



Report on the outcome of SWCG activities since last plenary

Presented to CGMS-50 plenary, agenda item 4.4

Introduction

Space Weather Coordination Group (SWCG)

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- Rapporteur: Andrew Monham (EUMETSAT)

Objectives of the Space Weather Coordination Group

- Coordinate space weather activities within and across CGMS working groups including space weather data, ensuring space weather operational measurements are incorporated into the CGMS baseline, relevant frequencies, anomaly resolution, products, knowledge, policy, etc.
- Address space weather topics relevant to CGMS that are not currently within the purview of other CGMS WGs
- Facilitate dialogue between CGMS members and space weather communities
- Identify which space weather organizations/forums the SWCG should interact with both as an active participant and/or engaging them within CGMS activities
- Identify needs and requirements from space weather communities that should be managed and coordinated by CGMS or its members
- Follow current and future international and domestic space weather policies which may have an effect on CGMS or its members
- Review the CGMS high level priorities related to space weather

SWCG Task Groups: Space Weather Inter-Calibration, Spacecraft Space Weather Anomaly Database, Space Weather Data Access, Ionospheric Radio Occultation System Optimisation

Overview of SWCG Sessions

SWCG Session: 17WPs

SWCG/2: 3rd CGMS risk assessment and baseline update -2WPs

SWCG/3: Updates on space-based observational capabilities -4WPs

- CMA, ESA, KMA, NOAA

SWCG/4: Updates on space weather activities -5WPs

- ESA, NASA, NICT, NOAA, WMO

SWCG/5: International space weather data user activities -2WPs

- ISES, ESA

SWCG/6: OSCAR review for space weather -1WP

SWCG/7: Task Group on space weather calibration -1WP

SWCG/9: Review and updating of the HLPP -2WPs

Joint WGI-WGIV-SWCG session: 7WPs

WGI-WGIV-SWCG/3: Benefits of space weather data usage for satellite operators and role of anomaly report database -3WPs

WGI-WGIV-SWCG/4: Requirements and feasibility of low latency RO data dissemination for space weather data users through direct broadcast -2WPs

WGI-WGIV-SWCG/5: Space Weather Data Access (outcome of User Survey) -1WP

WGI-WGIV-SWCG/6: Frequency-related topics in support to space weather -1WP

SWCG - Key Outcomes (1 of 4)

1. The updated CGMS Baseline aspects relevant to space weather were agreed, in particular:
 - a. Inclusion of hosted payloads where a commitment for continuity from a CGMS Member is made (*e.g.* ESA hosted payloads on commercial communications satellites).
 - b. Splitting of the baseline commitment for energetic particle sensors into different energy ranges (locations to be added prior to WGIII WG).

2. The CMA FY-3E LEO satellite continues with a space weather observation package including for the first time a Solar X-ray and Extreme Ultraviolet Imager. CGMS members are interested in data access for user applications and comparison purposes.

3. A broad range of ESA activities were presented including:
 - a. ESA Lagrange 5 mission, renamed "Vigil", is on track for launch in 2028, subject to approval in 2022, hosting a NOAA payload and a NASA payload is also under discussion.
 - b. Particle sensors are being embarked in LEO and GEO on EUMETSAT satellites as well as commercial satellites as hosted payloads.
 - c. Additional activities include definition of a LEO constellation of 16 nanosatellites carrying space weather payloads with a potential launch in 2026; and an auroral monitoring constellation with potential demonstration in 2027 and full deployment in 2030.

SWCG - Key Outcomes (2 of 4)

4. KMA has plans to continue and improve its space weather payload on GK2A Follow On satellite to be operational from 2029.

5. NOAA NESDIS is making good progress on the SWFO L1 mission, with launch as rideshare with NASA IMAP planned for 2025. Contingency measures to mitigate a potential gap due to the current reliance on ageing spacecraft at L1 are limited. Other developments include:

- a. GOES-18 Operational; first Compact CORonagraph (CCOR) integrated on GOES-U
- b. Established agreement with ESA on data sharing, potential ground-station and instrument cooperation
- c. COSMIC-2 space weather products available and TEC latency objective met
- d. NOAA establishing Space Weather Next Program to implement next generation space weather observations
- e. NOAA is planning to issue an RFP for commercial space weather data

6. NASA presented the broad scope of their activities including:

- a. The Heliophysics System Observatory, which together with partners comprises 20 operational spacecraft, 12 in formulation and 6 under study.
- b. The Hermes space weather instrument package in support of Gateway, a vital component of NASA's Artemis program, has been confirmed for flight.

SWCG - Key Outcomes (3 of 4)

7. NICT are continuing their operations as a member of ACFJ consortium, one of the ICAO's global center, and working on alert level definitions for spacecraft operations and the further development of the SECURES tool for real-time estimation of surface charging risk for GEO satellites.

8. NOAA Space Weather Prediction Center highlighted that Solar Cycle 25 has had a very active start and discussed the interaction with Starlink following the loss of 39 satellites due to prolonged low-level geomagnetic storm in early February 2022. SWPC are also fully engaged in the R2O O2R and modelling environment improvements, as well as providing ICAO support.

9. WMO reported activities based on the Four-year Plan for WMO's Coordination of Space Weather Activities 2020 - 2023 (FYP2020-23):

- a. WMO will be cooperating with ISES and COSPAR to improve international coordination of Space Weather activities.
- b. WMO has established an Expert Team on Space Weather (ET-SWx) with a broader mandate than the former IPT-SWeISS.
- c. WMO is preparing the establishment of core satellite data for Space Weather following the new WMO Unified Policy for the International Exchange of Earth System Data (Res. 1).

SWCG - Key Outcomes (4 of 4)

11. ISES reported on their activities and noted a need for rationalisation between various groupings, an effort which WMO have also identified as a priority as reported above.
12. The identification of services for space surveillance and tracking users was discussed by ESA which also links to some of the efforts under study at NOAA SWPC.
13. Progress is made on ensuring the correct structuring of space weather data within the WMO OSCAR database, including the implementation of data latency information.
14. A white paper for the inter-calibration of energetic particle sensors in GEO has been submitted to GSICS, but further interaction is required to formulate operational framework. The GSICS Executive Panel decided to form a sub-group on space weather instrument inter-calibration at their Annual Meeting and the outcome will be made to the CGMS Plenary.
15. The HLPP was updated following review of SWCG related matters. The revised HLPP will be presented to plenary for endorsement.

Joint WG I-WG IV-SWCG - Key Outcomes (1 of 2)

1. The Space Weather Spacecraft Anomaly Database Task Group

- Objective to allow an analysis of the impact of space weather on satellite systems to improve tools modelling space weather effects, spacecraft design robustness and support the spacecraft operations community with space weather warnings and improved post-event anomaly analysis.
- Issue concerning the lack of input data from CGMS Members has continued to be problematic.
- Actions relating to confidentiality concerns and workload have been identified which may help improve the situation.
- It is recommended to continue with the TG effort with these actions and decide prior to CGMS-51 whether sufficient progress has been made to justify the continuation of this TG effort.

2. Ionospheric Radio Occultation System Optimization Task Group

- Objective to improve Data Latency, Number of ionospheric measurement counts for the end-to-end system.
- IROWG and EUMETSAT ROM SAF experts are participating.
- COSMIC-2 has made substantial improvements to the data delivery latency.

Joint WG I-WG IV-SWCG - Key Outcomes (2 of 2)

3. Improving User Data Access to Space Weather Data from Orbital Sensors - TG proposed:

- Objective to identify and act on the needs of the operational Space Weather Service community, including consideration of both in-orbit sensor requirements, as well as improvements to data formats and ground segment data flows.
- TG will build on the on-going SWCG outreach activities to the operational space weather user community started in 2018, including surveys and organizing dedicated discussion forums at space weather workshops.

4. ITU Radio Regulations related to Space Weather

- It was noted that for the first time, the World Radiocommunications Conference 2023(WRC-23) will deal with space weather frequency related issues in 2 steps
 - WRC-23 : Preparatory studies
 - WRC-27 : Follow-on agenda item to establish regulatory conditions in the Radio Regulations in support of space weather observations