1. Outcomes of the 18th World Meteorological Congress

The 18th World Meteorological Congress (Cg-18) took place in Geneva June 3-14, 2019. More than 800 delegates from more than 140 countries participated in the event, with the main purpose of setting out the major directions for the work of the organization over the next four years.

One of the most significant decisions made by Cg-18 was to change the structure of the WMO technical commissions. Instead of the current eight commissions, there will be only two in the future, namely a Commission for Observation, Infrastructure and Information Systems (Infrastructure Commission) and a Commission for Weather, Climate, Water and Related Environmental Services and Applications (Services Commission). All technical aspects of WIGOS will be handled by the Infrastructure Commission, and in fact a large part of the inspiration behind the commission reform came from the successful experience with having all technical commissions represented in the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) over the past eight years. Specifically regarding the WIGOS discussion at Congress-18, four main elements need to be mentioned. First, the overall concept for the Global Basic Observing Network (GBON, see WIGOS Newsletter Vol. 5, no. 2) was approved. This is a very important milestone for WMO, since it represents a significant strengthening of WMO’s commitment to international exchange of observational data as a core principle of the organization. The new Infrastructure Commission will now be tasked with finalizing the regulatory material for GBON and will submit this material to the seventy-second session of the WMO Executive Council (EC-72) for its approval in June 2020.

Second, Congress approved the “Vision for WIGOS in 2040”. Under the leadership of ICG-WIGOS, this document had been in development since 2015, and it will now help guide the development of both surface- and space-based components of WIGOS over the next several years, and it will serve as a guide to users of observational data as well as to other interested stakeholders and decision-makers.

Third, a new approach to the assignment of WIGOS Station Identifiers (WSIs) needs to be mentioned. The intent of WIGOS is to have the observing system grow far beyond the scope of the Global Observing System (GOS) of the World Weather Watch, and in order to facilitate this, a larger number of stakeholders – also coming from outside the traditional constituency of National Meteorological and Hydrological Services (NMHSs) – will need to have access to core elements of the systems. Congress thus decided to grant authority to certain approved entities - representing either approved WMO observing programs or partner agencies - to register observing stations and assign to them WIGOS Station Identifiers directly, without going through the WMO Permanent Representatives first. This step is important, since it represents a strong signal of openness toward new contributors to WIGOS, and since it removes a significant obstacle to the overall growth of the system.

And finally, Congress was convinced that WIGOS is now ready to move on from its initial project phase, and therefore the decision was made to declare the system operational as basic WMO infrastructure per January 1, 2020. This might seem to be a mere formality, since some elements of the system have been operational for several years already. Nonetheless, this decision should be seen as a strong endorsement of the work of ICG-WIGOS and the entire community of experts working under it and under the individual technical commissions, and it clearly reflects the fact that many NMHSs have now come to depend on WIGOS for their daily work. That said, it is important to point out that even though the system may be considered operational, its implementation is nowhere near complete. Similar to other large-scale WMO endeavors, the system will have to continue to evolve and grow, and there is massive amount of work ahead, both on the individual WIGOS components and on their overall integration.

In summary, both via the decisions mentioned above, and during many discussions on the Congress floor as well as in the corridors outside the formal session, Congress provided a strong endorsement of WIGOS and the work undertaken so far. It is also clear that the expectations for the following operational phase are high...
2. WMO Global Cryosphere Watch (GCW) - Data Interoperability and Standardization of Observations: Data Access Made Easy (DAME)

Resolution 50 of Congress-18 has approved the pre-operational phase of the Global Cryosphere Watch (GCW), during the next financial period (2020-2023). GCW is developed as a cross-cutting activity for facilitating the availability of, and access to cryosphere data and information. To meet the needs of Earth system predictions, the access to additional, non-traditional sources of data is critical, including from stations and networks operated by institutions other than the National Meteorological and Hydrological Services. This is particularly true for the cryosphere data. Constraints like the diversity and heterogeneity of currently used metadata and data semantics, formats, and protocols, e.g. diversity of variable names, units, etc., are significant barriers, even when the data owners are willing to share their data. Therefore, standardization, timeliness, and interoperability of data and data systems, are important steps in achieving the goal of Earth system prediction. The mechanisms made available through WIGOS and the WMO Information System (WIS), provide the framework to achieve interoperability with non-traditional data sources. Successfully expanding access capabilities to new data sources has a positive impact on many applications, such as Numerical Weather Prediction data assimilation, as well as for quality controlled monitoring and research products.

GCW is working on overcoming this challenge, by establishing interoperable systems through the GCW Data Portal. To make diverse data sources of potentially uncontrolled quality, useful, the various datasets need to be converted to a common data format, adding standardized metadata aligned with the WIGOS Metadata Standard and WIS 2.0 with the possibility to add functions for quality control the accessed data. The proposed approach is relying on the application of the standard compliant NetCDF CF 1.6 with Attribute Convention for Data Discovery (ACDD - metadata file format, data formats, standard field names, and standard search metadata); the control and governance of terminology and semantics within these standards are recognized as a necessary next step. It also uses the standard compliant OpenDAP framework for data networking, which allows the GCW Data Portal to act as a client requesting data from servers of different data providers. Finally, the interoperability tool has at its core the MeteoIO open source pre-processing library, which reads data in its native format from each provider, and delivers a standardized dataset. The MeteoIO library, is being developed in collaboration with the Institute for Snow and Avalanche Research (SLF), Switzerland. Piloted by GCW with over 25% of the approved GCW stations, already, this data interoperability package will facilitate the development of the GCW Data Portal into a Data Collection or Production Centre (DCPC) within WIS, complementing the registration of all these stations in OSCAR/Surface, already under way.

Further work is needed to achieve the goal of interoperability, focusing on integrating parameter specific metadata (sensor height, sensor type...), handle multiple identical sensors (TA1, TA2…), handle “events” metadata time series (such as maintenance events), and prepare the foundation for, eventually, establishing a GCW component of the WIGOS Data Quality Monitoring System (WDQMS) for cryosphere observations. Governance, including of NetCDF CF 1.6 convention, remains an important topic, as it relates to semantics and terminology, data format metadata, and processing levels, etc.

More on MeteoIO library (Bavay, M., and T. Egger “MeteoIO 2.4.2: a preprocessing library for meteorological data” Geoscientific Model Development, 2014), is available at : https://models.slf.ch.

3. Outcomes from the RA II WIGOS Workshop - Regional WIGOS Centres in West Asia, 30 April-2 May 2019, Jeddah, Saudi Arabia

The WMO Regional Association II (RA II) Workshop on Regional WIGOS Centres (RWCs) for West Asia, was held in Jeddah, Saudi Arabia, from 30 April to 2 May 2019, at the kind invitation of the government of the Kingdom of Saudi Arabia and it was hosted by the General Authority for Meteorology and Environmental Protection (GAMEP) and co-organized by WMO Secretariat. The goals of the workshop were: to increase awareness of WIGOS for Members of West Asia, to review and further progress on establishing the RWCs in RA II, and the discussion of a coordination mechanism.

Representatives from five Members of West Asia (4 from RA II and one from RA VI), as well as representatives from two RWCs in RA II plus representatives from two candidates for RWCs, participated at the Workshop which was organized according to the following sessions: 1- Review of WIGOS Priority Areas, 2- Follow-up on the outcomes of the RA II WIGOS Workshop (Tokyo, March 2019), 3- National Implementation of WIGOS, 4- Regional WIGOS Centers in West Asia , 5- Summary and closing.
The Workshop agreed on a set of recommendations that are summarized in its Final Report.

Participants at the RA II WIGOS Workshop on RWCs for West Asia, 30 April-2 May 2019, Jeddah, Saudi Arabia

The CGMS endorsement means that the CGMS agencies are committed to assign resources to the deployment of the satellite systems outlined as the so-called Group 1 in the Vision, and to deploy additional systems as necessary to deliver more and better observations to all WMO application areas. This includes monitoring Greenhouse Gases and Climate Change in response to GCOS requirements in support of the implementation of the Paris Agreement.

CGMS-47 endorsed a draft resolution on the status of the architecture for climate monitoring from space, which was subsequently endorsed by Cg-18 and which aims to establish an operational climate monitoring capability in support of the Paris Climate Change agreement, based on the observational requirements established by the GCOS.

WMO presented the plans for the Global Basic Observing Network, which represents a substantial strengthening of the international exchange of surface-based observational data required for global Numerical Weather Prediction (NWP) and climate analysis. This was deemed to be of high relevance also to CGMS, and the group discussed ways in which it might offer an analogous commitment to WMO regarding continued open and unrestricted access to critical satellite data in support of global NWP.

WMO reported on the achievements under the Four-year Plan for WMO’s Coordination of Space Weather Activities 2016-2019 (FYP2016-19) and presented the new “Four-year Plan for WMO Activities Related to Space Weather (FYP2020-23)”.

With regard to the growing and changing role of the private sector in the global weather enterprise, the emerging WMO policy framework for public-private sector engagement was discussed.

Other important issues were brought to the attention of the Plenary, including:

- The coordination of CGMS activities with the WMO Information System,
- Applications for agricultural meteorology,
- The harmonization of rapid scan services provided by a number of satellite operators in support of the tropical cyclone community,
- Needs for satellite-based bathymetry,
- The WMO-CGMS Virtual Laboratory for education and training in satellite meteorology and plans for capacity development, in particular in developing countries, to promote the use of satellite data and products in support of implementing global development agendas.

The discussions at CGMS-47 demonstrated the continued strong collaboration between CGMS and WMO, which is essential for the operational implementation of the space-based observing system component of WIGOS.

4. Outcomes of the 47th Session of the Coordination Group for Meteorological Satellites (CGMS-47)

The space-based observing system is essential to the generation of weather, water and climate-related services and to support decision-making in a number of economic areas. Since 1972 the Coordination Group on Meteorological Satellites (CGMS, see https://www.cgms-info.org/) has coordinated those activities of the space agencies that actively support operational weather forecasting, climate monitoring and other WMO application areas.

The 47th Session of the CGMS was hosted by Roshydromet and Roscosmos and held in Sochi, Russian Federation, from 19 to 24 May 2019. WMO, represented by the Observing and Information Systems Department through its Space Programme, by the WMO Integrated Global Observing System (WIGOS) and as co-sponsor of the Global Climate Observing System (GCOS), participated in CGMS-47.

WMO actively contributed to the work of all CGMS Working Groups:

- WG I: Satellite Systems and Operations
- WG II: Satellite Data and Products
- WG III: Operational Continuity & Contingency Planning
- WG IV: Data Access and End User Support
- Space Weather Coordination Group (SWCG)

A total of 27 working papers and presentations on topics related to WMO work were presented and a WMO dedicated session (Session 3) was held during the CGMS Plenary (see https://www.cgms-info.org/agendas/agendas/CGMS-47).

CGMS-47 endorsed the draft Vision for WIGOS in 2040 (subsequently approved by the 18th World Meteorological Congress, Cg-18). This document represents WMO’s long-term vision of the observing system, and is intended to help guide the development of both space-based and surface-based components of WIGOS in the coming years.
5. OSCAR/Surface related activities

OSCAR/Surface new release

A new release (version: 1.5.1) of OSCAR/Surface platform is out! One major change is the possibility to filter the search and the map by operating status of the stations. The operating status of a station can be “Declared” (i.e. by the Members) or “Calculated” (i.e. according to the WIGOS Data Quality Monitoring System – WDQMS). Because a station may be affiliated with more than one programme/network, the overall declared operating status of a station to be shown by OSCAR/Surface in the search and on the map, is obtained from its status in the programs/networks that the station is affiliated with. Stations that are “Operational” or “Partly operational” in at least one program/network are then shown as “Operational” or “Partly operational”. In the case of a station that is “Closed” or “Unknown” in all programs/networks it will then be shown as “Closed” or “Unknown”. Stations with the status “non-reporting”, “planned” or “standby” in their programs/networks, will be shown as “Silent”. By default, only the stations with “Operational”, “Partly operational” and “Unknown” status are shown on the map. The stations with (overall) operating status “Closed” and “Silent” can be added to the map by checking the tickboxes under reporting status.

A new user manual for OSCAR/Surface with all new features including a documentation on the API will be uploaded soon in the WMO library (https://library.wmo.int/).

OSCAR/Surface training events

There are further OSCAR/Surface training events planned for this year for those countries in RA II and RA VI that have not yet received training. After completing these events we will have nearly captured the whole globe (see Figure). After our journey around the world the training will be more focused on the learning platform Moodle (https://etrp.wmo.int/course/view.php?id=146), where you can already find some online training materials, recordings of the OSCAR/Surface webinars, our blog and the forum - in near future tutorial videos and other interactive learning materials will also become available.

6. Outcomes from the GCOS Reference Upper-Air Network 11th Implementation Coordination Meeting, 20-24 May 2019, Singapore

The GCOS Reference Upper-Air Network (GRUAN) 11th Implementation Coordination Meeting (ICM-11) took place in Singapore from 20-24 May 2019, hosted by the Meteorological Service of Singapore (MSS). The goal of the meeting was to review progress and address identified issues with the implementation of GRUAN. The meeting focused on new data products and operational concerns. The highest priority action decided during the meeting is to complete the production of the first full version of the RS41 GRUAN Data Product (GDP). Other actions are meant to progress new GRUAN data products (GDPs), e.g. for Meisei RS-11G and IMS-100 radiosondes, Modem sonde, Integrated Water Vapor from Global Navigation Satellite Systems (GNSS-IWV), lidar and frostpoint hygrometers, and to document the various aspects of the RS92 to RS41 transition. The report of the meeting will be available shortly.

Participants to the GRUAN 11th ICM, 20-24 May 2019, Singapore

Radiosoundings performed at the Singapore site fulfill the requirements for reference data quality, and during the meeting GRUAN certified the Singapore GRUAN radiosounding program.
7. WIGOS Related Events/Meetings

7.1 Recent Events/Meetings

- Meeting of the Scientific Advisory Group for Ozone and Solar UV Radiation 6-9 May 2019, Geneva, Switzerland
- 19th Meeting of the Commission for Basic Systems Management Group (CBS-MG-19), 13-16 May 2019, Geneva, Switzerland
- 11th GRUAN annual Implementation and Coordination Meeting ICM-11, 20-24 May 2019, Singapore
- Eighteenth World Meteorological Congress (Cg-18), 3-14 June 2019, Geneva, Switzerland
- Seventy-first session of the Executive Council (EC-71), 17-19 June 2019, Geneva, Switzerland
- XIV Intercomparison campaign of the Regional Brewer Calibration Center-Europe, 17-28 June 2019, and 17th WMO-GAW Brewer operator course, 17-21 June 2019, Huelva, Spain
- WMO Workshop on Use of Unmanned Aerial Vehicles (UAV) for Operational Meteorology, 2-4 July 2019, Toulouse, France
- GCW Snow Watch Team Third meeting, 17-19 July 2019, Montreal Canada
- Training on Air Quality Observation, 21-23 May 2019, Dakar, Senegal

7.2 Coming Events/Meetings

- Weather and Climate Observation Infrastructure Workshop, 18-19 July 2019, Geneva, Switzerland
- Session of the Task Team on the Global Information System Centre (TT-GISC), 26-29 August 2019, Offenbach, Germany
- Biennial WMO/IAEA meeting on Carbon Dioxide, other greenhouse gases and related tracer measurement techniques (GGMT-19), 1-6 September 2019, Jeju Island, Republic of Korea
- 11th Meeting of the Committee on Earth Observation Satellites/Coordination Group on Meteorological Satellites (CEOS)/CGMS Working Group on Climate (WG-Climate-11), 4-6 September 2019, Anchorage, US
- CEOS 2019 Strategic Implementation Team (SIT) Technical Workshop, 9-12 September, Fairbanks, US
- Fourth Data Buoy Cooperation Panel (DBCP) Pacific Islands Training Workshop on Ocean Observations and Data Applications, 13-16 September 2019, Honolulu, Hawaii, USA
- OceanObs’19 Conference, 16-20 September 2019, Honolulu, Hawaii, USA
- 8th Session of the Task Team on Aviation XML (TT-AvXML-8) 16-18 September 2019, Exeter, UK
- Workshop on Network Common Data Form (NetCDF) Climate and Forecast (CF) Metadata Conventions for WMO Data Exchange, 19-20 September 2019, Exeter, United Kingdom
- International Radio Occultation Working Group (IROWG) 2019 Meeting, 19-25 September 2019, Konventum, Helsingor, Denmark
- Workshop on WICAP and Meeting of the RA V Task Team on Aircraft-Based Observations, 24-26 September 2019, Singapore
- RAII/RAV Satellite Data Requirements Group Meetings and Joint AMS/NOOA/EUMETSAT User Conference, 27 September-6 October, Boston, US
- Regional Association III Workshop on Regional WIGOS Centres and WIGOS Station Identifiers, 1-4 October 2019, Montevideo, Uruguay
- Thirty-seventh training session of the Global Atmosphere Watch Training and Education Centre (GAWTEC 37) on Total Atmospheric Deposition, 13-26 October 2019, Zugspitze, Germany
- Southern African Dobson Intercomparison, 7-18 October 2019, Irene, South Africa
- OSCAR/Surface training event for RA VI (tentative), 8-10 October 2019
- 33rd CEOS Plenary, 14-16 October 2019, Ha Noi, Vietnam
- Data Buoy Cooperation Panel (DBCP) Executive Board Meeting, 14 October 2019, and 35th Session of JCOMM Data Buoy Cooperation Panel (DBCP-35), 15-18 October 2019, Geneva, Switzerland
- Second session of the ICG-WIGOS Task Team on WIGOS Station Identifiers (TT-WSI-2) (tentative), 15-17 October 2019, place to be defined
- Back to back sessions of the ICG-WIGOS Task Team on OSCAR Development (TT-OD) and Task Team on WIGOS Metadata (TT-WMD), 28 October-1 November 2019 (tentative), place to be defined
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