



Report of the 42nd Meeting of the
Coordinated Group for Meteorological Satellites

Parallel Working Group Sessions: Ad-hoc meeting on space weather report

AD-HOC MEETING ON SPACE WEATHER REPORT

Chair: Suzanne Hilding (NOAA)

Rapporteur: Jérôme Lafeuille (WMO)

The ad-hoc meeting on Space Weather convened on Wednesday, 21 May 2014.

The ad-hoc group (see list of participants in the CGMS-42 report Annex) reviewed the proposed Terms of Reference for CGMS Space Weather Activities (see below) and recommended their endorsement by the CGMS-42 plenary. The ad-hoc group further recommended that, at CGMS-43, space weather activities be addressed within Working Group III, Global Continuity and Contingency Planning.

Proposed Action: CGMS Members to establish an implementation team with the task of defining detailed objectives for the implementation of CGMS space weather activities as defined in the ToR. In particular, the implementation team should propose objectives to be included in the HLPP, for instance:

- i. Include space-based observation data space weather in WIS.
- ii. Define and implement a procedure for reporting on spacecraft anomalies caused by space weather.

As per CGMS Action 41.15, CGMS Members have nominated “points of contact to work with WMO/ICTSW in order to define jointly a procedure to improve the collection, availability, and use of satellite anomaly information.” The points of contacts are: "Xiaoxin Zhang and Jianguang Guo (CMA); Mike Williams (EUMETSAT); Yasushi Izumikawa (JMA); Inchul Shin (KMA); Elsayed R. Talaat (NASA); Jérôme Lafeuille (WMO). Since this joint work between satellite operators and space weather centres has not yet started, it is still time to nominate points of contact. It was therefore agreed that a reminder for Action 41.15 be resent by the CGMS Secretariat with a new due date of 30 September 2014, to allow CGMS satellite operators to join this team, or to validate or update their participation. (The action has been included in the list of CGMS-42 WG III actions and recommendations).

The following action was assigned to these points of contact for satellite anomaly information, in collaboration with WMO/ICTSW, to jointly define a procedure for reporting on spacecraft anomalies attributed to space weather, taking into account the guidance from the ad-hoc meeting on space weather (see below), in particular as concerns the content of information to be shared, the frequency of reporting, the practicality of information collection, and the use of this information.

In order to facilitate communication and collaboration, the following actions were agreed:

CGMS-42 actions – Ad hoc Space Weather for WG III						
Actionee	Action	#	Description	Deadline	Status	HLPP ref
WMO	Ad hoc space weather for WG III	A42.16	WMO to establish an e-mail list server for CGMS Space Weather activities (including CGMS members and associated organisations)	30 Sep 2014	OPEN	HLPP# 5.2.1
CGMS members	Ad hoc space weather for WG III	A42.17	CGMS Members interested in space weather activities to indicate to the CGMS Secretariat their points of contact for inclusion into the e-mailing list.	30 Sep 2014	OPEN	HLPP# 5.2.1

TERMS OF REFERENCE FOR CGMS SPACE WEATHER ACTIVITIES

Background

Considering the significant impact of Space Weather events on the integrity of spacecraft;

Recognizing the contribution of CGMS Members to Space Weather observation, e.g. in operating space environment monitors, solar imagers, and GNSS radio-occultation sensors;

Noting that the WMO Congress has recognized Space Weather as one area of activity of the WMO Space Programme;

Noting that the WMO Executive Council has highlighted the need for coordination to maintain the continuity of satellite-based solar, solar wind and other space weather measurements;

Noting that in spite of several international initiatives there is no established mechanism to coordinate global efforts for space-based Space Weather observation;

Recalling the CGMS High Level Priority Plan to “Establish a coordinated approach to the monitoring of space weather and the reporting of space weather-related spacecraft anomalies”;

The CGMS agreed at its 41st meeting to develop the Terms of Reference for future CGMS Space Weather activities.

CGMS objectives for Space Weather

The overarching goal of CGMS Space Weather activities is to support the continuity and integration of space-based observing capabilities for operational Space Weather products and services.

This includes:

1. Keeping abreast of major user interests in operational Space Weather products and services (e.g. for spacecraft operations, aviation, energy, disaster management) and the related

requirements for space-based observations that can be addressed by CGMS Members, in particular those space weather requirements expressed by WMO¹;

2. Evaluating existing operational space weather products and services in support of spacecraft operations, and recommending additional services as appropriate;
3. Encouraging Space Weather monitoring missions either through dedicated satellites or through hosting space weather payloads aboard weather and climate monitoring satellites as technically appropriate;
4. Supporting when relevant the dual use of sensors such as GNSS radio-occultation receivers that provide essential information for weather/climate monitoring and ionosphere monitoring;
5. Fostering orbit coordination, on-orbit sensor calibration and harmonisation of operational Space Weather sensors and data formats with a view to ensure interoperability and data consistency;
6. Reporting on spacecraft anomalies and sharing the results of anomaly resolution and analyses;
7. Pursuing global coordination of the operational Space Weather observing constellation, with a view to help sustain future observing capabilities as CGMS has done successfully for terrestrial weather and climate observations, encouraging complementarity, compatibility and possible mutual back-up in the event of system failure through cooperative mission planning,
8. Communicating on socio-economic benefits of space weather prediction with policy makers, the public, and the non-technical community.

Partnership

In pursuing these objectives, CGMS recognises the complementary roles of the activities of its members and other international organisations or initiatives such as the International Space Environment Service (ISES), and the Committee on Space Research (COSPAR) Panel on Space Weather. It promotes partnership with these initiatives with a view to optimize overall efforts.

¹ Currently ICTSW, established by CBS and CAeM

COLLECTION OF INFORMATION ON SPACECRAFT ANOMALIES CAUSED BY SPACE WEATHER

- **What is the purpose of sharing this information within CGMS?**

The main purpose of sharing spacecraft anomaly information is to provide feedback to space weather centres on the context and the extent of spacecraft anomalies, for verification of space weather forecasts, and to document climatology of space weather impacts on spacecraft.

Although detailed feedback on spacecraft anomalies is also essential for industry to understand spacecraft behaviour, and to improve spacecraft design and protection, this is not the driving requirement. Spacecraft anomalies are generally very satellite specific, and their technical details are best addressed either bilaterally between satellite operators and industry, or within IEEE in the context of the development of industry standards.

- **Detailed information is required in the CGMS-ICTSW template: Is all that information relevant for space weather analysts? Is such a level of detail necessary?**

It is recommended to keep the information simple. There is no evidence that the details on, for example, spacecraft coordinates and velocity are relevant for space weather forecasters. The template should be reviewed and simplified in discussion among space weather centres and CGMS satellite operators.

- **Is there any difficulty in sharing this information and making it public?**

CMA has no issue with the unrestricted sharing of information on its spacecraft anomalies.

JMA wishes to clarify that the scope of information to be shared is only those anomalies that are assumed to be caused by space weather events. Furthermore, this should only be considered after completion of the in-orbit testing phase.

NOAA has no issue with sharing information on its spacecraft anomalies.

KMA indicates that information on anomalies is collected by KARI, which is responsible for controlling the spacecraft, so it will consult KARI to check what information can be shared.

ROSCOSMOS confirms that spacecraft anomaly information is important and interesting for many parties. However, detailed information on spacecraft status and location is classified and thus cannot be shared.

- **How is the information going to be used? By whom?**

Clarification is required on whether it is sufficient to provide an annual report, or more frequent updates are necessary. On the one hand, it may take several months to analyse an anomaly and confirm that it is caused by space weather, but such a delay may be acceptable for climatology purposes. On the other hand, quick feedback on anomalies would be useful for forecasters for forecast validation purposes, and for operators to support operational response to anomalies. It is suggested to share the information with space weather centres as soon as the origin of the space weather is confirmed.

- **What will be the benefit for satellite operators?**

As a verification loop, providing feedback on space weather related anomalies would contribute to better confidence in the forecasts.

As concerns the detailed impact on spacecraft, there is little interest in anomalies occurring on satellites of other operators, unless they are correlated with anomalies on their own satellites. The main benefit is in helping to understand the status of the spacecraft. Satellite operators might not take operational decisions on the basis of space weather forecasts (as their reliability is not yet demonstrated with a sufficient level of confidence), but use space weather information to analyse anomalies a posteriori, identify the root cause and determine possible responses.

