World Meteorological Organization

WMO Integrated Global Observing System
WIGOS NEWSLETTER

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1. From the Co-President of the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM), Johan Stander and from the JCOMM Observations Programme Area (OPA) Vice-Chair, Jon Turton

Marine Meteorological Services have been an important aspect of the global meteorological community since the earliest meteorological services in the mid-1800s.
When it comes to the weather and climate, the man on the street mostly thinks about what is happening in the atmosphere, however there is a much bigger picture to look at and that is our oceans and we simply cannot ignore this piece of the puzzle. The oceans cover more than 70 per cent of the Earth's surface and are a major driver of the world's weather and climate, through the ocean circulations that redistribute heat, their capacity to store heat and influence on the global water cycle.

It has to be noted that ocean applications, including marine weather forecasts, wave forecasting, storm surge and coastal inundation prediction, ocean mesoscale forecasts and tsunami monitoring, are critical to address socio-economical benefits such as maritime safety, maritime transport optimization, port construction and operations, tourism, marine pollution prevention and emergency response, as well as coastal environment protection.

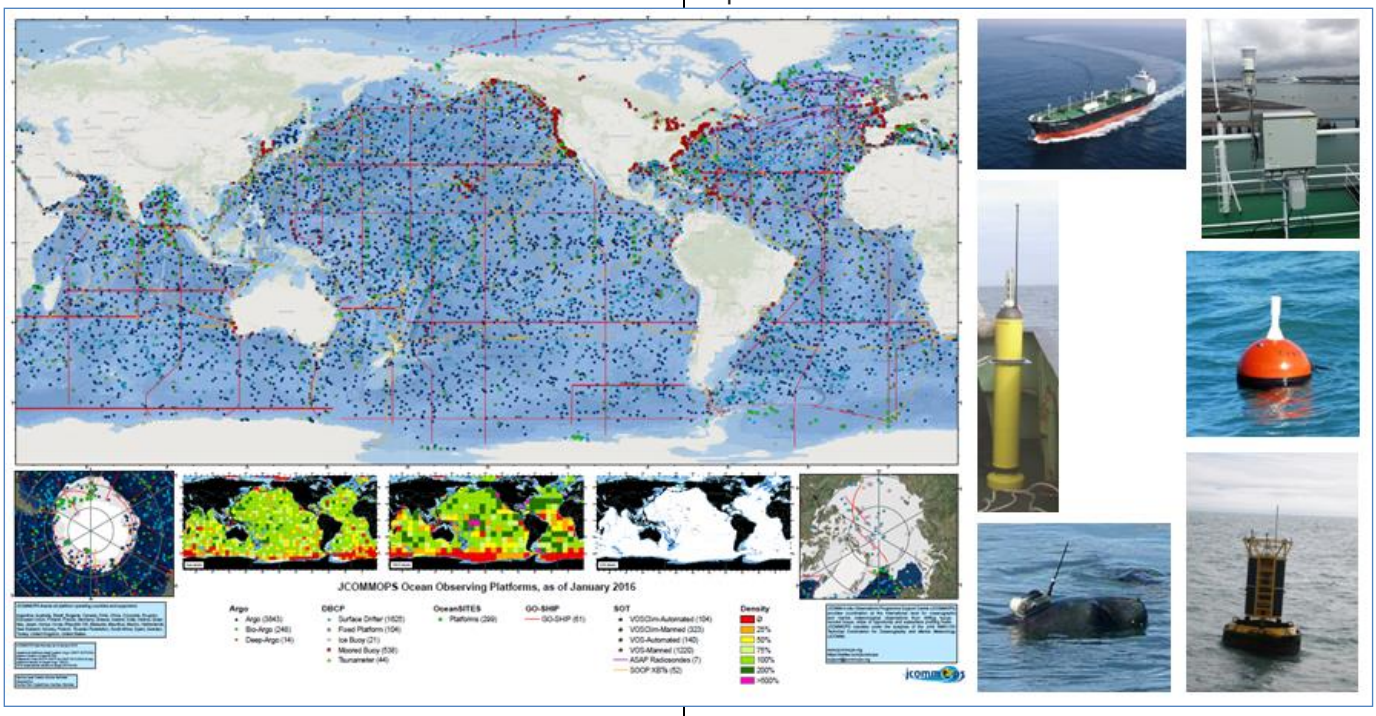
The WMO-IOC Joint Commission for Oceanography and Marine Meteorology (JCOMM) is responsible for coordinating worldwide marine meteorological and oceanographic services and their supporting observational, data management and capacity building programmes. It has three programme areas: Services and Forecasting Systems (SFSPA), Observations (OPA) and Data Management (DMPA), with participation from National Meteorological and Hydrological Services (NMHS), oceanographic and marine institutions and laboratories. Marine and ocean observations underpin all JCOMM services and are a key part of the Global Climate Observing System (GCOS) and to the WMO Integrated Global Observing System (WIGOS).

JCOMM promotes partnership between oceanographic institutes and operational meteorological agencies. The former are primarily addressing the oceanographic and climate research requirements for sustained observations, while the latter are primarily addressing the requirements for ocean applications, and each complements the other. Such collaboration has been and continues to be effective, while efforts continue to be made to ensure sustainability of the research component and to ensure stronger commitments from the national meteorological services towards addressing the ocean applications requirements.

JCOMM observations include JCOMM 'owned' networks: ship observations (VOS, SOOP, ASAP) under the Ship Observations Team (SOT), data buoy observations (global drifter array, tropical moored buoy array, national/coastal moored buoy networks, high latitude (Arctic/Antarctic) buoys, tsunami buoys) under the Data Buoy Cooperation Panel (DBCP) and the Global Sea Level Observing System (GLOSS) global tide gauge network. Partner networks associated with JCOMM are the Argo (global profiling float array), OceanSITES network of fixed point reference sites and the GO-SHIP repeat hydrography programme. The JCOMM OPA is also reaching out to embrace the glider, animal-borne sensor and HF radar communities in order to deliver more comprehensive observations of both physical and bio-geochemical variables.

From the Co-President of JCOMM, Johan Stander and from the JCOMM OPA Vice-Chair, Jon Turton (Cont.)

An important development is the redesign of the Tropical Pacific Observing System through the TPOS2020 project. The design of which is based on variable requirements with seamless consideration of satellite and in situ approaches, and their evolving roles. Key recommendations have been made on satellite contributions and in situ calibration, reconfiguring the mooring array, and doubling Argo coverage in the tropical Pacific region. TPOS2020 cuts across many networks and regions and was adopted in January 2017 as a WIGOS Pilot Project.



The OPA's role includes coordinating technical aspects (e.g. standards, best practices, data flow monitoring) of the above elements of the global ocean observing system, and it is now looking across the Standards and Best Practices documentation that have been developed by the individual networks with a view to identify gaps, synergies and provide more complete and coherent documentation.

The JCOMM in situ Observations Programme Support centre (JCOMMOPS) provides a one-stop shop for assistance to operators in the implementation and deployment of the observing networks, supporting data (and metadata) exchange and on monitoring the status of the networks. In the last year many of the networks have reviewed their targets and developed KPIs (Key Performance Indicators), which are now being used by JCOMMOPS to provide regular reports on the status of the marine/ocean observing system. The intention is to expand this to develop variable based metrics across the whole observing system. JCOMMOPS has a key role in providing a single consolidated interface for marine/ocean observing related metadata to be provided to the OSCAR/Surface tool, where an important task for JCOMMOPS will be to ensure that the metadata for the various networks are compliant with the WIGOS Metadata Standard.

Over the years the individual JCOMM observing networks have developed their own data processing and management systems with differing levels of capability (QC, data access, metadata, etc). Argo is providing the model for the newer and emerging networks (e.g. OceanSITES and gliders) as it has both an efficient real-time data delivery system (to both the GTS and two Global data Assembly Centres (GDACs)) for operational users and a delayed-mode data stream for research users. It will be important to bring all the networks up to the Argo standard. As only NMHSs have direct access to the GTS, JCOMM is running an Open Access GTS Pilot Project which will help partner organizations to improve access and to insert data onto the GTS.

The Open Geospatial Consortium (OCG) is also encouraging the use of the Environmental Research Division's Data Access Program (US NOAA, ERDDAP) web tools for integrating data and generating variable based products. A JCOMM data management strategy is presently being developed which will be submitted to the JCOMM 5 Session meeting in October 2017 for approval.

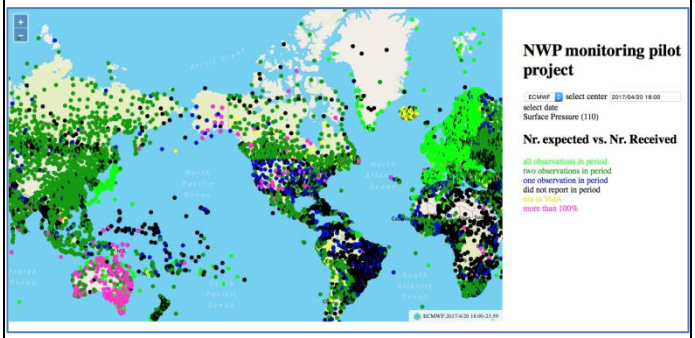
2. Outcomes of ICG-WIGOS-6, Geneva, Switzerland, 12-14 January 2017

The Sixth session of the Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS-6) was held at the WMO Secretariat in Geneva, Switzerland, from 12 to 14 January 2017. The session was co-chaired by Dr Sue Barrell (Australia), Co-Chair of ICG-WIGOS and Vice President of CBS, and Prof Bertrand Calpini, Co-Chair of ICG-WIGOS and President of CIMO, and it had representation from all Technical Commissions and all Regional Associations.

The main tasks for this session were to (i) review the progress made in the development of the Observing System Capabilities Analysis and Review tool (OSCAR) and the WIGOS Data Quality Monitoring System (WDQMS), (ii) review the work of the recently established Task Team on WIGOS Data Partnership (TT-WDP), and (iii) to make further progress toward establishing Regional WIGOS Centers in pilot mode in all WMO Regions.

OSCAR/Surface was deployed in operations in May 2016, and while the system is generally robust and fully functional, much remains to be done in terms of operational uptake by all Members. The two most important tasks needed to support this effort are completion of the machine-to-machine interface and additional education and training. The former will allow larger Members with existing electronic station inventories to easily upload all required WIGOS metadata in OSCAR, and the latter is required to support the vertical integration of OSCAR into the daily work of the NMHSs. OSCAR/Space is now a well-established and widely used reference regarding satellite-based capabilities in meteorology and related areas, and with the launch of Version 2.0 in June 2016, the system has become even stronger than before (see separate article below).

The WDQMS has progressed very well in two areas, a pilot project based on monitoring results from global Numerical Weather Prediction (NWP) centres and a demonstration project involving two Members from Region I. Thanks to the NWP-based pilot project we can now display data coverage in near-real time with a 6-hour granularity based on input provided by the European Centre for Medium range Weather Forecasts (ECMWF), the United States Nacional Centre for Environmental Prediction (NCEP), the Japan Meteorological Agency (JMA) and the German Weather Service (DWD) (Figure).



WDQMS Web-tool prototype

This is an extremely important diagnostic of WIGOS and WIS combined, and in due time it will be complemented also with data quality diagnostics. Discussions about how to transform this into an operational capability are ongoing. The RA-I demonstration project is focusing on using availability and quality information provided by the NWP centers to take corrective action in the operation of observing stations when needed.

The initial project phase ended in November 2016, but given the lack of enough results about the monitoring of data quality, especially from upper-air observations, it was decided to extend the project into 2017. The two projects so far are dealing with weather data only. A WDQMS integration workshop will take place in Geneva in June, with the aim of making progress toward integrating existing monitoring activities for observations related to climate, hydrology, atmospheric composition and the cryosphere into the overall system concept.

A Regional WIGOS Center operating in pilot mode has been established under the auspices of the EUMETNET Composite Observing System (EUCOS) activity hosted by DWD in Offenbach that were already largely in line with the plans for WIGOS. With formal agreement by the European Meteorological Services Network (EUMETNET) General Assembly, the EUCOS activities have been slightly expanded to accommodate the WIGOS requirements for all of Region VI. During the rest of 2017 and 2018 Regional WIGOS Center implementation workshops are planned to take place in all WMO regions to explore the possibility of establishing similar activities elsewhere.

3. The International Cloud Atlas (ICA). Debut of its revised web edition

The International Cloud Atlas, Manual on the Observation of Clouds and Other Meteors (WMO-No. 407), or ICA for short, has many purposes, but fundamental is its role as the source of advice and mandatory instructions for cloud observing and reporting as part of the WIGOS. Mandatory instructions of the ICA comprise Annex I to the Technical Regulations (WMO-No. 49) and have the Regulatory status of standard practices and procedures.

The new ICA edition made its debut on World Meteorological Day (23 March) 2017. Unlike the prior edition, which was a print edition dating to 1975 (Vol. I) and 1987 (Vol. II), the ICA is now electronic – it is an open-access website available at: www.wmocloudatlas.org.

Under the Commission for Instruments and Methods of Observation (CIMO), a Task Team worked for the past four years to completely revise the content, format, and style of the ICA. Historical continuity was maintained even as obsolete observing instructions were removed. The most significant changes for observers are additions to the classification scheme, a greatly expanded set of photographic examples and explanations, and the ability to compare pairs of images side-by-side. New classifications are added, but no previous ones are removed. Information is greatly expanded in the areas of upper atmospheric clouds, several areas of meteors other than clouds (lithometers, electrometeors, photometeors), the addition of a Glossary, and with a more accurate pictorial cloud classification Decision Aid diagram.

Cloud classification uses a hierarchical scheme of Latin naming, beginning with 10 cloud Genera (for example Cirrostratus or Altocumulus), followed by Species, Varieties, and Supplementary Features and Accessory Clouds. In addition, cloud classifications can include a genitus (mother cloud) or mutatus (cloud type from which the cloud evolved) suffix.

No changes were made at the fundamental level of Genera, but one new cloud species has been added, as well as five new supplementary features, one new accessory cloud, and five new special clouds. The highest-level change is the new species volutus (Figure), which occurs within the genera Altocumulus and Stratocumulus. It describes a long, typically low, horizontal, detached tube-shaped cloud mass that often appears to roll slowly about a horizontal axis. The Australian "morning glory" cloud is a non-convective example of this species. The new supplementary feature asperitas also generated much attention, and was proposed to WMO by the Cloud Appreciation Society. Other ICA additions, given formal names as supplementary features or accessory clouds, are the fluctus (Kelvin-Helmholtz wave), cauda (tail-shaped cloud), murus (wall cloud), and flumen (beaver's tail). There are also four new genitus and one mutatus. See the new ICA edition and its Glossary for definitions, examples, and wonderful illustrations.

Stratocumulus volutus (St Brelade, Jersey)

WMO codes C_L, C_M and C_H, which are used for the international exchange of cloud observational data are defined and explained in the Atlas. For example, C_L=1 indicates Cumulus humilis (little vertical extent and seemingly flattened) or Cumulus fractus (ragged) clouds of dry weather or both; while C_H=7 indicates Cirrostratus covering the whole sky.

A major effort of the revision was selecting and describing over 600 photographic images. These were chosen from thousands of submissions from around the world to illustrate clouds and other meteors in a variety of settings and situations. Clouds can appear quite different depending on climate zone. Each image is accompanied by a detailed description, sometimes with annotation pointing to specific features, and many images were supplemented by metadata such as synoptic maps and vertical soundings.

The ICA encompasses much more than clouds. Its content covering meteors other than clouds has been greatly expanded. For example, snow devil (Figure) and steam devil have been added to the hydrometeors, together with details regarding types of tornadoes. The optical phenomena (photometeors) have been thoroughly expanded with illustrations of various types of halo phenomena, rainbows and mirages. Upper atmospheric electrometeors known as "sprites" and "jets" - not yet discovered when the previous edition was published - have also now been added.

Snow devil (near Abraham Lake, Alberta, Canada)

Another major effort was to update the style of language. Although regulatory wording is not changed, most other sentences were. Some of the writing had not been updated since the 1939 edition or even earlier, and common use of language has certainly changed over the past century.

It is expected that the ICA will be made available as an e-book later this year, to enable its use in remote areas with limited/no internet connection. For the moment, the Atlas is available only in English, but consultations on its possible translation in all WMO languages are undergoing.

Cloud observations by human observers are an important element of the WIGOS. This new edition of the ICA makes cloud identification easier and reporting more accurate. CIMO and the task team are proud that this updated ICA will enable the worldwide consistency and clear communication of cloud observations that is essential to meteorology and scientific community. Any feedback on the website is welcome. It was released as a beta version which will enable the correction of small errors, if needed.

4. Using the WMO OSCAR tool for evaluation and gap analysis of space-based observation capabilities

The Observing System Capability Analysis and Review tool for space-based observations (OSCAR/Space) is an on-line resource on satellite programmes, instruments, and the variables they can observe.

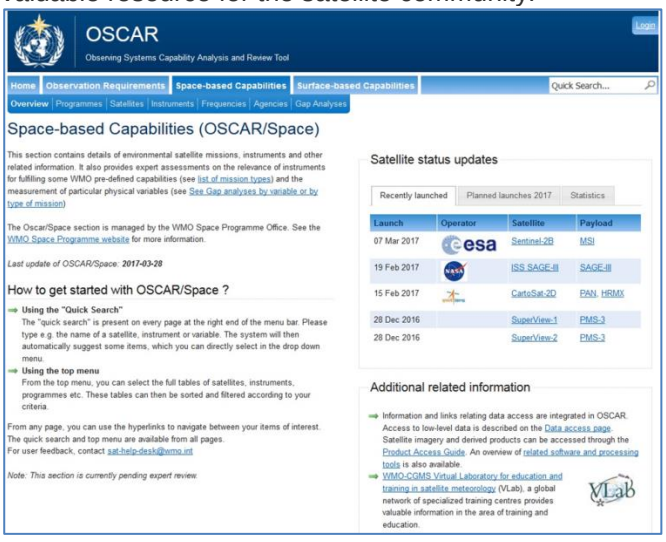
OSCAR/Space website (oscar.wmo.int/space) is increasingly used as a reference for studies, satellite applications, and gap analysis, in the area of Earth Observation (EO), and is being extended to space weather observing capabilities.

OSCAR (oscar.wmo.int) is comprised of OSCAR/Space and the two other following components:
• OSCAR/Requirements - repository of technology free observational user requirements for all application areas https://www.wmo-sat.info/oscar/observingrequirements
• OSCAR/Surface - records of metadata for all surface-based observing systems: oscar.wmo.int/surface

Available since September 2012, OSCAR/Space currently records references and details of more than 900 instruments from more than 600 satellites. It is regularly updated with inputs from space agencies, including the reports to Coordination Group for Meteorological Satellites (CGMS). OSCAR/Space is widely used, with more than 1,000 visits per day in average, from countries worldwide. Users include space agencies, researchers, students, application centres, and consultants. OSCAR/Space is routinely feeding the "satellite status" on the CGMS and WMO websites. It is used as reference for reports, application planning, gap analysis, socio-economic benefit studies, frequency management, etc.

The new version 2 of OSCAR/Space follows an expert system approach to analyze the instrument specifications in order to provide an objective evaluation of their potential to measure the various geophysical variables. Its knowledge basis includes more than 2000 rules based on remote sensing principles.

The new version and its approach is expected to increase the value and reliability of OSCAR/Space as a reference tool for the WMO Rolling Review of Requirements (RRR). It should also enable engaging expert groups to review the rules related to their fields of competence leading potentially to a truly collaborative resource. Beyond its primary role to support the RRR, OSCAR/Space is expected to be a valuable resource for the satellite community.



The OSCAR/Space Webpage

It will require however a comprehensive documentation of sensor characteristics and status, which can only be achieved through close collaboration between space agencies, the EO science community, and the WMO Secretariat.

5. Assessment of observing networks capabilities against the requirements for application areas

Recently, the WIGOS Project Office has been involved in several activities related to the assessment of the observations capabilities of some WMO Members. In the case of Saudi Arabia the assessment was requested by its Permanent Representative to the WMO Secretary-General, where a mission was conducted in the country from 6-8 February 2017.

In other cases the assessments are being planned and conducted in the context of funded international projects with the involvement of organizations interested in developing climate and hydro or agro meteorological capabilities of WMO Members, especially in African countries. That is the case of the Climate Risk and Early Warning Systems (CREWS) project "Strengthening national capacities for EWS service delivery in Burkina Faso" and the Global Framework for Climate Services (GFCS) project "Climate Services for Increased Resilience in the Sahel", where missions are scheduled for April (Senegal) and May (Niger).

The assessments cover essentially the actual capabilities of each Member to deliver observations for the most relevant Application Areas, e.g. Global Numerical Weather Prediction and Climate Applications.

The assessments are intended to identify gaps and needs and to formulate recommendations for the enhancement of Member's capabilities to better deliver their weather and climate services meeting the stated requirements for the WMO Application Areas (available in the OSCAR/Requirements database) and also to ensure the sustainability of their observations. Those activities also cover the assessment of the existing observing networks against the WIGOS Observing Network Design (OND) Principles.

The preparations for such assessments require preliminary analysis of each country's physiographic features, such as the area of the territory, identification of climatic regions and of major weather and climate related disasters occurred, as well as the analysis of the activities, projects and infrastructures of the NMHS related to observations, particularly training, maintenance, calibration and quality control activities; Critical information to be used in the assessments are the lists and maps of Member's operational surface stations, including basic WIGOS metadata. In some missions, training on how to use and populate the OSCAR/Surface database is also included.

During the assessment missions intense discussions are required with some of the most relevant local staff of the NMHSs as well as with representatives of their major partners, national and international, public and private ones.

The main deliverable of each missions will consist in a report containing the results of the assessment and a number of recommendations for the national and for the regional/international organizations involved, to consider in terms of what should be the priority actions, as well as what should be considered in the plan for the evolution of the observing networks in each country, in the mid-long term.

6. WIGOS Related Events/Meetings

6.1 Recent Events/Meetings

- ☞ Sixteenth session of Regional Association II (RA II-16), 12-16 February 2017, Abu Dhabi, United Arab Emirates
- ☞ Seventeenth meeting of the CBS Management Group, 27 February - 1 March 2017, Geneva, Switzerland
- ☞ Global Climate Observing System/Oceans Observations Panel for Climate (GCOS/OOPC) meeting, 14-17 March, 2017, Cape Cod, USA
- ☞ Seventeenth session of Regional Association IV (RA IV-17), 27-31 March, 2017, San José, Costa Rica
- ☞ Global Climate Observing System/Atmospheric Observations Panel for Climate (GCOS/AOPC) meeting, 27-30 March, 2017, Exeter, United Kingdom of Great Britain and Northern Ireland
- ☞ Ninth meeting of the Ship Observations Team (SOT-9), 27-31 March 2017, London, United Kingdom of Great Britain and Northern Ireland
- ☞ Eleventh session of the CBS Expert Team on Satellite Systems (ET-SAT-11), 4-6 April, Geneva, Switzerland
- ☞ Global Climate Observing System/Terrestrial Observations Panel for Climate (GCOS/TOPC) meeting, 6-7 April, 2017, Vienna, Austria

6.2 Coming Events/Meetings

- ☞ Third meeting of the Inter-Programme Expert Team on Satellite Utilization and Products (IPET-SUP-3), 2-5 May 2017, Geneva, Switzerland
- ☞ Sixty Ninth Session of the WMO Executive Council (EC-69), 10-17 May 2017, Geneva, Switzerland
- ☞ Eighth session of the JCOMM Observations Coordination Group (OCG-8), 22-25 May 2017, Qingdao, China
- ☞ OSCAR/Surface training course in RA VI, 23-24 May 2017, Offenbach, Germany
- ☞ Volatile Organic Compounds (VOC) expert meeting and NOAA annual conference, 23-26 May 2017, Boulder, USA
- ☞ Joint meeting of CIMO Expert Team on Operational In-Situ Technologies (A1) and CIMO Expert Team on Developments in In-Situ Technologies (A2), 21-23 June, Geneva (Switzerland)
- ☞ WIGOS Data Quality Monitoring System Workshop for the integration of WIGOS Component and Co-sponsored Observing Systems, 26-29 June 2017, Geneva, Switzerland
- ☞ The WMO International Conference on Automatic Weather Stations - “Automatic weather stations for environmental intelligence – the AWS in the 21st Century”, 24-26 October 2017, Offenbach am Main, Germany

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