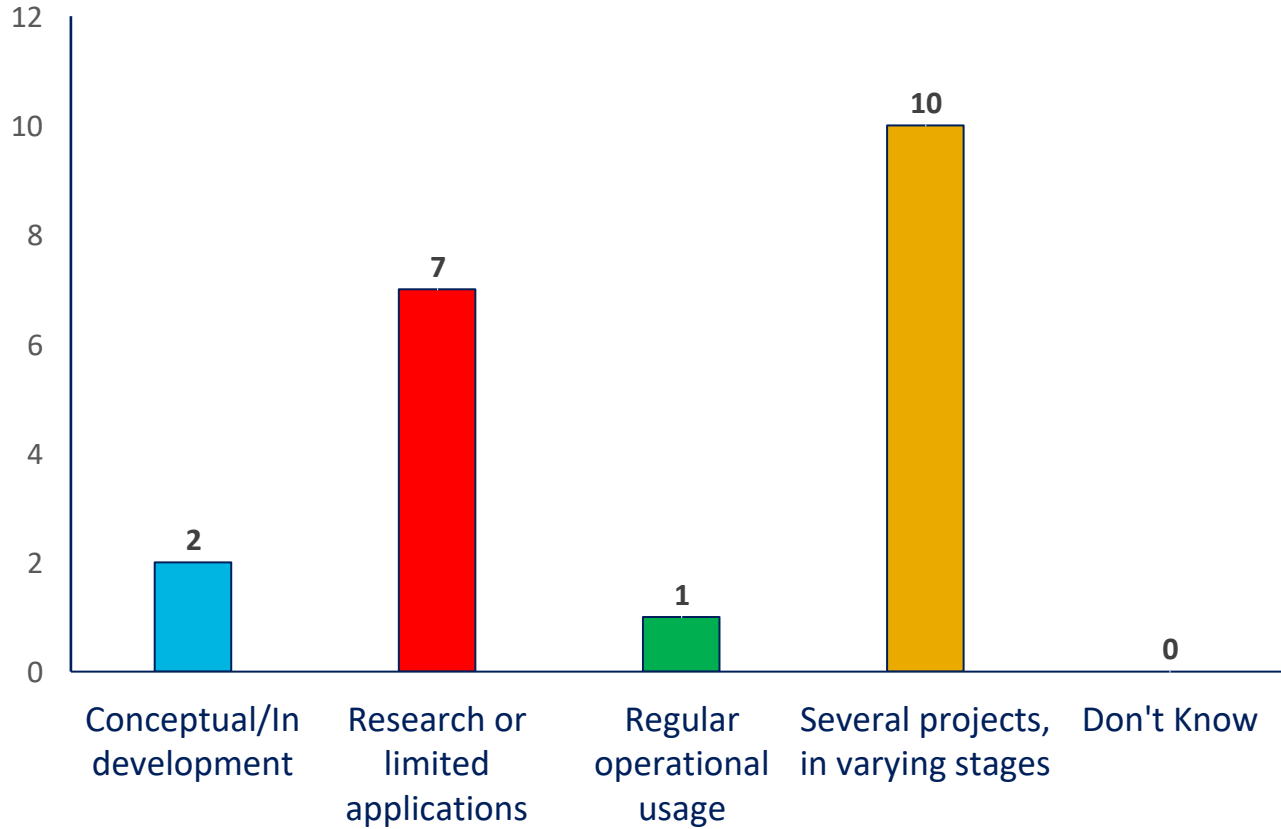
Perspectives and updates - EO commercial sector

1. **GNSS Radio Occultation (RO):** Successful pilot procurement and operational use by EUMETSAT and NOAA were highlighted, along with plans for future collaboration and data procurement. ROMEX important initiative to benchmark the future use of RO – US and Chinese private companies involved.
2. **GNSS-Reflectometry (GNSS-R):** The meeting discusses various players and their contributions to GNSS-R (NOAA and ESA). Assessment of GNSS-R data for Ocean is underway (ECMWF + UK MetOffice) – Soil moisture also under assessment – IROWG IWWG and IESWG important players to ensure assessment studies
3. **Microwave Sounding (MWS) and Greenhouse Gases (GHG):** ESA's involvement in MWS, also NOAA and NASA, including upcoming launches and new studies, is outlined. The active commercial sector's role in GHG monitoring and detection, including various international collaborations – ex. GHGSat just signed contract with Spire.
4. **Additional initiatives:** Indian private sector features the deployment of a satellite constellation with optical and SAR sensors for environmental, vessel monitoring, and insurance applications, beginning with the Dhruv mission in 2024, and aims to have 20 satellites for high revisit rates, including missions for hyperspectral data, deforestation, crop health, and climate change monitoring. In US, Space Weather Pilot involving PlanetIQ and Spire

AI – ML survey and updates

- As part of the CMGS future direction project, EUMETSAT in collaboration with AI/ML champion (XU Na, CMA) ran a survey gauging CGMS members' experiences with AI/ML and possibilities for future collaboration
- Results reveal that nearly all members are using AI/ML to some degree, though experiences differ
 - Members are applying AI to a broad spectrum of application areas, including satellite data applications, operations, ML-Ops, etc. but most projects remain in research or limited applications
 - Reported AI network architectures are consistent with earlier AI booms (e.g. CNN, Rand. Forest, RNN)
 - Members appear to be trying to build up internal expertise and experience, by acquiring additional computing and staffing resources, and shifting development and data preparation in-house
 - The most state-of-the-art AI technologies (GNNs, ChatBots, etc.) has only been modestly adapted by members, thus far
- On the topic of cooperation through CGMS, members highlighted a desire to share AI information with one another, as well as potentially other activities, notably data curation
 - Regarding data curation, members would like to see cooperation on much of the work of preparing datasets for training: selecting representative data, gap filling, formatting, labelling, etc.
 - Members are less interested in synthetically augmenting existing data
 - Members are also open to joint development of AI models and products, and tools to benchmark and compare them
- Several survey participants also pointed out the need for cooperation on topics such as the training of personnel and data accessibility for non-Space agencies

How would you characterize their usage?



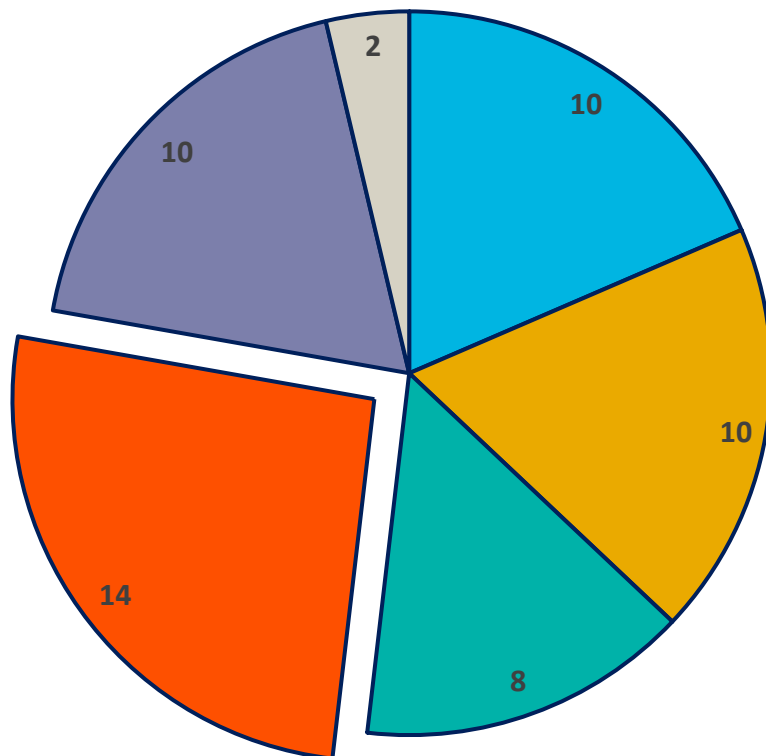
Nearly all members (95%) have on-going AI/ML projects

Unclear if the 'No' was in error, since n = 20 in the second question

Most agencies' projects (between 9-19) remain out of operational usage, for now

Which activities would you like to see cooperation on at the CGMS level? (Choose all that apply)

- Data Curation
- ML model development
- AI Product development
- Cooperation between agencies / Information sharing
- Creation of benchmarks (tools, datasets, etc.)
- Other



Information sharing is most requested CGMS action

Considerable numbers would also like to see joint actions on data curation, or model/product dev.

The 'Other' here is also interesting: a need to coordinate training of people to use AI/ML

Topics and actions to be discussed at the plenary include:

- Data curation activities to build best practices for AI readiness, considering also standards for data processing and formats.
 - Cooperation across international working groups on ML applications.
 - Specific collaborative projects, such as lightning prediction from geo-imagers.
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- Key areas warrant further discussion:
 1. Data quality considerations for satellite-based datasets for ML training.
 2. Standards for data Curation processing/formats
 3. Sharing information on ML retrieval algorithms.
 4. Ensuring the quality of AI/ML blended products and labeling them appropriately.

WG overview and recommendations

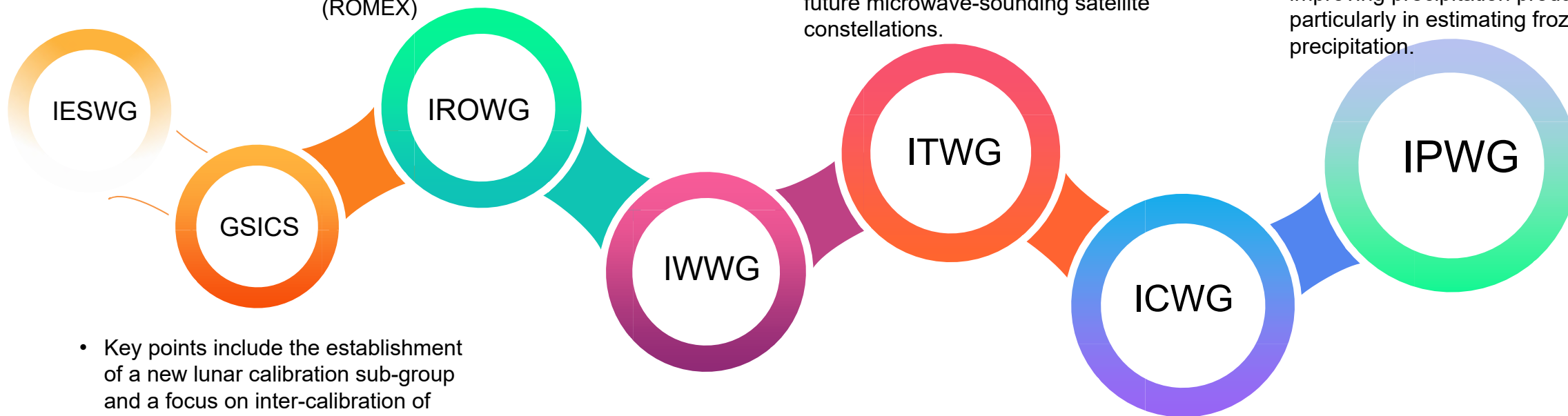
Coordination Group for Meteorological Satellites - CGMS

The IESWG continues to support the development of microwave radiative transfer models for complex surfaces and identifies Snow Water Equivalent measurements as a critical gap.

- IROWG-10 is scheduled for September 2024 in Boulder, Colorado, focusing on GNSS RO.
- RO Impact on NWP: Recent studies confirm the significant impact of RO data on numerical weather prediction (NWP8)
- Radio Occultation Modeling Experiment (ROMEX)

- Intersessional virtual meetings for various working groups (Advanced Sounders, Climate, Numerical Weather Prediction, etc.) are scheduled for June-July 2024.
- ITWG contributes to discussions on future hybrid space infrastructure and documents the performance and impact of current and future microwave-sounding satellite constellations.

- The Global Precipitation Measurement (GPM) mission's orbit boost extends its operations into the early 2030s.
- New radiometers with advanced capabilities are being launched by agencies.
- Growing use of AI/ML techniques is improving precipitation products, particularly in estimating frozen precipitation.



- Key points include the establishment of a new lunar calibration sub-group and a focus on inter-calibration of polarimeters within the VIS-NIR sub-group.
- The harmonization of GSICS coefficient reporting across agencies is under discussion, with recommendations to be presented at the CGMS-52 plenary session in June 2024.

- Key highlights include the progress in 3D Atmospheric Motion Vectors (AMVs) from hyperspectral IR sounders, recommendations for AMV producers and users, and the potential impacts of these winds on weather forecasting.

- Preparation for future cloud property intercomparison activities using the ISCCP-NG L1G dataset.
- Discussions on AI/ML approaches for cloud property retrievals, suggesting a new topical group for AI/ML in ICWG-4.

GSICS

- WG II acknowledges the significant work carried out by the Global Space-based Inter-Calibration System (GSICS) and fully supports its ongoing activities and newly proposed teams.
- Encourage GSICS and IPWG to interact on Cubesat intercalibration aspects

IROWG

- The International Radio Occultation Working Group (IROWG) strongly advocates for an open data policy towards purchasing commercial radio occultation (RO) data and recommends all agencies adopt this model. It emphasizes the importance of free and unrestricted access to essential RO data, including archived low-level data, with a preference for archiving raw (level 0) data.
- IROWG acknowledges the substantial capacity increase in commercial RO data providers. For instance, Chinese companies like Yunyao and Tianmu may soon produce over 100,000 profiles per day. The risk of losing this capacity underscores the need for agencies to consider acquiring this data while available.
- Based on current results from the ROMEX studies, IROWG stresses the necessity of maintaining uniform spatial and local time coverage for satellite mission planning. It proposes a modification to the current HLPP 1.2.9 statement to include providing 20,000 occultations per day with uniform spatial and local time coverage on a sustained basis.

ICWG and IWWG

- CGMS recommends that each space agency participate in the ICWG cloud product intercomparison using ISCCP-NG L1g data. It also encourages collaboration between the IWWG and ICWG to identify ISCCP-NG golden days that can make cloud height retrievals available for evaluation by the AMV community.

WG II

- WG II recognizes the substantial effort put forth by the international working groups and supports the sharing of best practices. Contributions have been provided by IROWG and IPWG. WG II endorses the following individuals:
- Clara Draper and Sam Pullen (NOAA) as the new co-chair and rapporteur of IESWG.
- Lihang Zhou (NOAA) as the new rapporteur of ITWG.
- Vincent-Henri Peuch (ECMWF) as the new vice-chair of the Joint WG on Climate.
- WG II acknowledges the significant societal impacts of G3W and the need for operational satellite information. It encourages G3W to prepare a short document for plenary to identify the added value and specific contributions from CGMS to G3W.

GEORing

CGMS requests that all relevant space agencies grant permission for their historic and current geostationary imager L1b data to be redistributed freely and without restrictions within the L1g data of the GEORing.

IESWG

IESWG has identified Snow Water Equivalent (SWE) as a critical observational gap. We recommend ongoing support for the Canadian Terrestrial Snow Mass Mission, which will deliver high resolution space-borne SWE measurements for the first time. The value of these data could be further enhanced for NWP and short-range hydrological applications with dedicated support for higher temporal frequency data dissemination.

Thanks