

# Topical Discussion Meeting report

Name of the meeting: Space Weather in the Vision for the WMO Integrated Global Observing System (WIGOS) in 2050

Convener/s:

Mpho Tshisaphungo, South African National Space Agency (Chair of the TDM)  
Jesse Andries, Royal Observatory of Belgium  
Joaquim Costa, Instituto Nacional De Pesquisas Espaciais (INPE)  
Kirsti Kauristie, Finnish Meteorological Institute

Secretary: Kirsti Kauristie

Date – Time – Room: Oct 30 – 13:30-14:40 - Miklagård

# of attendees (approximate): <20

Speakers:

Jesse Andries, Royal Observatory of Belgium  
Tiffany Day, Bureau of Meteorology (BoM), Australia  
Mamoru Ishii, National Institute of Information and Communications Technology (NICT), Japan  
Juha-Pekka Luntama, European Space Agency  
Andrew Monham, EUMETSAT

Form of TDM: Panel Forum

## Objective of the TDM

Originally the plan of TDM 11 was to review the first draft of the Vision for the World Meteorological Organization (WMO) Integrated Global Observing System (WIGOS) in 2050, but as the draft was not yet available for the meeting, discussions were conducted on a more general level. As a reference for interested readers, the current version of WIGOS vision can be found in [Vision for WIGOS in 2040 | World Meteorological Organization](#).

## Discussion highlights

Opening remarks:

Mpho Tshisaphungo gave an update on the status of space weather (SWx) under WMO. The Organization had in October an extraordinary Congress meeting where its financial situation was addressed. WMO is experiencing challenging times due to delays in the support of some Member countries. Congress discussed about re-organizations of WMO activities on the basis of a proposal by the Secretary General. The proposal included some cuts in the WMO Secretariat posts including that of the only SWx dedicated staff position in WMO. In addition, abolishment of all SWx activities was proposed in the document. Congress decided to cancel the decision about ending SWx activities, while the cuts in the Secretariat remained in force. The Executive Council of WMO was requested to establish a Task Force to discuss prioritization of programmatic items in view of the challenging budget situation. The Task Force is expected to present its first visions in summer 2026.

### Introductory presentations by the panelists:

Jesse Andries gave an overview of the WIGOS Vision 2050 preparatory work in WMO. The work was started already one year ago and the most recent workshop of the team composing the first draft took place in September. According to the current plan the first public draft of the Vision 2050 will be published in November 2026. It will be important to introduce SWx viewpoints throughout the document as a component of the WMO holistic picture of Earth Observing system. Until so far, SWx discussions in the Vision context have addressed mostly the space-based part which has three Subcomponents. Subcomponent 1 is the backbone system with a standardized orbit configuration and measurement approach. Subcomponent 2 is a supporting system for Subcomponent 1 with more flexibility for optimal implementation. Subcomponent 3 includes pathfinders and technology and science demonstrators. The structure of the surface-based component is still somewhat unclear in the new Vision. Detailed observable tables as were present in the current 2040 Vision will no longer be included and are replaced with more general level specifications in Vision 2050.

As an example of SWx integration to the current WMO observing system Tiffany Day described BoM experiences with the surface component of the WMO Observing Systems Capability Analysis and Review Tool (OSCAR). OSCAR is a web-based tool in which metadata is registered, managed and archived. BoM is maintaining a network of 11 stations which they have introduced to OSCAR during recent years. OSCAR surface has SWx in its domains, but the system has some features which may not be trivial to follow for all SWx data providers. As the first step one needs to contact the National Focal Point (NFP) to get a management account and WIGOS IDs for the stations to be integrated. NFP guidance will be valuable also when filling in the forms of the rather complex system covering several Earth Observation disciplines. In particular, it is important to set the Application Area and Program/Network affiliations to SWx for the station to ensure that SWx interested users will find it with the OSCAR search engine. After the station information has been established the data provider is asked to fill the metadata files which have the standardized WMO format. OSCAR/Surface has currently 125 SWx stations in its archives, which is a rather modest part of the instrumentation that WMO Member countries maintain. Obviously more coordination is needed to improve this situation.

Mamoru Ishii reported about a new coordination initiative among institutes and organizations promoting cooperation with ionosondes. The Global Ionosonde Observation/Operation Network (GION) has been established as a pilot project of the International Space Weather Coordination Forum (ISWCF, [International Space Weather Coordination Forum](#)). ISWCF was brought together as a joint effort of ISES, COSPAR and WMO who responded to the request of SWx coordination by the Expert Group on Space Weather under United Nations Committee on the Peaceful Uses of Outer Space. GION is an umbrella organization which consists of stakeholders, representatives and liaisons from already existing ionosonde organizations (e.g. URSI/INAG, GIRO and LISN). Topics discussed in GION include data sharing solutions (WMO Information System, WIS2.0 as an example), availability and archiving of metadata, data formats, inventory of instruments, and transition to next generation ionosondes. GION initiative was discussed also in TDM 15.

Andrew Monham gave a presentation about the activities of the Coordination Group of Meteorological Satellites (CGMS) whose main responsibility is to maintain and enhance the links between satellite operators and their data user communities. CGMS was established 50 years ago

and today it has representatives from >10 space agencies globally. CGMS has interests in SWx because many operators of meteorological satellites make also SWx observations. The Group maintains a recurrently updated Baseline Plan for satellite missions which is assumed to be compliant with the WMO Vision plans, particularly with Subcomponent 1. Space agencies contributing to the Baseline are committed with the agreed task division in satellite operations for the next 10 years which is the time horizon of the Baseline. Foreseen new SWx elements in the CGMS Baseline include the ESA Vigil mission and Radio-occultation data for ionospheric observations.

Juha-Pekka Luntama introduced some satellite missions which are not yet relevant for today's CGMS Baseline or WIGOS Vision subcomponent 1 but could be there in future. In ESSW discussions he has heard several times the message about a significant gap in heliospheric observations. Juha-Pekka revisited his previous presentation about ESA vision from 2020 on SWx satellite missions for 2025. The vision highlighted observations in the vicinity of Lagrange points L1, L5, L4 and L3 and above the solar polar regions. Today continuation of L1 observations is ensured (NOAA SWFO-L1, SOLAR-A/B) and L5 observations are under development (ESA Vigil). Korea AeroSpace Agency (KASA) is planning a L4 mission and first mission concepts for a L3 mission are under consideration. Juha-Pekka presented also a new interesting opportunity to monitor solar activity in the Sun-Earth line at a location closer to Sun (at 0.85-0.9 AU distance) than L1 (at 0.99 AU). This new capability can be offered with a satellite fleet on Distant Retrograde Orbits (DRO). Data by DRO satellites would increase lead time of solar wind observations with a factor of 10-15 when compared to today's L1 observations.

#### Questions and comments from the audience:

*When will the first draft of WMO Vision 2050 be published for community inputs?*

According to the best knowledge of Jesse Andries the draft will be published in early November. Most likely the draft will be delivered to the WMO SWx Expert Team, whose responsibility will be to circulate it further and collect the feedback. The plan is to collect feedback until Q1 2026 after which the Vision consolidation phase will start.

*Specifications of SWx stations in the OSCAR Surface are dispersed. Inconsistencies exist e.g. in the naming of observables. Shouldn't harmonization in the ontology be among the first steps in SWx integration to WIGOS?*

Jesse Andries acknowledged the value of standardized SWx ontology. The current situation is somewhat awkward because SWx community is asked to contribute to the vision for the evolution of the observing system while specifications of the current system for SWx observations is still largely missing in WMO documentation. Careful integration of SWx part in WIGOS with contributions to WIGOS Guide and Manual will take still some time and much more efforts, while input for the Vision is on a more general level and thus it hopefully can be composed in a shorter timeline.

*With the uncertain situation of SWx in WMO, is it wise to put effort in Vision which is far in the future?*

Jesse stressed the importance of SWx contributions WIGOS 2050 Vision. With the recent decision to continue SWx activities in WMO, it should be expected that the Vision will be intended to include

SWx elements. In that case it is important for the SWx community to make sure that these elements are representative of the views of the SWx community. Mature SWx specifications in the Vision will be an asset to advocate SWx continuation in WMO. Juha-Pekka supported Jesse's view and stressed the importance of Vision 2050 as input on SWx needs in the coordination work under CGMS. WMO-CGMS collaboration is an essential factor in cost-efficient maintenance and development of the space-based component in SWx services.

*It seems that the Earth as a platform for SWx observations does not get too much attention in WMO discussions. Why is that?*

Jesse, Juha-Pekka, and Andrew agreed with the comment. WIGOS Vision and its updates get visibility among satellite operators, while the situation is less clear with the community maintaining ground-based instruments. Andrew pointed out that one of the main purposes of the WIGOS Vision is to give a comprehensive view for the users on what can be expected from SWx observations in the future. In that context, surface-based observations are equally important as the space-based part. The large number of actors to be contacted for the surface-based component is a hurdle which complicates the planning efforts.

*Introducing ground-based SWx observations to WIGOS/OSCAR takes some effort like the example presented by BoM shows. What has motivated BoM to make that effort?*

The inclusion of space weather observations in the WIGOS vision will hopefully lead to more sustainable observations and consequently, more reliable and accurate space weather services for society's critical infrastructure. WMO is one of the very few organisations in the space weather ecosystem with a focus on operational standards for observations. The WIGOS vision and associated infrastructure such as OSCAR provides significant resources and expertise that can be leveraged by operational space weather centres and other actors in the space weather domain to undertake lifecycle planning for observing systems which is key component of long-term operational space weather services. Within the space weather ecosystem there are a number of observing networks created as part of research programs that have declined over time. Such networks, or sub-components of these networks, could be identified as key observations as part of the research programmes and subsequently included as key components of the global observing system for space weather, supporting their long-term viability.

Inclusion of space weather in the WIGOS vision will also lead to improved efficiencies in the space weather domain. Infrastructure such as OSCAR facilitates gap analyses such as those recently conducted for space-based Earth and space weather observations. Such gap analyses reviews observations based on need and helps understand where observations are meeting requirements or lacking, reducing duplication of effort where observations are unnecessary.

Inclusion of space weather in the WIGOS vision also provides the supporting infrastructure and standards to undertake critical reviews of progress against requirements through the setting of the various thresholds and goals in OSCAR, allowing the space weather community to understand whether we are making progress towards observing requirements.

## **Main conclusion of the meeting**

WMO is a global actor with strong record on standards and future development needs for coherence in activities by multiple actors. Therefore, the efforts to keep SWx alive in the WMO framework is considered worthwhile. In this context, the most urgent task in near future for the SWx community will be to study the first draft of the WIGOS 2050 Vision when it will be published in early November. Comments, additions, and corrections to the Vision can be sent to the members of the Expert Team of SWx ([Expert Team on Space Weather \(ET-SWx\) | World Meteorological Organization](#)) which will serve as the contact point toward WMO in the Vision updating work.

Inputs to the Vision can also be provided through an [online WMO questionnaire](#).