

WORLD METEOROLOGICAL ORGANIZATION

COMMISSION FOR BASIC SYSTEMS

OPAG ON INTEGRATED OBSERVING SYSTEMS

INTER-PROGRAMME EXPERT TEAM ON THE OBSERVING SYSTEM DESIGN AND EVOLUTION (IPET-OSDE)

THIRD SESSION

(IPET-OSDE3)

Geneva, Switzerland, 29 January to 1 February 2018

FINAL REPORT, Rev. 1



COPYRIGHT AND DISCLAIMER

© World Meteorological Organization, 2018

The right of publication in print, electronic and any other form and in any language is reserved by WMO. Short extracts from WMO publications may be reproduced without authorization, provided that the complete source is clearly indicated. Editorial correspondence and requests to publish, reproduce or translate this publication in part or in whole should be addressed to:

Chairperson, Publications Board

World Meteorological Organization (WMO)

7 bis, avenue de la Paix

Tel.: +41 (0) 22 730 84 03

P.O. Box 2300

Fax: +41 (0) 22 730 80 40

CH-1211 Geneva 2, Switzerland

E-mail: publications@wmo.int

NOTE

The designations employed in WMO publications and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of WMO concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Opinions expressed in WMO publications are those of the authors and do not necessarily reflect those of WMO. The mention of specific companies or products does not imply that they are endorsed or recommended by WMO in preference to others of a similar nature which are not mentioned or advertised.

This document (or report) is not an official publication of WMO and has not been subjected to its standard editorial procedures. The views expressed herein do not necessarily have the endorsement of the Organization.

CONTENTS

Agenda		p. 5
Executive Summary		p. 7
General Summary		p. 10 - p. 59
Annex I	List of Participants	p. 60
Annex II	Action sheet from IPET-OSDE-3	p. 65
Annex III	Updated IPET-OSDE workplan with status of tasks	p. 72
Annex IV	Procedure for update, validation and approval of SoGs within the RRR process	p. 77
Annex V	Proposed milestones and activities for developing the future WIGOS-IP	p. 78
Annex VI	Status of Existing Statements of Guidance	p. 82
Annex VII	Proposed science questions to be addressed for observing system design	p. 90
Annex VIII	Outcome of Breakout Group 7 on the Monitoring of Status of Actions of the EGOS-IP (Methodology)	p. 92
Annex IX	Updating and maintenance procedure for OSCAR/Space and OSCAR/Requirements	p. 93
Annex X	Template of Statements of Guidance	p. 103
Annex XI	Outcome of breakout Group 1 on the Review of Various Implementation Plans	p. 106
Annex XII	Outcome of breakout Group 2 on the Need for New Application Areas	p. 108
Annex XIII	Outcome of breakout group 3 on the Review of Variables	p. 110
Annex XIV	Outcome of breakout groups 4 and 5 on the review of Status of Actions of the EGOS-IP	p. 112
Annex XV	Proposed plan for the evolution of OSCAR/Surface	p. 128
Annex XVI	OOPC Comments on Statements of Guidance	p. 130
Annex XVII	Proposal for Gap Analysis using OSCAR	p. 134
Annex XVIII	Impact of Surface-based GNSS Observations on NWP	p. 137
Acronyms		p. 138

Ref.: 13860/2018.1.1 OBS. WIGOS/OSD
Approved by Fernando Balda Esplugues, Wed May 23 15:04:38 UTC 2018



[Group Picture, 1 February 2018]

AGENDA

1. ORGANIZATION OF THE SESSION

- 1.1 Opening of the meeting
- 1.2 Adoption of the agenda
- 1.3 Working arrangements

2. REPORT OF THE CHAIRPERSON

3. GUIDANCE FROM CHAIRPERSON OF THE OPAG-IOS

4. WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

- 4.1 WIGOS progress relevant to the activities of IPET-OSDE

5. REVIEW OF ACTIONS FROM IPET-OSDE-2

6. REVIEW OF OTHER ACTIVITIES RELATED TO IPET-OSDE AND OPAG-IOS

- 6.1 Update on GCOS activities
- 6.2 Update on GCW activities

7. ROLLING REVIEW OF REQUIREMENTS AND STATEMENTS OF GUIDANCE

- 7.1 Review database of User Requirements (OSCAR/Requirements)
 - 7.1.1 Status of OSCAR/Requirements and plans
 - 7.1.2 Harmonizing lists of variables
- 7.2 Review database of Observing System Capabilities (OSCAR/Space & OSCAR/Surface)
- 7.3 Gap analysis using OSCAR
- 7.4 Applications Areas
 - 7.4.1 Overview of status of Statements of Guidance (SoGs)
 - 7.4.2 Consider newly revised SoGs
 - 7.4.3 Consider areas requiring revised SoGs
 - 7.4.4 Consider any new Application Areas

8. OBSERVING SYSTEM STUDIES

- 8.1 Update on recent observation impact experiments
- 8.2 Proposal for new observation impact experiments to be promoted by IPET-OSDE
- 8.3 Plans for 7th Workshop on "The impact of various observing systems on NWP", 2020.

9. IMPLEMENTATION PLAN FOR THE EVOLUTION OF GLOBAL OBSERVING SYSTEMS (EGOS-IP)

- 9.1 Review of Guidance from Congress, CBS-16, EC-70 and ICG-WIGOS on the EGOS-IP and its status as part of WIGOS implementation
- 9.2 Current EGOS-IP (2025)
 - 9.2.1 Review of progress since IPET-OSDE-1, including Actions
 - 9.2.2 Proposals for future review and reporting
- 9.3 Review of interactions with NFPs
- 9.4 High-level document on the EGOS-IP
- 9.5 Review of various Implementation Plans
- 9.6 Updated or new Technical Regulations and Guidance
- 9.7 Future WIGOS IP responding to the WIGOS Vision 2040

10. VISION FOR THE EVOLUTION OF GLOBAL OBSERVING SYSTEMS

- 10.1 Vision for WIGOS in 2040
- 10.2 Updating the Vision for 2025

11. OBSERVING NETWORK DESIGN (OND) - PRINCIPLES AND GUIDANCE

- 11.1 Possible update of Observing Network Design Principles and related Guidance
- 11.2 IPET-OSDE perspective on RBON Regulatory and Guidance material

12. PREPARATION FOR FORTHCOMING CBS ACTIVITIES AND MEETINGS

- 12.1 IPET-OSDE updated work-plan for 2013-2016 and pending activities
- 12.2 Reports to ICT-IO5-10 and CBS TECO 2018

13. ANY OTHER BUSINESS

14. ACTION PLAN

15. CLOSURE OF THE SESSION

EXECUTIVE SUMMARY

The Third Meeting of the Inter Programme Expert Team on Observing System Design and Evolution (IPET-OSDE) of the Open Programme Area Group for Integrated Observing Systems (OPAG-IOS) of the Commission for Basic Systems (CBS) was held at the WMO Headquarters in Geneva, Switzerland from 29 January to 1 February 2018 and was chaired by the Chair of the IPET-OSDE, Dr Erik Andersson (ECMWF).

The Team received guidance from its Chair and from the OPAG-IOS Chair. It took into account the decisions and guidance from the latest WMO Executive Bodies Sessions and from the 16th Session of the Commission for Basic Systems (CBS-16, Guangzhou, China, November 2016). It reviewed progress on the development of the WIGOS pre-operational phase 2016-2019 activities relevant to the IPET-OSDE. Guidance was also received from the Inter-Commission Coordination Group on the WMO Integrated Global Observing System.

The Team received an update on several activities related to its work, and particularly from the WMO-IOC-UNEP-ICSU Global Climate Observing System (GCOS), and the Global Cryosphere Watch (GCW). The Team took note of publication of the new GCOS Implementation Plan (GCOS-200).

As part of the Rolling Review of Requirements (RRR) process, the Team reviewed the status of the WMO database of observational user requirements and observing systems capabilities, which has been integrated into the Observing System Capability Analysis and Review tool (OSCAR).

Also in the context of RRR, the Team reviewed the status of the Statements of Guidance (SoGs) for WMO Application Areas (AAs). The Team reviewed available updates to individual SoGs as provided by the nominated Points of Contact. The IPET-OSDE assessed which SoGs should be revised, and it discussed whether there were any additional areas with distinct observation requirements requiring new AAs. A synthesis of the Team's review and decisions with regard to the SoGs and AAs is summarized in **Annex VI**.

The Team reviewed the current activities regarding observing system studies, with emphasis on the future design of observing systems contributing to WIGOS. It considered proposals for additional studies to be promoted by the IPET-OSDE, and it agreed to promote them through the ICT-IOS-10, which was planned to meet in Geneva the following week. The Team discussed the plans for the 7th Workshop on "The impact of various observing systems on NWP", Republic of Korea, in 2020.

The Meeting reviewed Guidance from Cg-17, CBS-16, EC-69 and the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) on issues related to the EGOS-IP and its status as part of WIGOS Pre-Operational Phase (2016-2019). Concerning the current EGOS-IP (responding to the Vision of the GOS for 2025 and WIGOS needs), the Meeting reviewed the progress on Actions contained in the Plan since IPET-OSDE-2 and made proposals for updating the status of these Actions. The Meeting also developed proposals for future review of and reporting against EGOS-IP, and review of the interactions with the National Focal Points (NFPs).

The Meeting discussed its perspective, on the need to review the various Implementation Plans (EGOS-IP, GCOS, GCW, GFCS, GAW) and prepare a synthesis document for the Members to understand better the totality of CBS-related activities across all these WMO Programmes, and their respective plans.

The meeting identified a few issues for which new or updated Technical Regulations and/or guidance to Members are needed (e.g. on the scheduling of reporting of upper air observations, exchange of surface-based GNSS data).

The meeting reviewed and discussed the latest version of the draft Vision for WIGOS in 2040, and considered the Team's further input to this document prior to its further submission to the agreed review process beyond IPET-OSDE. In particular, the final draft of the new Vision for WIGOS in 2040 is meant to be submitted to Cg-18 for its approval.

Observing Network Design (OND) Principles were developed by IPET-OSDE, and have then been adopted by Cg-17 and included in the WIGOS Manual. According to its Terms of

Reference, the IPET-OSDE was also tasked to propose guidance regarding the OND Principles. This work was completed and the Team's proposed guidance was adopted by CBS-16 and included in the WIGOS Guide. The Team agreed on the need to make the OND Principles and associated guidance more widely known and used by Members; the team also discussed potential improvement through future revisions of the guidance.

The meeting reviewed draft Regulatory and Guidance material regarding the WIGOS Regional Basic Observing Network (RBON), which will eventually replace the GOS Regional Basic Synoptic Network (RBSN) and the Regional Basic Climate Network (RBCN).

The Meeting agreed on a draft report and updated IPET-OSDE work-plan for 2016-2019 that will be reviewed and presented to ICT-IO-10. It also reviewed and discussed relevant draft Regulatory and Guidance material to be submitted through the CBS process, including CBS TECO 2018 and the 18th Session of the CBS Management Group.

The Team agreed on its action plan for the period until the next IPET-OSDE meeting.

Ref.: 13860/2018_1.1 OBS- WIGOS/OSD
Approved by Fernando Belda Esplugaes, Wed May 23 15:04:38 UTC 2018

Ref.: 13860/2018_1.1 OBS- WIGOS/OSD
Approved by Fernando Belda Espluques, Wed May 23 15:04:38 UTC 2018

[page left intentionally blank]

IPET-OSDE3, Final report
GENERAL SUMMARY

Ref.: 13860/2018-1.1 OBS- WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

1. ORGANIZATION OF THE SESSION

1.1. Opening of the Meeting

1.1.1. The Meeting of the CBS OPAG-IOS Inter Programme Expert Team on Observing System Design and Evolution (IPET-OSDE) opened at 09.00 hours on Monday, 29 January 2018, at the WMO Headquarters in Geneva, Switzerland.

1.1.2. Mr Etienne Charpentier, Chief of the Observing systems Division opened the meeting on behalf of the Director, WMO Observing and Information Systems Department, Mr Fernando Belda. He welcomed the participants and explained the significant developments relevant to CBS and especially OPAG-IOS since the second Session of the IPET-OSDE in April 2016. He recalled that the work of this IPET-OSDE meeting will be important to feed draft decisions and recommendations to WMO Executive Bodies, including EC-70 in 2018 and Cg-18 in 2019, through ICT-IOS-10 (Geneva, Switzerland, Feb. 2018) and CBS Technical Conference (TECO, Geneva, Switzerland, March 2018).

1.1.3. Dr Erik Andersson (ECMWF), Chair of IPET-OSDE, also welcomed the participants and wished for a successful meeting.

1.1.4. The Participants introduced themselves. The list of participants is given in **Annex I**.

1.2. Adoption of the agenda

1.2.1. The Team adopted its agenda for the Session on the basis of the provisional agenda provided in IPET-OSDE-3 document¹ no. 1.2(1). It introduced the following item as part of item 13 (any other business): conclusion of discussions on facilitating the exchange of surface-based GNSS data. It noted that IPET-SUP and the ICG-WIGOS Task Team on Data Partnership are addressing the issue.

1.3. Working arrangements

1.3.1. The Team agreed on its working hours and adopted a tentative time-table for consideration of the various agenda items.

1.3.2. The Secretariat introduced the documentation plan of the meeting. The Chair thanked all those who have contributed to the preparation of documents.

1.3.3. The Team established the following working groups for the duration of this IPET-OSDE Session:

- **Group 1:** Review of various IPs (EGOS-IP excluded)
- **Group 2:** Need for new Application Areas
- **Group 3:** Harmonizing lists of variables
- **Group 4:** OSCAR/Surface

¹ <https://my.alfresco.com/share/wmo.int/page/site/ipet-osde-3/dashboard> (login required, ask Secretariat for access if needed)

- **Group 5:** EGOS-IP Review (space part)
- **Group 6:** EGOS-IP Review (surface part)

2. REPORT OF THE CHAIRPERSON

2.1. The IPET-OSDE Chairperson, Erik Andersson (ECMWF) reported on the activities carried out since the last meeting of the IPET-OSDE (IPET-OSDE-2, Geneva, Switzerland, 11-14 April 2016). He recalled that the IPET-OSDE was re-established by CBS-16 (Guangzhou, China, November 2016) as a Team under the Open Programme Area Group for Integrated Observing Systems (OPAG-IOS) of the CBS of WMO. All the Terms of Reference of IPET-OSDE and all the elements of its Work Programme are related to the goals and activities of the WMO Integrated Global Observing System (WIGOS). The Chair mentioned that one of his first own initiatives has been to write an ECMWF article on 'How to evolve the global observing systems', available on ECMWF Website². It is hoped that this article can be used widely to promote the activities of IPET-OSDE.

Type	Ref.	What	By whom	Deadline
Action	2.1	to share its generic Presentation on the Rolling Review of Requirements (RRR) with the Team members	Secretariat	asap

2.2. The Chair provided a brief review of the IPET-OSDE tasks according to its Terms of Reference and work-plan, and proposed priorities for this meeting as follows:

- Review the status of Actions from IPET-OSDE-2 and decide which of these to continue or amend as its own Actions.
- He drew the Team's attention to specific activities and achievements since IPET-OSDE-2 that are relevant to our work (see Chair's report for details).
- At IPET-OSDE-3, the Chair proposed that we give particular attention to the following issues:
 1. The continuation and extension of the OSCAR facility, in particular with a view of better supporting gap analysis – agenda item 7.
 2. Further strengthening and promotion of the RRR process, and continued engagement with representatives from the WMO Application Areas.
 3. Safeguarding of WMO's well-established data sharing principles, ensuring that these principles lead to extended and enhanced global exchange of observations to meet the future WIGOS requirements.
 4. Ensuring progress on Actions in EGOS-IP. It should be the role of IPET-OSDE, with the support of OPAG-IOS and WIGOS as a whole, not only to monitor progress but also actively to promote it.
 5. Looking ahead, developing plans for a future WIGOS-IP.
 6. Our recommendations to take forward to ICT-IO-10 and CBS, taking into account the information gathered at the 6th WMO workshop on the impact of various observing systems on NWP², the updated SoGs prepared for this meeting, and the outcome of our discussions.

3. GUIDANCE FROM CHAIRPERSON OF THE OPAG-IO-5

3.1. The CBS OPAG-IO-5 Chairperson provided guidance to the Team in the light of recommendations and resolutions of the Sixteenth Session of the CBS (CBS-16, Guangzhou, China, 23-29 November 2016) and of relevant decisions and resolutions by the Sixty-Ninth Session of the Executive Council (EC-69, Geneva, Switzerland, 10-17 May 2017).

3.2. He recalled the need to provide IPET-OSDE proposed actions and recommendations

² <https://www.ecmwf.int/en/newsletter/153/meteorology/how-evolve-global-observing-systems>

to CBS through the tenth Session of the CBS Implementation-Coordination Team on Integrated Observing System (ICT-IOS-10, Geneva, Switzerland, 5-8 February 2018), the CBS 2018 Technical Conference (Geneva, Switzerland, March 2018) and follow up process for having CBS Regulatory and Guidance material submitted to the Seventieth Session of the Executive Council (EC-70, Geneva, Switzerland, mid-2018) and the Eighteenth Session of the World Meteorological Congress (Cg-18, Geneva, Switzerland, mid-2019).

3.3. OPAG IOS Chair listed the Decisions and Recommendations of CBS-16 that directly relate to OPAG-IOS (see his report for the list). He invited the Team to check this list and take necessary steps for expected actions to be undertaken. In particular, ICT-IOS is invited to respond to the following CBS-16 Decisions as follows:

- Decision 17 (CBS-16): to advise on the potential for developing and providing a freely available open-source OSCAR-compatible software package that could be implemented at the national level;
- Decision 19 (CBS-16): to consider mechanism for identifying experts to contribute to the training effort concerning OPAG IOS issues;
- Decision 21 (CBS-16): to review draft RBON Regulatory and Guidance material prepared by WIGOS PO and WIGOS Editorial board; and
- Decision 33 (CBS-16): All Expert Teams to act according to their Work Plans.

3.4. The CBS Management Group met for its 17th session in Geneva, Switzerland from 27 February to 1 March 2017 and discussed through teleconferences after that at various occasions. At the CBS-MG-17, the Management Group decided on the membership of the various teams and roles within the OPAG (Annex III of the final report of the CBS Management Group meeting). Approved work plans of the CBS expert teams are provided in Annex IV of the CBS-MG-17 final report. The IPET-OSDE Work Plan includes the following elements where IPET-OSDE is invited to focus besides the normal Rolling Review of Requirements activities of the Team:

- To contribute to the implementation of WIGOS, including WIGOS Manual, and provide relevant advice and support to the chairperson of ICT-IOS;
- Prepare and maintain reviews of observation impact studies undertaken by NWP centres and provide information for consideration by IPET-OSDE and OPAG-IOS;
- Monitor progress and actions by Members and partner Organizations per the approved Implementation Plan for the Evolution of the Global Observing Systems (EGOS-IP), fully responding to the "Vision for the GOS in 2025", and promote activities in support of progress.

3.5. Taking the outcomes of CBS-16 into account as well as guidance of the CBS Management Group, the ICT-IOS had a series of teleconferences and agreed on a number of actions. The ICT-IOS has also agreed on a series of draft Decisions and Recommendations to be promoted through the CBS process, with the view to have drafts submitted to the 70th Session of the Executive Council (EC-70, June 2018) and the 18th Session of the World Meteorological Congress (Cg-18, 2019) as appropriate.

3.6. The Action Plan for developing draft OPAG-IOS Decisions and Recommendations to be submitted through the CBS Process includes actions for the Expert Team chairs to undertake with the view to have draft material submitted in advance of ICT-IOS-10. The Expert Team chairs will be reporting during this meeting about their proposals according to the Action Plan. In particular, the IPET-OSDE is invited to discuss the following items:

Finalization of the Vision for WIGOS in 2040.

3.7. The goal is to have the WIGOS Vision 2040 submitted to Cg-18 in 2019. The Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS) is in charge of the task, with input from CBS OPAG IOS Expert Teams, and the IPET-OSDE in particular. See IPET-OSDE-3 agenda item 10, and document No. 10.1.

Updated and new Regulatory and Guidance Materials, and additional Technical Documentation produced.

3.8. Observing Network Design Principles and Guidance were adopted by Cg-17 and CBS-16 and included in WIGOS Manual and Guide respectively. The IPET-OSDE may wish to consider whether revisions would be needed, and whether additional regulatory and guidance material should be proposed. See IPET-OSDE-3 agenda item 11, and document No. 11.2.

Recommendations on contribution of Members to WIGOS Implementation pending integrated Implementation Plan for WIGOS Component Observing Systems

3.9. See IPET-OSDE-3 agenda items 9.5 and 9.6 and documents 9.5 and 9.6 concerning undertaking a review of the various Implementation Plans, and developing a roadmap for developing the new WIGOS Implementation Plan, responding to the WIGOS Vision 2040.

Reviewing and updating of science questions for impact assessment for Observing System Design and Evolution

3.10. See IPET-OSDE-3 agenda item 8.3 and document 8.1.

Recommendations on implementing and integrating emerging observing systems (e.g. new satellite technologies, aircraft, surface GPS) in the Regions

3.11. IPET-OSDE is invited to consider possible "update of EGOS-IP" regarding surface-based GNSS observations and exchange of such data originating from the private sector³, and draft decision/recommendation to be proposed. This can be discussed under IPET-OSDE-3 agenda item 9.6 and the AOB.

3.12. The Team also agreed that there was the need for CBS to consider updating guidance on Tiered Networks in order for it to be better elaborated and more precise. Enhancement of the OND guidance on this topic is one possibility to be explored.

4. WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

4.1. WIGOS progress relevant to the activities of IPET-OSDE

4.1.1. The Meeting reviewed status of development of the WIGOS Pre-Operational Phase (2016-2019) based on decisions and guidance of Cg-17. In particular, the Team wanted to clarify and consolidate its role with regard to the five priority activities of the WIGOS Pre-Operational Phase:

- Complementing the WIGOS Regulatory Material with necessary guidance material providing Members with those technical details that are required for the implementation;
- Further developing the WIGOS Information Resource (WIR), with special emphasis on the operational deployment of the OSCAR/Surface database;
- Development and implementation of the WIGOS Data Quality Monitoring System;
- Concept development and initial establishment of Regional WIGOS Centres; and
- National WIGOS implementation.

4.1.2. The Team identified other potential activities contributing to WIGOS and reviewed relevant guidance from the Sixth and Seventh Sessions of the Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS), Geneva, Switzerland, 12-14 January 2017 and January 2018 respectively.

³ Surface-based GNSS observations are covered by EGOS-IP through Actions G26 and G27. However, these actions do not take into account the fact, and implications, that some of the GNSS networks data are purchased by NMHSs from the private sector.

4.1.3. With regard to the specific issues identified by the WIGOS Project Office in document 4.1(1), the Team agreed with the following:

- Review of variables in the WIGOS Metadata Standard and OSCAR: See item 7.1.2.
- Accuracy of metadata fields in OSCAR/Surface (see also item 7.2): Eventually, the WIGOS Data Quality Monitoring System (WDQMS) should be able to identify problems with individual stations, and allow action to be taken for these to be corrected.

Type	Ref.	What	By whom	Deadline
Action	4.1.3	to invite CIMO to assist by giving guidance with regard to observing station metadata fields accuracy requirements in OSCAR/Surface and advise on the critical variables for which the desired level of accuracy ought to be provided, e.g. barometer height ⁴	Secr.	asap
Action	4.1.3	The Observing Network Design guidance should be updated to clarify the requirements. Application Area Points of Contact are requested to provide feedback on how to record accuracy requirements for the identified key metadata fields in OSCAR/Surface (such feedback to be used to inform the accuracy with which metadata are provided in OSCAR/Surface, and before CIMO is invited to consider the issue)	PoCs	ongoing
	4.1.3	Based on feedback from the PoCs per above actions, to advise on how proposed level of some metadata fields accuracy will be achieved, and how it should be recorded in OSCAR/Surface.	CIMO	After feedback from PoC is received

- With regard to OSCAR/Space allowing for ingestion of the metadata according to the WIGOS Metadata Standard and required evolution of OSCAR/Space, the Team noted that OSCAR/Space had been developed before OSCAR/Surface and OSCAR/Requirements; and was not necessarily a natural home for WIGOS metadata. Also, most satellite metadata needed by data users (e.g. spectral response functions for each instrument) are provided together with the data being exchanged, or with the relevant software releases. Also, OSCAR/Space together with OSCAR/Surface serve a number of uses, including (i) a tool for the RRR and gap analysis, (ii) a source of information for data quality monitoring (WIGOS Station ID, platform owner, Country)⁵, (iii) getting an overall view over WIGOS and the contributing observing platforms, (iv) metadata repository for helping data users to understand the data⁶, (v) a readily available database for recording WIGOS metadata⁵.

4.1.4. It was also noted that while the RRR is recording observational user requirements in multiple Application Areas, there is no obligation for Members to meet them all. For example, as part of the RBON developing Technical Regulations, Members will be invited to select the primary Application Areas with requirements the observing

4 In this example, reference is made to the altitude and measuring device, i.e. reporting Level I data. As required, Level II data should be reported for which the position of such a device can be used, but another reference level (station altitude) might be used as well. For pressure reports these reference levels are relevant, not the altitude of the device.

5 OSCAR/Space does not currently provide for this function

6 OSCAR/Space provides for this function only partly

stations they'll commit to RBON will meet at the Threshold level.

4.1.5. WIGOS Project Office reported that recent experience from discussions with Members to assess their national observing capabilities showed that some of the application areas they wish to address don't match the current WMO application areas, for example, application areas such as "health", "energy", "transportation (land)" are often mentioned by Members as some of the most relevant. The Team stressed that Application Areas are defined as those activities which require direct use of observations. From that perspective, "energy" and "health" cannot be regarded as Application Areas as they correspond to Services provided on the basis of forecasts output; so "energy" and "health" they are not making direct use of observations. In the breakout group discussing potential new AAs (**Annex XII**), the Team considered the possibility to create a Terrestrial AA, where land transport would naturally fit.

4.1.6. The Team also discussed engagement with the private-sector providers of observations per guidance from the WIGOS Task Team on the WIGOS Data and Partnerships (TT-WDP) and the draft Guidance on WIGOS Data Partnerships⁷. The purpose of the "Guidance on WIGOS Data Partnerships" is to provide specific recommendations related to incorporating and sharing observations from non-NMHS sources into the WIGOS framework. It highlights the potential benefits and challenges of data from non-NMHS providers, and clarifies the roles and expectations of NMHSs in integrating these data in compliance with WIGOS technical regulations. The guidance has an initial focus on surface-based meteorological observations (primarily from manual and automatic weather stations), although the principles and general guidance are broadly applicable to other observation types. These surface stations are considered to be the most numerous and widely available sources of non-NMHS observations and therefore represent a significant opportunity to enhance overall national (and in turn global) observation sets.

4.1.7. The Team invited its members to have a look at the report from the WIGOS TT-WDP and to provide their feedback to WIGOS PO through the IPET-OSDE Chair and OPAG-IOIS Chair. Final guidance to Members on PPP will be submitted to EC-70 for its consideration of being included in an updated version of the Guide to WIGOS. The Team recommended that the TT-WDP consider as appendix some example draft clauses that Members could use in contract business. Example of such clauses could include requirements on data processing to be part of the radio-sonde procurement contract as it is critical for data users to understand how data are being produced; ability to distribute data to other users.

4.1.8. The Team also noted that compliance with WIGOS Metadata Standard and completeness of metadata provided to OSCAR/Surface were recognized as a potential barrier to the contribution of observations by external partners. Two-way communications with partners, such as JCOMM, GCW and the research community is important as there are clear benefits of having complete and consistent WMD records in the OSCAR/Surface as they are used for assessment of national observing capabilities.

4.1.9. It further noted that once the Guidance on Data Partnership is approved by EC-70, all WMO Programmes will be requested to provide their feedback and provide data partnerships-related case studies and lessons learned.

Issue #1	Draft Guidance on WIGOS Data Partnerships			
Background	WIGOS Task Team on the WIGOS Data and Partnerships (TT-WDP) drafted Guidance on WIGOS Data Partnerships ⁷			
Decision	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>

⁷ <http://www.wmo.int/pages/prog/www/WIGOS-WIS/meetings/ICG-WIGOS-7/WDP%20Guidance%20Document%20V19%20180112%20clean.docx>

	4.19	to have a look at the report from the WIGOS TT-WDP and to provide their feedback to WIGOS PO through the IPET-OSDE Chair and OPAG-IO Chair	IPET-OSDE members	asap
Recommendation	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	4.19	To consider as appendix of the Guidance on WIGOS Data Partnerships, some example draft clauses that Members could use in contract business. Example of such clauses could include requirements on: data processing to be part of the radio-sonde procurement contract as it is critical for data users to understand how data are being produced and that such data meet the user needs; ability to distribute data to other users.	TT-WDP	Feb. 2018

Ref.: 13860/2018-1.1 OBS- WIGOS/OSD
Approved by Fernando Belda Espluques, Wed May 23 15:04:38 UTC 2018

5. REVIEW OF ACTIONS FROM IPET-OSDE-2

5.1. The meeting reviewed actions from the previous session of the IPET-OSDE, including progress made against each item, and updated its work plan accordingly (**Annex II**).

6. REVIEW OF OTHER ACTIVITIES RELATED TO IPET-OSDE AND OPAG-IO

The Meeting was informed on the activities within WMO and other international programmes and projects relevant to the OPAG-IO and the IPET-OSDE, including an update on the Global Cryosphere Watch (GCW) activities, and the Global Climate Observing System (GCOS) activities that are relevant to observing systems and the Rolling Review of Requirements.

6.1. Update on GCOS activities

6.1.1. Tim Oakley presented a summary of the key points from the GCOS document. The GCOS programme has recently published its new Implementation Plan (2016) and much of the recent activity has been focused on addressing the broad range of actions (20 cross-cutting, 40 Atmosphere, 57 Ocean and 72 Land). Of particular relevance to IPET-OSDE was the initiation of 4 Task-Teams to address specific actions on: the future role and benefit of the GCOS Upper-Air Network (GUAN); a proposed GCOS surface reference network; the use of weather-radar observations in climate monitoring and the requirements for Lightning observations in support of the new Lightning ECV. He also presented updated 2017 statistics for the GUAN and GCOS Surface Network (GSN) which for some regions shows the gradual decline in the performance of these networks, as compared against their minimum requirements, particularly for RA-I (Africa).

6.1.2. The work of the Tropical Pacific Observing System (TPOS) 2020 was highlighted as a key activity being supported by GCOS. The meeting was asked to support the actions identified in the GCOS Implementation Plan (2016) and contribute to the ongoing actions of GCOS in developing the global climate observing system.

Issue #2	Support for Global Climate Observations			
Background	The Global System for Climate: Implementation Needs (GCOS-200) identifies the actions needed to improve global climate observations. This document highlights ongoing activities initiated by GCOS.			
Rationale for the decision/action or recommendation	The Status of the Global Observing System for Climate (GCOS-195) describes the gaps and needs of the global climate observing system.			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	6.1	Surface Vision 2040: items from GCOS IP needed to be reflected in the Vision. Make sure that the space-based parts are covered properly in the Vision consistently with GCOS-IP (rec. to ICT-IOS to do that).	ICT-IOS to consider	Feb. 2018
Recommendation(s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	6.1	To consider both requirements and capabilities for GCOS concerning weather radar and lightning detection systems (in particular, what are the capabilities of radar or lightning to contribute to GCOS-IP? How do radar and lightning data contribute to building the climate record?)	GCOS	End 2018

Note: There is joint membership between TT-Radar of GCOS and IPET-OWR.

6.2. Update on GCW activities

6.2.1. Rodica Nitu (Secretariat, GCW Project Manager) reported on recent GCW activities. In developing GCW, WMO has assumed a coordinating role in cryosphere observations, research, and applications, to facilitate achieving global consistency for cryosphere data and for clear and consistent information on the state of the cryosphere (the "Watch"), as are the products made available part of the Snow Watch theme. GCW brings together the scientific and operational communities, in a broad sense, which use cryosphere data and information to fulfil their respective mandates.

6.2.2. In 2017 the GCW Surface Observing Network continued to grow, and 120 stations were approved by EC-69 as CryoNet and contributing stations. Additional stations will be approved in 2018. Over 50% of these stations are long term commitments, operated by academia, research, and non-NMHS organizations, an indication of the relevance of cryosphere observations and services, in the broader scientific and operational community. It is also acknowledges that, of all cryosphere variables, NMHSs normally report snow depth and some sea ice products, the latter, mostly through the National Ice Service programmes, but have very limited or no engagement on activities related to the other cryosphere components.

6.2.3. GCW made notable progress regarding the further development of a consolidated database of cryosphere terms, as a valuable reference <http://globalcryospherewatch.org/reference/glossary.php>. Currently, there are 4141 entries from 26 sources, and over 2200 are unique. Furthermore, the terms are being analyzed to identify differences in terminology and definitions; actions will be recommended towards developing integrated definitions. This is a critical step towards the development of standards for cryosphere data and metadata exchange, the

documentation of observing requirements, by application area, including the WIGOS Metadata Standard. The Team noted that the database of Cryosphere terms will be useful with regard to the Team's effort to review lists of variables (see item 7.1.2).

6.2.4. The Team recalled that GCW is not regarded as an Applications Area, and that instead all Application Areas need to reflect the requirements of the Cryosphere in OSCAR/Requirements and their respective Statements of Guidance (see item 7.4.4). GCW will be reviewing one Application Area at a time, and it will take about two months for GCW to complete its review of all SoGs. The goal is for GCW to provide a report for each reviewed SoG, with possible recommendations.

Type	Ref.	What	By whom	Deadline
Action	6.2.4	To review one Application Area at a time, and it will take about two months for GCW to complete its review of all SoGs	GCW	31 Mar. 2018

6.2.5. The Team noted with appreciation the excellent progress with regard to the international exchange of snow depth data in particular thanks to adopted Resolution 15 (EC-69). Recommendation on the international exchange of the Snow Water Equivalent data is under preparation for submission to EC-70.

6.2.6. The Team also noted that some cryosphere data gaps have been identified and are being addressed by the GCW.

7. ROLLING REVIEW OF REQUIREMENTS AND STATEMENTS OF GUIDANCE

7.1. Review database of User Requirements (OSCAR/Requirements)

7.1.1. Status of OSCAR/Requirements and plans

7.1.1.1. The Meeting reviewed progress regarding the operations, maintenance and further development of the WMO Database of User Requirements, included as OSCAR/Requirements into the Observing Systems Capability Analysis and Review Tool (OSCAR).

7.1.1.2. Since IPET-OSDE-2 in 2016, the following changes were introduced:

- The list of Application Areas in OSCAR was rationalized to bring consistency with the official list of Application Areas on the Website⁸. This applied particularly to the climate related Application Areas, where a teleconference was organized in the view to come up with a solution.
- Point of contact for Nowcasting and Very Short Range Forecasting, Paolo Ambrosetti (Switzerland), retired. The IPET-OSDE Chair approached Mr Alexander Kann (Austria) and asked whether he would be willing to take on that role. Mr Kann eventually accepted to be the new point of contact.
- Point of Contact for Ocean Applications, Guimei Liu (China), was promoted to another position and indicated that she could no longer undertake that role.
- New Point of Contact for Hydrology and Water Resources, Silvano Pecora (Italy), was nominated to replace the former Secretariat Point of Contact.
- Point of Contact for Space Weather, Terry Onsager (USA), was replaced by the Chair of the Inter-Programme Team on Space Weather Information, Systems and Services (IPT SWeISS), Ms Larisa Trichtchenko (Canada).
- Michel Rixen (WMO Secretariat) is the Point of Contact for the new Climate Science Application Area.

⁸ <http://www.wmo.int/pages/prog/www/OSY/GOS-RRR.html#SOG>

- The Point of Contact for Global NWP, Erik Andersson, expressed the wish to be replaced in that role, having recently taken on the role of Chairperson for IPET-OSDE.

7.1.1.3. Since IPET-OSDE-2, the Points of Contact were also reminded by the Secretariat of their responsibility to keep observational user requirements in OSCAR up to date. The following changes were made since IPET-OSDE-2:

- Some Ocean Application requirements were updated.
- Requirements for Aeronautical Meteorology were validated.
- Requirements for Atmospheric Chemistry related Application Areas were submitted although they could not be entered in the database at this stage due (i) delays in making submitted input consistent with the OSCAR database relational model, and (ii) most variables not existing in OSCAR/Requirements and requiring to be inserted in the database per updating and maintenance procedure described in **Annex IX**, noting also the process discussed under item 7.1.2 for integrating Variables in OSCAR and WIGOS.

7.1.1.4. The IPET-OSDE agreed with possible changes to be proposed for development and implementation in the OSCAR/Requirements information system:

- Allowing regional requirements (i.e. by regional association) to be documented in OSCAR/Requirements for each application area
- Allowing requirements of specific climate zones to be documented in OSCAR/Requirements for each application area
- Updating the list of variables in OSCAR/Requirements to reflect the proposal of the review group for variable names.
- Allowing requirements of sub-application areas to be documented in OSCAR/Requirements.

7.1.1.5. The Team also agreed that some guidance should be developed on how to use and interpret the user requirements in OSCAR/Requirements.

Type	Ref.	What	By whom	Deadline
Action	7.1.1.5	to draft an initial version of guidance on how to use and interpret the user requirements in OSCAR/Requirements, for review by the Team at its next meeting, as an extension of the existing general documentation of the RRR process	Secr.	IPET-OSDE-4

7.1.1.6. The Team reviewed the updating and maintenance procedure for OSCAR/Space (owned by ET-SAT) and OSCAR/Requirements (owned by IPET-OSDE) A procedure was developed and endorsed by ET-SAT and IPET-SUP in 2013 for the updating and maintenance of OSCAR/Space. Agreed updated version of the procedure for OSCAR/Requirements is provided in **Annex IX** (proposed update was to reflect that the Points of Contact for Application Areas are responsible for making sure that the Application Area "owner", i.e. the relevant Commission or Expert Group, is agreeing with the proposed requirements in OSCAR/Requirements). While OSCAR/Surface is operated by MeteoSwiss, the procedure for maintenance of WIGOS metadata in OSCAR/Surface is regulated in the WMO No. 1160, WIGOS Manual, with guidance in WMO No. 1165, WIGOS Guide. In particular, the WIGOS Guide includes a chapter 4 on Making WIGOS Metadata available to WMO using OSCAR/Surface.

Issue #3	Points of Contact of Application Areas
Background	All Application Areas need a Point of Contact.
Rationale for the	The Point of Contact is responsible for coordinating RRR activities for

decision/action or recommendation	<p>their Application Area with the user community of that area and to (i) collecting and compile observational user requirements and their entering into the OSCAR/Requirements, and (ii) doing a critical review and gap analysis and drafting the Statement of Guidance of the Application Area.</p> <p>PoCs are missing for some of the Application Areas, or the PoC expressed the wish to no longer undertake that role.</p>			
Decision(s)/action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.1.1	Nominate PoC for Ocean Application Area	JCOMM	Mar. 2018
	7.1.1	Nominate new PoC for Global NWP	CBS/DPFS	Mar. 2018
	7.1.1	To make sure that their Application Area "owner", i.e. the relevant Commission or Expert Group, is agreeing with the proposed requirements in OSCAR/Requirements	All PoCs	Ongoing

Issue #4	OSCAR/Requirements updating procedure			
Background	The OSCAR/Requirements and OSCAR/Space updating and maintenance procedure is kept under review by the IPET-OSDE and ET-SAT respectively.			
Rationale for the decision/action or recommendation	Some changes are proposed to the OSCAR/Requirements procedure to reflect on the recommendations of the OSCAR Variables review group.			
Recommendation(s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
		To update the OSCAR/Requirements updating and maintenance procedure as proposed in Annex IX	ICT-IO5	Feb. 2018

Issue #5	Evolution of OSCAR/Requirement			
Background	OSCAR/Requirements software and database to evolve in order to facilitate the undertaking of the RRR.			
Rationale for the decision/action or recommendation	A few possible evolutions of OSCAR/Requirements were identified and the IPET-OSDE is invited to discuss them and agree on which one(s) should be proposed.			
Decision(s)/action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.1.1	To agree on the list of OSCAR/Requirements evolution(s) to be proposed	IPET-OSDE-3	Jan. 2018
Recommendation(s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	7.1.1	To recommend list of desired evolutions of OSCAR/Requirements, and request the Secretariat to facilitate their development and implementation. To invite Members to contribute resources in support of development of the required	CBS through ICT-IO5	Mar. 2018

		changes.		
--	--	----------	--	--

Issue #6	Integration of lists of variables			
Background	To make proposals through appropriate governance for required changes in OSCAR, WIGOS Metadata Standard, and WMO Codes Lists			
Rationale for the decision/action or recommendation	Proposal with rationale will be expected from the List of Variables Review Group.			
Decision(s)/action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.1.1	To review, concur with or adjust the proposal of the Review Group	IPET-OSDE-2	Jan. 2018
	7.1.1	To work with MeteoSwiss for implementing required changes in OSCAR concerning lists of variables	Secretariat.	TBD
Recommendation(s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	7.1.1	To recommend implementing the changes proposed to the relevant WMO Codes lists	CBS via OPAG ISS	
	7.1.1	To recommend implementing the changes proposed to the WIGOS Metadata Standard	ICG-WIGOS via TT-WMD	

7.1.2. Harmonizing lists of variables

7.1.2.1. The meeting was briefed on actions taken in 2017 to make progress with regard to better integrating the Variables listed in OSCAR/Requirements & OSCAR/Space with those in OSCAR/Surface and the WIGOS Metadata Standard.

7.1.2.2. It has been recognized that there are some inconsistencies between the names and definitions of variables held in different parts of the WMO OSCAR database:

- between the names and definitions in OSCAR/Requirements (which are currently consistent with those used in OSCAR/Space), used for the RRR process,
- and the names and definitions used in OSCAR/Surface (which are currently consistent with those used in the WIGOS Metadata Standard).

7.1.2.3. In April 2017, the Secretariat initiated discussions within a small ad hoc group representing WIGOS, CBS and other interests to agree a way forward to resolve these inconsistencies. The group has met by teleconference and has agreed an approach for the work.

7.1.2.4. The group has agreed that the objective is to develop a coherent list of variables in the WIGOS Metadata Standard that can be used in OSCAR/Requirements, OSCAR/Surface and OSCAR/Space, and to minimize impact on those activities that use these facilities when implementing required changes. Also, it will be necessary to preserve the observational user requirements currently recorded in OSCAR.

7.1.2.5. The group has recalled that governance for the evolution of the lists of variables is currently the following:

- IPET-OSDE: OSCAR/Requirements
- WIGOS TT on WMD: WIGOS Metadata Standard

- WIGOS TT on OSCAR Development: OSCAR/Surface and OSCAR/Space
- IPET-CM: WMO Codes Lists
- TT-ACV: Content of WMO code lists concerning atmospheric composition

7.1.2.6. The group invited John Eyre (UK) and Léa Freydier (Switzerland) to lead a small team working with domain experts to solve identified issues.

7.1.2.7. The group has also agreed a number of Actions to take forward the technical work involved and has advised on the technical experts who may be approached to be involved in this work.

7.1.2.8. As an aid to resolving the conflicts in variable names and definitions, a new spreadsheet has been created, here called the "OSCAR variables spreadsheet"⁹, in which are listed:

- the variable name,
- the variable's ID number and definition for each of:
 - o the WIGOS metadata database,
 - o OSCAR/Surface,
 - o OSCAR/Requirements,
 - o the TT-ACV database,
- comments on issues to be resolved.

7.1.2.9. Work has progressed to the point where many of the conflicts, or apparent conflicts, have been resolved, and those that remain have been clearly identified. Further progress will now rely on the engagement of groups and/or their representatives who have expertise in particular RRR Application Areas and/or in particular observing technologies. This includes:

- experts in space-based observations (and in OSCAR/Space),
- representatives of GCW,
- representatives of GCOS,
- representatives of CHy,
- representatives of the Task Team on WIGOS Metadata .

7.1.2.10. This list is not intended to be complete – as the work progresses it is likely that representatives of other WMO interests will need to be involved.

7.1.2.11. The work has also identified groups of variables that appear to lack the required consistency and completeness, and which are also common to observations for several Application Areas and from several observing technologies. These variables and the work to resolve these issues are presented in Appendix 1 of IPET-OSDE-3 document¹ no. 7.1.2.

7.1.2.12. Comments on Appendix 1 of IPET-OSDE-3 document no. 7.1.2, received from invited experts by 4 January 2018, are summarized in Appendix 2 of IPET-OSDE-3 document¹ no. 7.1.2.

7.1.2.13. The Team concurred with the conclusions of the Breakout group that was formed during the meeting to address this issue. The conclusions of the group are provided in **Annex XIII**. The Team also agreed with the following:

- The WIGOS Metadata Standard is the reference but we may not have to use all of the standard variables in OSCAR;
- We need to come up with the list of WIGOS Metadata Standard variables which is consistent with OSCAR/Requirements;

⁹ <https://docs.google.com/spreadsheets/d/1Vcn-4nnahLsAciOGCdYJbqKyAq-ENf2IN1mq7zuCyJQ/edit?usp=sharing>

- We can introduce a grouping of variables (super-set) that are similar for the purpose of RRR, and then resolve inconsistencies and duplications. Obvious inconsistencies should be fixed as soon as possible.

7.2. Review database of Observing System Capabilities (OSCAR/Space & OSCAR/Surface)

7.2.1. The Meeting reviewed the status of the space-based observing systems capabilities database (OSCAR/Space), and the status of the new surface-based observing systems capabilities database (OSCAR/Surface) that has been developed in partnership with MeteoSwiss.

OSCAR/Space

7.2.2. The Team noted with appreciation that in September 2016 version 2 of the WMO space based Observing System Capability Analysis and Review tool (OSCAR/Space v2) was released. It offers now (i) factual information on satellites and instruments, and (ii) instrument assessments and “gap analyses”. In addition, the frequency plans of meteorological and some associated satellites and space-based space weather observation instruments are included as well. It was reviewed in CGMS-45 in June 2017, and CGMS Members and Observers are asked to support the WMO effort to maintain and update OSCAR/Space v2. It is challenging to sustain the information at its current level due to the increasing range of satellite programmes of CGMS interest, e.g. Space Weather. OSCAR/Space Users’ Workshop was held in October 2017 in EUMETSAT Users’ Conference for (1) further promote the use of OSCAR/Space; (2) inviting users to present their experiences in using OSCAR/Space; and (3) seeking contributions from users to the maintenance of OSCAR/Space.

7.2.3. For facilitating the provision of information on programmes, satellites and instruments templates have been created and made available to satellite operators by WMO to streamline the provision of input to the WMO Space Programme. This will help the OSCAR/Space project team to properly inject new and updated information into the OSCAR architecture. The task of keeping OSCAR/Space up to date can only be achieved with the network of experts from space agencies.

7.2.4. To achieve a sufficient maintenance and support for OSCAR/Space with keeping the database updated with information of sufficiently high quality, WMO would like to strengthen the cooperation with CGMS members and observers from other space agencies through newly established support groups, the OSCAR/Space Support Team (O/SST) and the OSCAR/Space Science and Technical Advisory team (O/SSAT), to ensure the sustainability of OSCAR/Space in the years to come. This scheme will lay the foundation of cooperation with CGMS for sustaining the OSCAR/Space updating process through provision of information on their satellite programmes by making use of the provided templates. A necessary budget and human resources will be allocated in accordance with the Decision 17 (CBS-16) on OSCAR Maintenance and Resourcing; where the Commission requested the Secretary General to facilitate maintenance and further development of the three components of OSCAR (OSCAR/Surface, OSCAR/Space, OSCAR/Requirements), and to actively solicit contributions from Members to this effort, for example in the form of secondments or financial resources to the WIGOS Trust Fund.

Ref.: 13860/2018-1.1 OBS- WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

Issue #7	OSCAR/Space as repository of WIGOS Metadata
Background	OSCAR/Space is not currently a natural repository of WIGOS metadata for space-based observing systems.
Rationale for the decision/action or recommendation	A proper repository is needed for WIGOS metadata concerning space-based observing systems.

Decision(s)/action(s)		What	By whom	Deadline
	7.2.4	To raise with ICT-IOS the issue that OSCAR/Space is not a natural place for hosting WIGOS metadata, and have ET-SAT to address the issue	IPET-OSDE Chair	Feb. 2018

Issue #8	Strengthening collaboration with CGMS regarding operations and evolution of OSCAR/Space			
Background	To achieve a sufficient maintenance and support for OSCAR/Space with keeping the database updated with information of sufficiently high quality, WMO would like to strengthen the cooperation with CGMS members and observers from other space agencies through newly established support groups, the OSCAR/Space Support Team (O/SST) and the OSCAR/Space Science and Technical Advisory team (O/SSAT), to ensure the sustainability of OSCAR/Space in the years to come. This scheme will lay the foundation of cooperation with CGMS for sustaining the OSCAR/Space updating process through provision of information on their satellite programmes by making use of the provided templates. A necessary budget and human resources will be allocated in accordance with the Decision 17 (CBS-16) on OSCAR Maintenance and Resourcing; where the Commission requested the Secretary General to facilitate maintenance and further development of the three components of OSCAR (OSCAR/Surface, OSCAR/Space, OSCAR/Requirements), and to actively solicit contributions from Members to this effort, for example in the form of secondments or financial resources to the WIGOS Trust Fund			
Rationale for the decision/action or recommendation	In order to ensure the sustainability of OSCAR/Space in the years to come, there is a need to achieve a sufficient maintenance and support for OSCAR/Space with keeping the database updated with information of sufficiently high quality.			
Decision(s)/action(s)	Ref.	What	By whom	Deadline
	7.2.4	To relay IPET-OSDE recommendation with regard to OSCAR/Space to CBS Management Group via ICT-IOS-10 and CBS TECO 2018, and communicate about resource requirements.	IPET-OSDE Chair	ICT-IOS-10
Recommendation(s)	Ref.	What	To whom (e.g. EC-70, Cg-18, ...)	Time frame
	7.2.4	<ul style="list-style-type: none"> To strengthen the cooperation with CGMS members and observers from other space agencies through establishment of relevant advisory and support groups. To request Members and invite other interested parties to invest in OSCAR/Space 	Cg-18	2019

OSCAR/Surface

7.2.5. The Team noted OSCAR/Surface developments and operations since the last IPET-OSDE meeting. It noted with appreciation the operational implementation of OSCAR/Surface in May 2016. OSCAR/Surface replaced WMO No. 9, Volume A. A number of OSCAR related decisions and recommendations were also adopted by CBS-16 in November 2016.

7.2.6. The Team underlined the importance of OSCAR/Surface for NWP Centres, together with the need to link OSCAR/Surface with the WIGOS Data Quality Monitoring

System (WDQMS). The Team agreed with the following priorities: (1) OSCAR/Surface operational use, (2) other evolutions of OSCAR/Surface, (3) tools and foundation for gap analysis. With these priorities in mind, the Team concurred with the proposed plan for the evolution of OSCAR/Surface in the next two years as detailed in **Annex XV**.

7.2.7. NWP centres and data users are also invited to provide feedback to the Secretariat on possible issues.

Issue #9	Plan for the evolution of OSCAR			
Background	Plan for the evolution of OSCAR in particular for the migration of OSCAR/Requirements with OSCAR/Surface within the MeteoSwiss IT infrastructure was presented to IPET-OSDE-3.			
Rationale for the decision/action or recommendation	The goal is to rationalize operations and long term maintenance of OSCAR, and undertake the software developments necessary for meeting the identified requirements.			
Recommendation(s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	7.2.7	To concur with the OSCAR development plan with consideration of the following priorities: (1) OSCAR/Surface operational use, (2) other evolutions of OSCAR/Surface, (3) tools and foundation for gap analysis	ICT-IOS and ICG-WIGOS	asap

7.3. Gap analysis using OSCAR

7.3.1. The meeting recalled its discussion at IPET-OSDE-2 with regard to developing tools for assisting the Points of Contact to undertake the critical review and gap analysis for the purpose of updating the Statements of Guidance of their respective Application Areas. In particular, IPET-OSDE-2 agreed that performing a gap analysis across the different observing systems is a scientifically and technically challenging task. In order to avoid over-engineering this project, the strategy is to gradually implement OSCAR/Analysis by implementing specific reports requested by Members and to gradually generalize them to arrive at more integrated analysis capability. IPET-OSDE-2 agreed to support the development of OSCAR/Analysis by providing a list of reports that could support the RRR process.

7.3.2. The Team reviewed and concurred with the proposal that was developed by the Secretariat according to IPET-OSDE-2 guidance. The proposal, slightly updated by the meeting is provided in **Annex XVII**.

Issue #10	Proposed gap analysis using OSCAR			
Background	IPET-OSDE-2 agreed to support the development of OSCAR/Analysis by providing a list of reports that could support the RRR process. A proposal of gap analysis using OSCAR was submitted to IPET-OSDE-3 for its review and concurrence.			
Rationale for the decision/action or recommendation	A relatively simple solution is being proposed (Annex XVII) as one of many other tools that can be used for gap analysis purposes (e.g. impact studies, expert knowledge) and meant to be used by experts knowing limitations of such tool.			
Decision(s)/action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.3.2	To specify the proposed gap analysis proposal using OSCAR in the view to estimate the cost of and options for its development.	Secretariat	Once approved by ICG-

Recommendation(s)	Ref.	What	To whom (e.g. EC-70, Cg-18, ...)	WIGOS Time frame
		7.3.2	To submit IPET-OSDE proposal for gap analysis as described in Annex XVII to ICT-IOS and ICG-WIGOS for their review and possible approval.	ICG-WIGOS via ICT-IOS

7.4. Application Areas

7.4.1. The meeting discussed WMO Application Areas under this item. The Team recalled the definition of an Application Area, i.e. an activity involving primary use of observations, in a chain of activities which allow National Meteorological Services or other organizations to render services contributing to public safety, socio-economic well-being and development in their respective countries, in a specific domain related to weather, climate and water. The concept of a WMO Application Area is used in the framework of the WMO Rolling Review of Requirements (RRR) and describes a homogeneous activity for which it is possible to compile a consistent set of observational user requirements agreed by community experts working operationally in this area.

7.4.2. Overview of status of Statements of Guidance (SoGs)

7.4.2.1. The IPET-OSDE Chair recalled that the Statement of Guidance (SoG) is a gap analysis and is meant to help CBS formulate plans to address gaps in the observing system with respect to user requirements. Recommendations derived from these gap analyses eventually go into the Implementation Plan and the Vision for the WIGOS component observing systems. The RRR process informs the Points of Contact (PoCs) of all WMO Application Areas (and indirectly all Members, WMO constituent bodies, WMO Programmes and co-sponsored Programmes) on the extent to which their requirements are met by present systems, will be met by planned systems, or would be met by proposed systems. This would also allow Members, WMO constituent bodies, WMO Programmes and co-sponsored Programmes, to check whether their requirements have been correctly interpreted and update them through the relevant PoC according to the RRR process. The procedure agreed by the Team for update, validation and approval of SoGs is provided in **Annex IV**.

7.4.2.2. The Team noted that, following IPET-OSDE-2 recommendations and further guidance from the Chair, some of SoGs have been updated during the last intersessional period. The Team reviewed available updates on individual SoGs as provided by the PoCs. Status of SoGs by IPET-OSDE-3 is summarized in **Annex VI**.

7.4.2.3. The Team recommended that the Points of Contact use the template of Statements of Guidance as provided in **Annex X**. The Team reminded the Points of Contact to update their SoG to be consistent with the agreed template (unless already done so).

7.4.3. Consider newly revised SoGs

7.4.3.1. The Meeting reviewed available updates on individual SoGs provided by the nominated Points of Contact within specific application areas.

Global NWP

7.4.3.2. The Point of Contact (PoC), Dr Erik Andersson (ECMWF¹⁰), reviewed and updated the Statement of Guidance for Global Numerical Weather Prediction (GNWP)

in December 2017. Changes included consideration of the following:

- GNWP Centres have shown that in a four-dimensional assimilation system wind can be directly constrained from assimilating radiances (e.g. MHS), through the tracer effect;
- Benefit of dissemination of high-resolution BUFR radiosonde data has been demonstrated;
- Wind Gust identified as important element where availability of more timely and accurate data would bring benefits, not least for the verification of damaging wind storms;
- Wind profiles at all levels outside the main populated areas, particularly in the tropics and in the stratosphere is part of the critical atmospheric variables that are not adequately measured by current or planned systems.

Issue #11	Global exchange of data in support of global NWP			
Background	Statement of Guidance for Global Numerical Weather Prediction (GNWP) identified			
Rationale for the decision/action or recommendation	GNWP would potentially substantially improve forecast quality by assimilating at higher time and space resolutions additional observations, which are not currently being exchanged but exist (e.g. commercial data).			
Recommendation(s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	7.4.3	to encourage the global exchange of data that is currently available Nationally or Regionally (sometimes commercially), in support of Global NWP at higher resolution, and the resulting needs for data from higher-density observing networks and higher temporal resolution, as well as observations of all relevant components of the Earth System, to enhance the forecast quality.	Cg-18	2019

High Resolution NWP

7.4.3.3. The Chair reported on the status of the SoG for High Resolution NWP on behalf of the Point of Contact, Thibault Montmerle (France) who has reviewed the Statement of Guidance in 2017 with the following considerations:

- Following IPET-OSDE-2 guidance and discussion with Elena Saltikoff of the radar community, the PoC has modified the section about "3D Clouds and Precipitation" in order to add some comments about the capability of weather radar to describe the 3D structure of precipitation.
- Comments about clouds and precipitation are now more clearly separated, and distinction about precipitation intensity at ground and 3D observation of precipitation (liquid or solid) is more clear.
- The PoC also added a brief comment about "*the interest of ground based radiometer, which is an interesting instrument allowing to sample profiles of low to mid-level humidity with high temporal and vertical resolutions*".
- Following the modifications related to radar reflectivity's, a request was made for a new requirement about "precipitation (liquid or solid)".

7.4.3.4. While thanking the PoC for his recent update of the SoG, the Team questioned introduction of changes related to the 3rd bullet above¹¹. The Team also suggested revisions to reflect the higher demand concerning the timeliness of observations, associated with more frequent update of the analysis.

Type	Ref.	What	By whom	Deadline
Action	7.4.3.4	To contact PoC and suggest revision of the questioned part of SoG HRNWP(i.e. the added sentence " <i>Ground based microwave radiometers have the same abilities with a good accuracy, vertical and temporal resolutions, but with marginal horizontal resolution</i> ").	E. Andersson	asap
Action	7.4.3.4	To revise the questioned part of SoG HRNWP (i.e. the added sentence " <i>Ground based microwave radiometers have the same abilities with a good accuracy, vertical and temporal resolutions, but with marginal horizontal resolution</i> ")	PoC HRNWP	asap
Action	7.4.3	To provide a proposed update of the Statement of Guidance for HRNWP to reflect the higher demand concerning the timeliness of observations, associated with more frequent update of the analysis, to be relayed to the PoC by the IPET-OSDE Chair.	S. Klink	End Feb. 2018

7.4.3.5. Small update was made by the PoC in OSCAR/Requirements in later 2017:

- doubled the requirements of the horizontal resolutions for surface pressure. Such increase is justified by the fact that forecast errors of surface pressure in HR NWP models have larger horizontal correlations than the other classical variables. The new threshold value of 40 km still is one order of magnitude lower than that of GNWP (whose 500 km is rather broad), but comparable to the 25 km for Ocean applications.
- introduced new requirements for Precipitation (liquid or solid) in the database with comment "3D precipitations can be deduced from active sensors such as ground based, airborne or space-borne radar. Details can be found in the SoG for HR NWP.

7.4.3.6. The Team discussed the issue of proposing possible solutions through CBS for improving timely availability of upper air reports, for example by splitting the distribution of individual reports in two or more parts distributed as the profile is being made. This would allow critical parts of the profile to be received by NWP centres in a timely manner. It is to be noted that there would be implication concerning the coding of the reports and reporting practice. The Team discussed briefly about the best split to be recommended, whether based on when a certain level (e.g. 300 hPa, in addition to the already established 100 hPa level) is reached, or whether based on some specific reporting frequency (e.g. every 30 minutes), but didn't come to a conclusion,

¹¹ e.g. the Team commented as follows : These observations have high temporal resolution but very low (almost non-existent) vertical resolution – they effectively provide one piece of information on water vapor (total column) and about 2 on temperature (roughly, surface air temperature and mean PBL temperature).

and agreed that requirements have to be better captured first for both GNWP and HRNWP.

Ref.: 13860/2018_1.1_OBS-WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

Type	Ref.	What	By whom	Deadline
Action	7.4.3.6	The Team invited the PoC for HRNWP to express the requirements regarding the best split to be recommended for upper air reports for improving timely availability of upper air reports (e.g. whether based on when a certain level (e.g. 300 hPa, in addition to the already established 100 hPa level) is reached, or whether based on some specific reporting frequency, e.g. every 30 minutes)	T. Montmerle	End Mar. 2018
Action	7.4.3.6	to consider this issue, and to task ET-SBO to propose a solution on the best split to be recommended, for upper air reports for improving timely availability of upper air reports (e.g. whether based on when a certain level (e.g. 300 hPa, in addition to the already established 100 hPa level) is reached, or whether based on some specific reporting frequency, e.g. every 30 minutes)	ICT-IOS-10	Feb. 2018

Nowcasting and Very Short Range Forecasting

7.4.3.7. The Team welcomed nomination in November 2017 of the new Point of Contact (PoC), Mr Alexander Kann (Austria) following retirement of the former PoC, Mr Paolo Ambrosetti (Switzerland), and thanked him for having proposed an update of the SoG.

Issue #12	Nowcasting and Very Short Range Forecasting			
Background	The new Point of Contact for Nowcasting and Very Short Range Forecasting (NVSRF) is invited to review observational user requirements in OSCAR/Requirements database and to update the Statement of Guidance of the Application Area			
Rationale for the decision/action or recommendation	Need to keep Application Areas under review, including user requirements and statements of guidance. In particular, there is the need to look at how AMDAR data and some satellite data (e.g. Sentinel) contribute to NVSRF, and what are the gaps in order to update SoG.			
Decision(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	to review observational user requirements in OSCAR/Requirements database	PoC NVSRF	April 2019
	7.4.3	to update the Statement of Guidance of the NVSRF	PoC NVSRF	April 2019
	7.4.3	to review and propose changes to SoG for NVSRF	F. Grooters	asap
	7.4.3	to review and proposed update to section about Sentinel in the SoG for NVSRF	J. Eyre	asap

Sub-seasonal to longer range predictions

7.4.3.8. The meeting noted the report provided by the Point of Contact, Dr Yuhei Takaya (Japan). The SoG has not been updated since IPET-OSDE-2. However, it is planned to revisit this document at the next IPET-OPSLS meeting (sometime in 2019), and if needed, an update will be made.

7.4.3.9. Also, in the context of redesign of the tropical Pacific observing system (TPOS), and the associated TPOS 2020 project (<http://tpos2020.org/>), impact studies are foreseen, which results should eventually lead to further update of the SoG.

7.4.3.10. In the context of model initialization for the ocean and sea-ice in Polar regions, the Team noted that the plans of the EU-funded APPLICATE project <https://appliccate.eu/> for specific observation impact studies that may be relevant.

7.4.3.11. The Team agreed that some elements on model initialization concerning the stratosphere could be introduced in the SoG to provide better predictability at seasonal time scales.

Type	Ref.	What	By whom	Deadline
Action	7.4.3.11	To introduce elements on initialization of the stratosphere in the SoG for SSLP to provide better predictability at seasonal time scales	PoC SSLP	IPET-OSDE-4

Aeronautical Meteorology

7.4.3.12. The Point of Contact, Dr Jitze van der Meulen (the Netherlands) reported to the Team via teleconference.

7.4.3.13. With regard to observational user requirements, small update was made by the PoC in January 2018, based on comments provided by experts nominated by the CAeM MG and secretariat. These were mostly linguistic improvements, and some new text was added. The PoC considered the request to introduce requirements related to icing, turbulence and lightning. It is found that for these phenomena particular objective variables have to be chosen (like Eddy Dissipation Rate, EDR for turbulence or Undercooled Liquid Water Content for icing) or defined (lightning (3D) in the Lower Troposphere (LT)). Currently no detailed requirements can be stated and progress should be made in further research to define these requirements. Also an appropriate definition of horizontal and vertical resolution should be stated for OSCAR/requirement. It might be expressed in terms of grid sizes (square root of the inverse of the density of measuring points) but alternatives might be more feasible.

7.4.3.14. Proposed updates of the SoG were provided and explained to the meeting. At the end of the SoG a special note is provided on the definition of the stated requirements on measurement uncertainty. The PoC suggested that, for statements of uncertainty requirements, WMO should follow the international regulations (explained in WMO-No. 8, the CIMO Guide) which differ from the definition used in OSCAR. This would imply a conversion of data and good understanding by the PoCs providing the requirements data.

7.4.3.15. The Team thanked the PoC for updating the SoG.

7.4.3.16. The PoC proposed the following actions:

Type	Ref.	What	By whom	Deadline
Action		To update the definition of uncertainty (one or two standard deviation). One Sigma has so far been consistently adopted in OSCAR/Requirements. The PoC proposed to multiply all figures of uncertainty by two. The Team felt that implementation of this proposal would introduce inconsistencies elsewhere, and decided not to adopt the proposal. The Team decided to introduce a note in OSCAR/Requirements to explain the	J. Eyre	asap

	definition of uncertainty used		
	To update the definition of horizontal and vertical resolution in OSCAR/requirements for Aeronautical Meteorology	E. Andersson	Mid-2018
	To introduce new variables in OSCAR, once proposal has been prepared by PoC for Aeronautical Meteorology.	PoC Aeromet	End 2018

7.4.3.17. The Team recalled that IPET-OSDE-2- action #48, which is still open, was to liaise with appropriate groups and address the issue of inconsistencies between the requirements and guidance of the International Civil Aviation Organization (ICAO), the Global Data Processing and Forecasting System (GDPFS), and WIGOS in a future review of the SoG for Aeromet. CAeM MG has an action item on this; it met from 22 to 24 January 2018 and discussed the issue, although it placed this action "on hold" (their next meeting is planned in 2019 at the earliest). The Team also recalled action #49, also still open, whereby icing and lightning paragraphs to be introduced in SoG with reference to such observations by aircraft. Resolution of both actions will depend on foreseen developments of ICAO regulations (i.e. review of ICAO Annex 3, which is WMO No. 49, Volume 2) and recommendations from the CAeM members (on icing and lightning).

Issue #13	Introduction of the correct definition of uncertainty, in line with international standards in OSCAR			
Background	The PoC for Aeronautical Meteorology had suggested that, for statements of uncertainty requirements, WMO should follow the international regulations (explained in WMO-No. 8, the CIMO Guide) which may differ from the definition used in OSCAR. This would imply a conversion of data and good understanding by the PoCs providing the requirements data.			
Rationale for the decision/action or recommendation	OSCAR/requirements is indicated by the WMO Technical Regulations as the standard reference to be followed for uncertainty requirements.			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	To update the definition and the database and make definition in the documentation of the database and RRR guidance document. In particular, IPET-OSDE-3 decided to keep current definition, and to continue using one sigma for the measure of uncertainty.	J. Eyre and Secretari at	asap

Issue #14	Introduction of the correct definition for horizontal and vertical resolution in OSCAR			
Background	The resolution mentioned in OSCAR was previously used by the Manual on the GDPFS and typically related to GRID based NWP. For surface based observations other variable are used to indicate the density of a network or spatial distributions. Conformity on the appropriate use of resolution is a requirement for defining networks.			
Rationale for the decision/action or recommendation	OSCAR/requirements is indicated by the WMO Technical Regulations as the standard reference to be followed for uncertainty requirements. Such mandatory requirements shall be feasible for all application areas.			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	To study the issue and make proposal at next IPET-OSDE-meeting	Chair and J. Eyre	IPET-OSDE-4

Issue #15	Introduction of new variables in OSCAR			
------------------	---	--	--	--

Background	Some new variable have to be defined, relevant for aeronautical meteorological services (1) For aeronautical meteorology volcanic ash is utmost relevant. It is proven that the variable expressing volcanic dust or particle concentration or density is less relevant than the particle size distribution of volcanic ash. (2) The detection and intensity of lightning, and also the possible potential for the occurrence of lightning is of major interest for aviation. Not only for surface but also for the LT. The current variable Lightning detection (2D) is insufficient for this practice and more appropriate variable(s) should be defined			
Rationale for the decision/action or recommendation	To introduce variables following requirements stated in the SoG			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	To study the issue of introducing new variables on aeronautical meteorology in OSCAR and consider proposals for possible update or addition to the list of variables	Chair and J. Eyre	End. 2018

Atmospheric Composition

7.4.3.18. Geir Braathen (WMO Secretariat) reported on the status of the SoGs concerning Atmospheric Chemistry on behalf of the Point of Contact, Oksana Tarasova (WMO Secretariat). The Team recalled that IPET-OSDE-1 had recommended that the Atmospheric Chemistry application area should be split into sub-applications. This has now been done, and it has been replaced, and split into the following three new application areas:

- Forecasting Atmospheric Composition
- Monitoring Atmospheric Composition
- Providing Atmospheric Composition information to support services in urban and populated areas

7.4.3.19. The Team noted with appreciation that observational user requirements have been developed for the three sub-AAs and are about to be inserted in OSCAR. The SoGs will be developed after the URs have been developed.

7.4.3.20. The Team noted that the Global Atmosphere Watch (GAW) Station Information System (GAWSIS) allows performing a gap analysis for the *in situ* observing systems capabilities addressing the requirements of the three sub Applications Areas. However, space-based observing system capabilities have also to be taken into account.

7.4.3.21. The Team agreed that what the GAW community has done in the last few years with regard to Atmospheric Composition was a good example of how to proceed to identify observational user requirements and define relevant new Application Areas.

Issue #16	Atmospheric Composition Application Areas observational user requirements
Background	Atmospheric Composition related Application Areas are (1) Forecasting Atmospheric Composition, (2) Monitoring Atmospheric Composition, and (3) Providing Atmospheric Composition information to support services in urban and populated areas. Their observational user requirements need to be recorded in OSCAR/Requirements, and gap analysis conducted. For some variables there are duplicate requirements, coming from different sources.
Rationale for the	Firstly, several of the old and deprecated Application Areas are not

decision/action or recommendation	<p>application areas at all, but either programmes/projects (e.g. CLIC), committees/panels (e.g. Climate-AOPC) or scientific disciplines (e.g. Atmospheric Chemistry). These deprecated Application Areas ought to be removed, not only from the list of Application Areas, but also from the list of Requirements. For some variables, and a given application area, there exist requirements that originate with different sources. There is hence a large risk that the requirements may be inconsistent within the considered application area. This is, for example, the case within the area that is the responsibility of GAW. Since GAW is dealing with observing requirements concerning greenhouse gases (notably CO₂, CH₄ and N₂O), reactive gases (notably O₃, NO, NO₂, CO, VOC, SO₂), GAW representing the users ought to be the sole source and owner of requirements for these variables and for the 3 Application Areas related to Atmospheric Composition (GAW may consult in the process with the relevant user communities and the Scientific Advisory Groups as needed).</p>			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	Decided that GAW shall be the sole source and owner of requirements for variables that are related to atmospheric composition (gases, aerosols) and UV radiation in the 3 AAs (1) Forecasting Atmospheric Composition, (2) Monitoring Atmospheric Composition, and (3) Providing Atmospheric Composition information to support services in urban and populated areas.	IPET-OSDE	Done
	7.4.3	To nominate PoCs for each of the 3 Application Areas related to Atmospheric Composition	GAW	asap
	7.4.3	new PoCs of AAs related to AC, once nominated, to do the gap analysis taking into account both surface-based and space-based observing systems for their sub-AA	PoC AC	End 2018
	7.4.3	to distribute the requirements spreadsheet on AC related AAs to the IPET-OSDE members for their review	Secr.	asap

Issue #17	Uncertainty units in the requirement database			
Background	The units used for uncertainties are hard-coded and cannot be changed when one enters requirements into the database.			
Rationale for the decision/action or recommendation	In some cases one wants uncertainties expressed in percent and in other cases one wants to express them in absolute terms. The GAW Secretariat suggested that there ought to be some freedom to express the uncertainties in accordance with what experts in the GAW Scientific Advisory Groups recommend.			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	To take note of the requirement. To remove the hard-coding of the units used for uncertainties while noting that the units for uncertainty is a characteristic for each 'variable' and is common across all AAs.	Secr. And Chair	Asap

Issue #18	Creation of new variables			
Background	<p>Within the application areas that deal with atmospheric composition there are many variables that have not yet made it to OSCAR. This is the case for several important species, such as H₂ (the most abundant molecule in the universe), NH₃, NO₃ and glyoxal. In the future we will certainly also want to add organic molecules (including halocarbons) that are not in OSCAR as of now. We also need to include isotopologues of a number of species, such as HDO, D₂O, ¹³CO₂, C¹⁷O¹⁶O, and their isotopomers. Today, the introduction of additional variables has to be approved by a committee.</p>			
Rationale for the decision/action or recommendation	<p>The GAW Secretariat suggested that the process to add new variables to OSCAR should be simplified, and that it ought to be possible for the GAW Secretariat to add new, relevant variables to the database.</p>			
Decision(s)/action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	To update the OSCAR/Requirements update procedure, so that the PoC for AC AAs should check whether there is any possible conflict with the WIGOS Metadata Standard; if not, the Chair of IPET-OSDE has authority to approve a new variable.	Secr.	ASAP

Issue #19	Subscripts and superscripts in OSCAR			
Background	<p>In chemistry one makes extensive use of subscript and superscript. This is not implemented in OSCAR and this creates a problem and can cause confusion. This becomes particularly visible when one deals with isotopes. As long as one deals with simple cases like CO₂ and CH₄ it is obvious that this means CO₂ and CH₄, but when one sees ¹³C¹⁸O¹⁶O, it becomes confusing if one does not have access to superscripts, since in this case it is not a molecule with 18 carbon atoms and 16 oxygen atoms, but it is and isotopologue of CO₂, namely ¹³C¹⁸O¹⁶O</p>			
Rationale for the decision/action or recommendation	<p>In order to be able to write chemical formulae correctly, and to avoid confusion, OSCAR needs to be able to display subscripts and superscripts.</p>			
Decision(s)/action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	Investigate how to make the OSCAR database capable of displaying subscripts and superscripts	Secr.	Asap

Ocean Applications

7.4.3.22. The Team noted that the Point of Contact for Ocean Applications, Dr Guimei Liu (China), resigned from that role due to her being promoted to another position in China. Steps will therefore have to be taken with JCOMM to have a new Point of Contact nominated.

7.4.3.23. The fifth Session of JCOMM (JCOMM-5, Geneva, Switzerland, 25-29 October 2017) also adopted Decision 14 (JCOMM-5) – Contribution to the Rolling Review of requirements, which requested (i) the JCOMM Observations Programme Area to consider in its work plan, and in dialogue with funders and implementers of the observing networks, how the critical variables identified in the Ocean Applications Statement of Guidance could be better observed in order to address the noted gaps, (ii) the JCOMM Services and Forecasting Systems Programme Area to assist the Point of Contact for Ocean Applications in reviewing the Statement of Guidance for Ocean Applications, and updating it as needed in order for this document to continue reflecting the reality of the gaps while the ocean observing system is being

implemented; in particular, consideration should be given to identifying whether additional critical variables such as sea-ice and snow could be added to the list, and (iii) the RRR to note the efforts and work of the Tropical Pacific Observing System (TPOS) Project TPOS-2020 and consider how to incorporate their recommendations.

7.4.3.24. The Team noted with appreciation the review of the Ocean Applications and other Statements of Guidance by the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC). OOPC thereby provided its feedback by mean of a letter from the OOPC co-chairs to the Point of Contact. In the letter, it is explained that given the fast-changing environment in ocean forecasting systems and the observing system status and capabilities, OOPC is keen to have a conversation about how ocean observations contribute to the WMO application areas (given that while the panel is responsible for observation requirements and observing system design all aspects of ocean climate for GCOS, it is also responsible for all timescales of ocean physics for GOOS), and the OOPC is particularly interested in supporting and advising the ocean applications area. Additional comments on other Statements of Guidance are also included in the letter. The OOPC Comments are provided in **Annex XVI**.

Issue #20	Ocean Applications			
Background	New Point of Contact for Ocean Applications needs to be nominated. The new Point of Contact for Ocean Applications, once nominated, is invited to review observational user requirements in OSCAR/Requirements database and to update the Statement of Guidance of the Application Area			
Rationale for the decision/action or recommendation	Need to keep Application Areas under review, including user requirements and statements of guidance.			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	Taking into account JCOMM-5 Decision 14 (e.g. with regard to consideration of sea-ice and snow requirements), the PoC to review observational user requirements in OSCAR/Requirements and to update them if necessary	PoC Ocean	IPET-OSDE-4
	7.4.3	Taking into account JCOMM-5 Decision 14 (e.g. with regard to consideration of sea-ice and snow requirements), PoC to review Statement of Guidance and to update it if necessary.	PoC Ocean	IPET-OSDE-4
	7.4.3	PoC to consider making proposal for renaming the Application Area, and possibly propose sub-applications for which independent sets of observational user requirements could be defined.	PoC Ocean	IPET-OSDE-4
	7.4.3	PoC to consider the comments from OOPC in its letter dated 11 December 2017, to liaise with OOPC co-Chairs and to update the SoG accordingly	PoC Ocean	IPET-OSDE-4
	7.4.3	To consider that the requirements in Coastal zones are different than the global ones, and to populate the user requirements in the	PoC Ocean	IPET-OSDE-4

		database accordingly		
	7.4.3	to consider the comments from OOPC for the review of their SoG	All PoCs	IPET-OSDE-4
Recommendation (s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	7.4.3	To nominate new Point of Contact for Ocean Applications	JCOMM MAN	Asap

Agricultural Meteorology

7.4.3.25. The Point of Contact for Agricultural Meteorology, Robert Stefanski (WMO Secretariat) reported on the status of the SoG for this Application Area. The Team noted that overall progress is delayed due to changes with regard to the relevant Expert Team in the Commission for Agricultural Meteorology (CAgM). However, work is progressing with regard to consideration of soil moisture requirements. Another issues to be considered will be how to handle rainfall measurements from simple rain gauges from farmers: the Regional Instrument Center (RIC) in Italy has tested simple rain gauges, and a report is pending. The Team invited the Point of Contact to update the observational user requirements in OSCAR/Requirements according to recent findings.

Hydrology and Water Resources

7.4.3.26. Claudio Caponi (WMO Secretariat) reported on the status of the SoG for Hydrology and Water Resources on behalf of the Point of Contact, Dr Silvano Pecora (Italy). He explained that the list of global user requirements in OSCAR/Requirements for Hydrology is probably useless, as for instance water discharge is not even in the list. The PoC has suggested to hide these requirements from the database. He proposed that user requirements for Hydrology in OSCAR/Requirements should be organized by type of basin and sub-application. One could start for example with flood forecasting for one type of basin; the rest will follow.

7.4.3.27. Team concurred with the plan proposed by the PoC, and is looking forward to completion of below actions.

Issue #21	Process to update SoG and requirements for Application Area "Hydrology"			
Background	<p>As announced at IPET-OSDE2, CHy-15, in December 2016, through its Resolution 5 (CHy-15) requested its Advisory Working Group "To prepare a new version of the observational requirements and the Statement of Guidance for the Application Area "Hydrology", taking into consideration the implementation plan of phase II of the WMO Hydrological Observing System (WHOS)."</p> <p>CHy also requested that the implementation plan of WHOS phase II be presented to EC-70 in June 2018 for its endorsement. The AWG is currently working hard to keep this tight deadline. It is expected to have a CHy-agreed version of the plan by mid-March 2018. In this framework, S. Pecora, the CHy vice-president and PoC of the Application Area, is forming a Task Team to review the requirements and update the SoG. The first contributions to OSCAR/Requirements should be made by the end of 2018.</p>			
Rationale for the decision/action or recommendation	Building on the experience of the WHOS pilot projects, it should be relatively easy to agree on requirements for a specific sub-application and different types of basins			
Decision(s)/action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Dead line</i>
	7.4.3	Submit requirements for flood	CHy	Dec.

		forecasting and different categories of basins	(S.Pecora)	2018
	7.4.3	Update the SoG on the basis of the requirements developed for different sub-applications	CHy (S.Pecora)	Mar. 2019

Climate Monitoring (GCOS)

7.4.3.28. Tim Oakley (GCOS Secretariat) reported on the status of Climate Monitoring (GCOS) Application Area. The Team recalled that ET-EGOS-2 (July 2006) accepted as SoG a set of GCOS documents. Currently, this set corresponds to the following:

- (i) Status of the Global Observing System for Climate, with last version, GCOS 195¹², published in 2015;
- (ii) The Global Observing System for Climate: Implementation Needs, with last version, GCOS 200¹³, published in 2016.

7.4.3.29. The decision to capture the GCOS requirements under one application area entitled 'Climate Monitoring' has been agreed by all three GCOS expert panels (AOPC, OOPC and TOPC). Work is currently ongoing to map the Essential Climate Variables (ECVs) requirements, which are listed in an Annex to the GCOS Implementation Plan, to the measurement requirements so these can be updated in OSCAR. If no match is identified then GCOS will propose new measurement definitions to be considered by IPET-OSDE. This is expected to be completed soon after the panel meetings which will take place in March and April 2018. GCOS also noted, with appreciation, the inclusion of a long-term 'stability' value in the OSCAR requirements and will work with its experts to include these in the updated requirements.

Issue #22	OSCAR and RRR need to be updated with current requirements			
Background	GCOS/WCRP was previously listed as the owner of nine application areas in OSCAR/requirements, some of which contained variable lists and actual information that were severely out of date. GCOS has been asked to revise the list of applications areas, and to revise/update the actual values of the requirements for the variables. The latest session of the WCRP WDAC preferred a single climate monitoring application area folding the current WCRP entries into the GCOS ones by using the 'goal' value.			
Rationale for the decision/action or recommendation	The secretariat needs to investigate how to incorporate the observational requirements, based on those listed in GCOS-200 and WCRP observational needs			
Decision(s)/action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	Update OSCAR/Requirements for the AA "Climate Monitoring" based on GCOS-200, decisions on requirements by the GCOS Steering Committee and information from WCRP, and to make them OSCAR-compliant	WMO Secretariat (GCOS)	
	7.4.3	WCRP to consider any observational requirements additional to those provided by GCOS for the AA "Climate Monitoring"	WCRP Secretariat	

Climate Applications (Other aspects, addressed by the Commission for Climatology)

7.4.3.30. Peer Hechler (WMO Secretariat) reported on the status of the SoG for

12 http://library.wmo.int/pmb_ged/gcos_195_en.pdf

13 https://library.wmo.int/opac/doc_num.php?explnum_id=3417

Climate Applications (other aspects, addressed by the Commission for Climatology) on behalf of the Point of contact, William Wright (Australia).

7.4.3.31. A teleconference with participation of IPET-OSDE chair and vice-chair, and Secretariat staff in charge of WIGOS, Observing Systems, GFCS, GCOS, WCRP and CCI was organized on 8 June 2017 to discuss OSCAR Climate Applications Requirements. The teleconference discussed the variety of climate related applications to be considered in the Rolling Review of Requirements framework with a view to find consensus on the official list of application areas to be considered in the future, and how to keep the climate-related observational user requirements up to date in OSCAR/Requirements.

7.4.3.32. In particular, with regard to the Climate Application (other aspects as managed by CCI) Application Area (Climate-CCI-AA), it was noted that it is relatively complex but mostly relies on data management, quality control and post-processing of existing and historical observations. There are various applications considered such as assessment of extreme events, production of indices, providing input to the IPCC assessment reports, prospective forecast products (monthly, seasonal, annual, decadal), calibration of climate models. Application for urban meteorology is also arising with the need for higher spatial resolution data. The use of volunteer networks is also leading to recommendations on how to make best use of such data, and the reinforced need for collecting WIGOS metadata. Currently, CCI considers all user requirements for its relevant key applications are probably already covered by GCOS.

7.4.3.33. Also, (i) there are no observational user requirements currently recorded in OSCAR/Requirements for Climate-CCI-AA and (ii) the current Statement of Guidance for Climate-CCI-AA is outdated (May 2012).

7.4.3.34. In front of the complexity of Climate-CCI-AA, and other priorities within CCI, there has been no update to the Statement of Guidance for this Application Area since IPET-OSDE-2 in April 2016.

7.4.3.35. The expansion of non-traditional observation networks has led the CCI Management Group to recommend to establish in the next intersession period starting in April 2018, a CCI Advisor on minimum requirements for specific climate applications on using non-NMHSs and volunteer networks (sitting in CCI-MG to liaise with CSIS, WIGOS, and GCOS). It is expected that through this new mechanism if endorsed by CC-17 in April 2018, CCI would be able to advise whether set(s) of user requirements independent from other existing Application Areas could be identified, propose name(s) of new Application Area(s), take action to have their requirements recorded in OSCAR/Requirements, do gap analysis and propose new Statement(s) of Guidance.

7.4.3.36. After discussion, the Team **decided to discontinue this Application Area**, but to keep the Statement of Guidance¹⁴ up to date and link from the SoG Webpage, below the table that contains the list of existing Application Areas. CCI will keep the document updated and assure whether important requirements are missing from a CCI/climate applications view. However, there is no intention to submit quantitative observational user requirements since it is assumed that such requirements are mostly captured by the GCOS 'Climate Monitoring' application area as well as by other existing application areas.

7.4.3.37. The Team also invited CCI to consider approaching IPET OSDE in the future in case it is believed that independent sets of observational user requirements related to climate applications could be provided quantitatively in OSCAR/Requirements.

14 'An analysis of current and emerging capacity gaps in surface and upper air observations to support climate activities' by William Wright (Australia). This document contains important qualitative requirements for climate applications.

Issue #23	CCL Requirements for Climate Applications			
Background	See IPET-OSDE-3 document ¹ no. 7.4.2(13)			
Rationale for the decision/action or recommendation	Need to keep Application Areas under review, including user requirements and statements of guidance.			
Decision(s)/ action(s)	Ref.	What	By whom	Deadline
	7.4.3	To update the SoG Webpage to reflect the Team's decision with regard to the status of Climate Applications	Secr.	asap
Recommendation(s)	Ref.	What	To whom (e.g. EC-70, Cg-18, ...)	Time frame
	7.4.3	<p>To investigate specific requirements of CCI with regard to climate applications, address the following or other options, decide and take action accordingly:</p> <p>(a) Declare Climate Application (CCI) AA obsolete and take steps for the observational user requirements of CCI to be documented through the other Application Areas, and the corresponding Statements of Guidance also updated according to those requirements and the identified gaps.</p> <p>(b) Keep the current SoG for climate applications document updated and assure whether important requirements are missing from a CCI/climate applications view. The document will be made available from suitable area on the OSCAR web pages.</p>	CCI	IPET-OSDE-4

Space Weather

7.4.3.38. The new Point of contact for Space Weather, Dr Larisa Trichtchenko (Canada, IPT-SWEiSS) reported on recent developments with regard to this Application Area

7.4.3.39. She recalled that space weather observations include the following domains: the Sun, interplanetary space, near-Earth space, magnetosphere, ionosphere, thermosphere, geomagnetic field. The required space weather data are obtained by a numerous types of instruments, both in space and on Earth. These platforms are operated by different organizations, in many cases not associated with meteorological services. In order to incorporate ground-based observing stations into OSCAR/surface database, the needs of multiple organizations have to be provided with the clear identification of steps involved in this process. The Recently established

CBS Inter-Programme Team on Space Weather Information, Systems and Services (IPT-SWeISS) has inherited the responsibilities of the former ICTSW and is continuing to coordinate space weather activities within the WMO Programmes.

7.4.3.40. She explained that the review of capabilities concerning space-based space weather observing systems (for OSCAR/Space) is moved into 2018. More data from recent space missions has only recently become available and can now be reviewed.

7.4.3.41. Review of capabilities concerning surface-based space weather observing systems currently cannot be done with use of OSCAR/Surface. The need to incorporate surface-based stations/platforms is identified, and IPT-SWeISS is working on the development of relevant templates for metadata (Solar, Ionosphere and Magnetic).

7.4.3.42. The Team noted with appreciation that the new version of SoG (with Gap Analysis) has been submitted by IPT-SWeISS to the WMO Secretariat for approval in December 2017. The review of OSCAR/Space SW-related dataset, requirements and Gap re-analysis is scheduled for 2018. Highlights include:

- Solar wind observations in real time have recently become available from the NOAA DSCOVR Space Weather service mission. In addition, NASA/ESA ACE scientific mission continues to serve as a backup.
- The required long-term continuity of in-situ solar wind measurements from the L1 position as well as coronagraph imagery remains one of the highest priorities. The US Space Weather Forward Observatory (SWFO) mission is currently in the pre-formulation phase and would satisfy both of these requirements. SWFO would be a two spacecraft mission with nominal launches of 2022 and 2027, providing a total mission life of 10 years. Completion of SWFO is dependent on successful funding in the US budget process.

7.4.3.43. The Team noted with appreciation excellent developments in this Area and thanked the Point of Contact for her efforts.

Issue #24	To clearly identify procedure for incorporating ground based space weather observations into OSCAR/Surface.			
Background	Space Weather observations from the ground include solar observatories, ionospheric observations (GPS and non-GPS), magnetic observatories, traditionally provided by many organisations, in many cases not related to MET services.			
Rationale for the decision/action or recommendation	In order to incorporate ground-based space weather observations into OSCAR/Surface, the procedure should be developed, which includes several steps, such as, for example: to create templates for 3 types of observation (magnetic, ionosphere and solar); to identify the level of necessity and a procedure for issuing WIGOS Station ID numbers for non-WMO ground based platforms (i.e. solar observatories, geomagnetic observatories, GPS ground stations, etc.)			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.3	To assist ICG-WIGOS Task Team on the WIGOS Metadata for updating the WIGOS Metadata Standard for compliance with Space Weather requirements	PoC	Cg-18
	7.4.3	To clarify requirements for issuing WIGOS Station IDs for surface-based Space Weather observing platforms	OPAG-ISS	IPET-OSDE-4
	7.4.3	to liaise with the PoC for Space	TT-WMD	Cg-18

		Weather and assure that the WIGOS Metadata Standard complies with Space Weather observing systems characteristics		
	7.4.3	To consider proposed update of the WIGOS Metadata Standard complying with Space Weather observing systems requirements, and take steps to update OSCAR/Surface and its data model accordingly	OSCAR/Surface Project Committee	2020

All Applications Areas

<i>Type</i>	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
Action	7.4.3	Team members are invited to provide feedback and suggestions for changes to all SoGs to the Points of Contact and the IPET-OSDE Chair	IPET-OSDE members	End May 2018
Action	7.4.3	IPET-OSDE vice-Chair, Stephan Klink will also be assisting to follow up regarding IPET-OSDE members providing feedback and suggestions for changes to all SoGs to the PoCs and IPET-OSDE Chair	S. Klink	End 2018
Action	7.4.3	to follow more strictly the terminology for SoGs, as specified in the SoG template, and to propose short summaries at the end of the SoG.	All PoCs	IPET-OSDE-4
Action	7.4.3	to invite the PoCs to advertise the SoGs at the national level	Secr.	IPET-OSDE-4

7.4.4. Consider areas requiring revised SoGs

Global Cryosphere Watch (GCW)

7.4.4.1. The Team noted with appreciation GCW efforts to respond to IPET-OSDE guidance from the last meeting, and in particular with regard to

- 1) Identifying application areas where cryosphere variables are required, consider adding missing variables in OSCAR/Requirements, and reviewing gaps relevant to GCW in all SoGs,
- 2) Identifying whether there are any current or emerging WMO activities for which independent sets of observational user requirements could be identified, and new Application Area(s) proposed,
- 3) Addressing the considerable differences between the lists of cryosphere variables from different sources and implement the use of GCW terminology in OSCAR.

7.4.4.2. The GCW Steering Group approved in 2017 the observing requirements for a CryoNet station, including recommended variables, desired variables, and required meteorological variables. These reflect the existing observing programmes supported by the scientific and operational communities engaged in GCW, supporting current scientific and operational goals, many, outside those normally delivered within the NMHSs framework.

7.4.4.3. As part of establishing the GCW surface observing network, all stations are expected to be visible through the OSCAR database. Additional development is needed within the OSCAR framework, to reflect the observations currently carried out at the GCW stations, especially those not managed by NMHSs. The further

development of the WIGOS Metadata Standard, to include additional cryosphere variables, is a priority for GCW. One of the recommendations to be made is to update the "snow/ice/glacier" subgroup to "cryosphere" to facilitate an accurate inclusion of all components of cryosphere.

7.4.4.4. Many of the existing Application Areas (hydrology, NWP, etc...) make references to a range cryosphere measurements, to various degrees of specificity, e.g. more detailed for snow observations, but minimal or missing for glacier, permafrost, ice sheets, etc.

7.4.4.5. The observing requirements documented in the existing Statements of Guidance are being fully reviewed by GCW, to assess whether they cover the cryosphere requirements of communities, in particular those not directly involved with the NMHSs. A report of the gap analysis will be made available in the latter part of 2018.

7.4.4.6. The review will address the topic of measured versus derived variables, and the in-situ versus space observations, and will include the additional clarity provided through the terminology assessment project, and will make recommendations regarding additional application areas, as needed.

7.4.4.7. Overall, the development of GCW is defined in the GCW Implementation Plan, which documents the range of services targeted for support, through the activities of GCW, as a WMO programme. The GCW IP, including its 2018 updates, would constitute a starting point for assessing the necessity of additional application areas.

7.4.4.8. The Team agreed that priority should be given at this stage to refining the user requirements for AAs already in OSCAR/Requirements, insofar as they refer to cryospheric variables; some additional user requirements that do not exist could also be introduced. Second priority will be to reviewing the SoGs of all AAs to improve the description of the observation capabilities, requirements and gaps with respect to the cryosphere, and identify whether there are AAs that could be proposed as additional to the existing AAs.

7.4.5. Consider any new Application Areas

Climate Research

7.4.5.1. The meeting was briefed about the work that was done in 2017 to look at all climate related Application Areas, and achieve better consistency between them.

7.4.5.2. WCRP related observational user requirements were initially organized under a number of separate WCRP-managed Application Areas dealing with respective Earth System domains (GEWEX for atmosphere-land, CliC for cryosphere, SPARC for stratosphere-troposphere, CLIVAR for ocean-atmosphere), air-sea fluxes (joint with SOLAS) and general climate modelling requirements. Many of those entries were as old as 1998. Those have now been consolidated and reviewed into a single Climate Science Application Area. Former observational user requirements of WCRP applications have now been hidden in OSCAR/Requirements.

7.4.5.3. Observational user requirements for the new Climate Science Area have been reviewed by the WCRP science community as of Dec 2017. First draft was submitted to the Secretariat by mean of an Excel sheet. Further efforts will be needed in order to finalize them and enter the figures in OSCAR/Requirements.

7.4.5.4. The Data Advisory Council and the Modelling Advisory Council meet on an annual basis, and will be looking at how to deliver a new Statement of Guidance for Climate Science. It is expected to have a draft SoG available within 18 months. The Team noted that requirements for climate process studies need to be kept and

maintained separately from those for the AA "Climate Monitoring" and any other climate related applications.

Ref.: 13860/2018-1.1 OBS- WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

Issue #25	Lack of resources to conduct a more detailed analysis of observational requirements and to develop a detailed SoG for the Climate Science Application Area.			
Background	Reduced financial and manpower resources in WCRP			
Rationale for the decision/action or recommendation	Climate Science is fundamental to ensure continuous progress and quality of climate services and support to policy making. Satellite and in-situ observations are critical to support research in climate analysis and prediction (including numerical model development, reanalyses, climate predictions and projections).			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	7.4.5	To enter the observational user requirements submitted in Excel sheet in the OSCAR/Requirements database. Observational requirements for climate science should particularly cover the observational needs of climate process studies (and not duplicate those provided by GCOS for Climate Monitoring).	PoC in collaboration with Secretariat (OSD)	asap
Recommendation(s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	7.4.5	To request Secretary General to identify resources to further review Climate Science requirements	EC-70	EC-70

Disaster Risk Reduction

7.4.5.5. The meeting invited WMO DRR Programme to review all SoGs and identify whether some SoGs should be updated to better reflect DRR requirements.

<i>Type</i>	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
Action	7.4.5	to review all SoGs and identify whether some SoGs should be updated to better reflect DRR requirements	WMO DRR Programme	IPET-OSDE-4

Urban requirements

7.4.5.6. With regard to Urban requirements, the Team recalled that Application Area "Providing Atmospheric Composition information to support services in urban and populated areas" already provided some information on current observation requirements and gaps. HRNWP and NVSRF are also addressing Urban observation requirements to some extent, but this can be further expanded. Other AAs will also need to consider Urban requirements.

<i>Type</i>	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
Action	7.4.5	PoCs of all other AAs than AC related, HRNWP and NVSRF to consider Urban requirements when updating their SoGs	All PoCs	End 2018

7.4.5.7. The Team further discussed Urban observations requirements in a

Breakout Group. The Team concurred with the conclusions of the breakout group as reflected in **Annex XII**.

8. OBSERVING SYSTEM STUDIES

8.1. Update on recent observation impact experiments

8.1.1. Dr Sid Boukabara (USA) presented an overview of the current activities with observing system studies, summarizing recent progress on several observing systems in terms of benefit to NWP since the second session of IPET-OSDE. His report had been prepared by the Coordinators on Scientific Evaluation of Impact Studies undertaken by NWP Centres (R-SEIS), i.e. Sid Boukabara (USA) and Seiyong Park (Rep. of Korea).

8.1.2. NWP centres conduct rigorous observation system experiments (OSEs) and sometimes routine FSOI before introducing new observations in their forecasting systems. With these impact experiments, the centres assess the benefits from new or additional observations before implementing their use in data assimilation. The Team noted the latest developments with regard to Observing System Experiments (OSEs), and Observing System Simulation Experiments (OSSEs), and in particular the outcome and recommendations of the 6th International Workshop on the Impact of Various Observing Systems on NWP (Shanghai, China, 10-13 May 2016), which included a number of recommendations (see IPET-OSDE-3 document¹ no. 8.1).

8.2. Proposal for new observation impact experiments to be promoted by IPET-OSDE

8.2.1. The Team recalled that a comprehensive proposal of specific studies and science questions of particular interest to IPET-OSDE had been developed for the Sixth WMO Workshop (Shanghai, China, 10-13 May 2016) and submitted and approved by CBS-16 in November 2016.

8.2.2. Sid Boukabara presented an updated list to the Team. The Team noted the updated list, which is reproduced in **Annex VII**, and to be submitted to the ICT-IOS-10.

Issue #26	Be able to undertake experiments to answer as many scientific questions as possible by influencing NWP centers to undertake these experiments or steer existing ones to also address these questions.			
Background	NWP Impact experiments tend to take a long time to execute. The reliance on the regular timeline of a workshop organization might not offer enough time to be able to influence the execution of the experiments.			
Decision	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	8.2.2	to submit the updated list of science questions to ICT-IOS-10	E. Andersson	Feb. 2018
Proposed recommendation	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cq-18, ...)</i>	<i>Time frame</i>
	8.2.2	-Share the information of the workshop scope and objectives and encourage the active participation of the NMHSs & NWP centres -Engage early enough (mid 2018 is recommended) with NMHSs to conduct OSEs and	To CBS OPAG-DPFS IPET-OSDE ET-SBO, ET-SAT	When the SOC is established (mid-2018)

		OSSEs and other impact experiments, to address the specific science questions identified by the meeting		
--	--	---	--	--

8.3. Plans for 7th Workshop on “The impact of various observing systems on NWP”, 2020.

8.3.1. The Meeting discussed preparations for the seventh WMO workshop on the impact of various observing systems on Numerical Weather Prediction (NWP) in 2020. Recently (September 2017) Korea Meteorological Administration (KMA) informed WMO CBS ICT-IOS chair of its willingness to host the workshop. The CBS management group and WMO Secretariat, after deliberations, accepted KMA’s offer. As a result, the 7th workshop is going to be held in the Republic of Korea (the specific city remains to be decided by KMA, but candidates are Seoul and Jeju). It will be held in May 2020. The duration will be 3.5 days and the number of participants expected will be around 100, consistent with previous workshops such as the one held in Shanghai in 2016.

8.3.2. After a few iterations, the list of the Scientific Organizing Committee (SOC) was proposed by C-CEIS co-coordinators and was discussed at IPET-OSDE-3 meeting. The Team concurred with the list below for the SOC:

- Sid Boukabara (NOAA, ET-SAT, C-SEIS), Chair of SOC
- SeiYoung Park (KMA, C-SEIS, POC from local host), co-Chair of SOC
- Erik Andersson (ECMWF, IPET-OSDE),
- Lars Peter Riishojgaard (WMO/WIGOS-PO),
- John Eyre (UKMO, IPET-OSDE),
- Tom Auligne (UCAR),
- Jianxia Guo (CMA).

8.3.3. The final decision will be taken at the 10th ICT-IOS, January/February 2018. It will most likely include representatives from CBS (ICT-IOS), WMO secretariat, and key persons involved in NWP impact assessments experiments. The Local Organizing Committee (LOC) is going to be suggested by the host (KMA) to the C-CEIS co-coordinators in early 2019.

8.3.4. The first circular for the workshop will be sent to the WMO members in August 2019 and the abstracts will be gathered until November 2019 (with a likely extension of a month or two offered). Once the SOC is established, the C-CEIS co-coordinators recommend that we engage global NMHS and NWP centers as early as possible (mid 2018), to encourage them to undertake some of the experiments to answer the scientific questions. Early engagement will increase the chances that experiments will be undertaken, or perhaps steered toward answering the high priority questions. Logistical information will start being sent to the participants in December 2019, the second circular will be sent in the February/March 2020 timeframe and a final reminder in late April 2020. An agenda of the workshop, to be put together by the SOC, will be expected in the April 2020 timeframe.

8.3.5. Under this item, the Team noted a proposal from IPET-OSDE member, Ms Zeinab Fahmy (Egypt) on how to extend time and spatial coverage of radiosonde data (see IPET-OSDE-3 background document no. 1). The Team encouraged the proposed impact study and agreed that it can potentially contribute to improving return of upper air data in RA-I. It also noted that it related to proposed Science Question number S11 on the Regional upper-air network design studies, as well as to EGOS-IP Action G10. The Team further noted that such study could only be made once the data are available at NWP centres, while consideration must be given to the fact that the current BUFR template for upper air data does not provide for the reporting of descent data, so data

Ref.: 13860/2018-11 OBS- WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

will have to be made available to NWP centres separately from the GTS. A suitable new BUFR template is under development. The quality of the data will also need to be assessed e.g. by inter-comparison. If the quality is comparable to that of ascent upper air data, then impact assessments should be conducted to assess the added value of this new data source.

Type	Ref.	What	By whom	Deadline
Action	8.3.5	To recommend composition of the Scientific Organizing Committee for the seventh WMO workshop on the impact of various observing systems on Numerical Weather Prediction (NWP)	E. Andersson	ICT-IOS-10

9. IMPLEMENTATION PLAN FOR THE EVOLUTION OF GLOBAL OBSERVING SYSTEMS (EGOS-IP)

9.1. Review of Guidance from Congress, CBS-16, EC-70 and ICG-WIGOS on the EGOS-IP and its status as part of WIGOS implementation

9.1.1. The Meeting reviewed Guidance from Cg-17, CBS-16, EC-69 and the Inter-Commission Group on WIGOS (ICG-WIGOS) on issues related to the EGOS-IP and its status as part of WIGOS Pre-Operational Phase (2016-2019). In particular, the Team recalled that the Seventeenth World Meteorological Congress (Cg-17, Geneva, Switzerland, 24 May – 12 June 2015) requested Members, in collaboration with partner organizations, and identified agents in the EGOS-IP, to address all Actions listed in the Plan in order to address the identified observational gaps with regard to the observational user requirements of the WMO Application Areas. Congress further requested Members who had not yet nominated their National Focal Points for the monitoring of progress on the actions listed in the EGOS-IP to do so by the end of December 2015. It requested CBS to find ways of improving the engagement of Members and Regions in completing the EGOS-IP actions and urged Members to mobilize resources to drive these activities forward. Congress and CBS-16 guidance was considered when discussion agenda items below.

9.2. Current EGOS-IP (2025)

9.2.1. Review of progress since IPET-OSDE-1, including Actions

9.2.1.1. Since IPET-OSDE-2, Geneva, Switzerland, April 2016, efforts have been made to review the progress on Actions contained in the current EGOS-IP (responding to the Vision of the GOS for 2025 and WIGOS needs) according to the guidance provided IPET-OSDE-2 in this regard. In particular, the following has been done:

- A letter was sent to all Permanent Representatives of WMO Members on 6 September 2016, requesting them (i) to pay particular attention to the list of the key EGOS-IP actions that was identified by IPET-OSDE and consider how they may address them; and (ii) to ensure that the country has a National Focal Point for EGOS-IP (terms of reference and nomination form were provided in Annexes of the letter). Details are provided in IPET-OSDE-3 document¹ no. 9.4 and its Appendix.
- The National Contact Points for the EGOS-IP have been requested to provide national reports for 2016 and 2017 with feedback regarding status of some specific Actions at the national level according to the template proposed by IPET-OSDE-2.
- A web-based survey was issued on 10 November 2017 asking NFPs to provide further feedback on a smaller number of EGOS-IP actions. See IPET-OSDE-3 document¹ no. 9.3 for further details.

- Action "owners" were contacted through the Secretariat to provide feedback on the status of Actions they "own".

9.2.1.2. The progress against the Actions of the EGOS-IP according to the feedback received from the NFPs, the Survey and the action "owners" was reviewed by the team and further updated by the Team. Outcome of this review is provided in **Annex XIV**.

Issue #27	Recommendations to Members with regard to Evolution of Global Observing Systems pending adoption of the future WIGOS IP			
Background	By monitoring status of Action of the EGOS-IP, some actions are showing slow or limited progress.			
Rationale for the decision/action or recommendation	Pending development and adoption of the future WIGOS IP (planned for 2023), which will be responding to the WIGOS Vision 2040, there is a need to assure appropriate evolution of global observing systems in order for WMO to be able to address critical gaps of Application Areas.			
Decision	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Dead line</i>
	9.2.1	To define list of specific EGOS-IP Actions for inclusion in draft Cg-18 Decision, based on the outcome of the EGOS-IP review at IPET-OSDE-3 and the discussions at ICT-IO-10.	E. Andersson	Mar. 2018
Recommendation(s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	9.2.1	To request Members and identified implementing agents to take steps to better address implementation of some specific EGOS-IP Actions (list TBD)	Cg-18	2019

9.2.2. Proposals for future review and reporting

9.2.2.1. The Meeting developed proposals for future review of and reporting against EGOS-IP. See **Annex VIII** for details.

9.3. Review of interactions with NFPs

9.3.1. The Meeting reviewed the interactions with the National Focal Points (NFPs). Consultation was initiated with the EGOS-IP National Focal Points, and a web-based Survey issued in November 2017.

9.3.2. For the purposes of monitoring progress by Members on implementing the various actions of the EGOS-IP, the Secretariat has established a group of National Focal Points (NFPs) who have the responsibility to provide feedback to WMO and the IPET-OSDE.

9.3.3. The Team agreed with the following:

- 1) A review of the questionnaire to NFPs is needed, and questions ought to be further refined
- 2) A review of the methodology for the questionnaire is also needed
- 3) Agree on schedule for interaction with the NFPs
- 4) The Team selected some key actions where we thought the NFPs were in the best position to have the expected feedback. It also turned the actions into a number of direct questions to the NFPs in order to facilitate their provision of feedback.

- 5) There has been good progress in the interaction with NFPs although not sufficient.
- 6) Improvements were noted with regard to the increase of observations frequency.
- 7) Thanking the NFPs is also important
- 8) There has been some omissions (missing responses from Members), and specific NFPs should be approached individually.
- 9) ET-SBO is also monitoring implementation of SBO through regional membership of ET-SBO.
- 10) NFPs should also be asked about their responsibility level and profile within their Country.

<i>Type</i>	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
Action	9.3.3	To (i) undertake a review of the questionnaire to NFPs and further refine the questions, (ii) undertake a review of the methodology for the questionnaire, and (iii) agree on schedule for interaction with the NFPs (Chair, assisted by Secr.)	E. Andersson	End 2018
Action	9.3.3	To thank the NFPs (chair, assisted by Secr.)	E. Andersson	End Feb. 2018
Action	9.3.3	To ask NFPs about their responsibility level and profile within their Country	Secr.	ongoing

9.4. High-level document on the EGOS-IP

9.4.1. The Team recalled the need to communicate to the Permanent Representatives of WMO Members on why we have the EGOS-IP, and what are the benefits. The goal is to facilitate implementation of EGOS-IP Actions by Members by raising awareness and commitment of the Permanent Representatives in this regard.

9.4.2. Following discussions at IPET-OSDE-1 (March 2014) and IPET-OSDE-2 (April 2016), and decisions of the Team, communication to the Permanent Representatives of WMO Members on why we have the EGOS-IP, and what are the benefits was drafted. The goal was to facilitate implementation of EGOS-IP Actions by Members by raising awareness and commitment of the Permanent Representatives in this regard.

9.4.3. Following IPET-OSDE-2, the Secretariat, in consultation with IPET-OSDE chair finalized and issued a letter on 6 September 2016 and entitled "Members contributions toward implementing actions of EGOS-IP" to all Permanent Representatives. The letter, included annexes on (i) New ways to contribute to and benefit from WMO Global Observing systems through the EGOS-IP, (ii) Key EGOS-IP Actions for Members, (iii) Nomination of National Focal Points on the EGOS-IP, and (iv) List of NFPs on the EGOS-IP. The Team agreed with the following:

Issue #28	Members contributions toward implementing actions of the Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP)
Background	<p>Following discussions at IPET-OSDE-1 (March 2014) and IPET-OSDE-2 (April 2016), and decisions of the Team, communication to the Permanent Representatives of WMO Members on why we have the EGOS-IP, and what are the benefits was drafted. The goal was to facilitate implementation of EGOS-IP Actions by Members by raising awareness and commitment of the Permanent Representatives in this regard.</p> <p>Following IPET-OSDE-2, the Secretariat, in consultation with IPET-OSDE chair finalized and issued a letter on 6 September 2016 and entitled</p>

	<p>“Members contributions toward implementing actions of EGOS-IP” to all Permanent Representatives. The letter includes the following annexes: Annex 1: New ways to contribute to and benefit from WMO Global Observing systems through the EGOS-IP; Annex 2: Key EGOS-IP Actions for Members; Annex 3: Nomination of National Focal Points on the EGOS-IP, and Annex 4: List of NFPs on the EGOS-IP.</p> <p>In parallel, consultation is also underway with the EGOS-IP National Focal Points, and a web-based Survey initiated in November 2017. See IPET-OSDE-3 document¹ no. 9-3 for details.</p>			
Rationale	<p>Need to communicate to the Permanent Representatives of WMO Members on why we have the EGOS-IP, and what are the benefits. The goal was to facilitate implementation of EGOS-IP Actions by Members by raising awareness and commitment of the Permanent Representatives in this regard.</p>			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	9.4.3	To issue a new version of the letter to the Permanent Representatives on Members contributions toward implementing actions of the EGOS-IP (only to those Members which have not nominated NFPs)	Secr.	30 June 2018
	9.4.3	To review Annex 1 of the letter and possibly propose changes	IPET-OSDE members	End Feb. 2018
	9.4.3	To review the list of key EGOS-IP actions and possibly propose changes	IPET-OSDE members	End Feb. 2018
	9.4.3	To invite ICT-IO5 to address IPET-OSDE concerns with regard to specific EGOS-IP actions 1) How to address the decline of GUAN in the tropical regions 2) S20 (MW imagers for SST – Ensure availability of microwave imagers with all necessary channels to monitor SST) whereby WMO should continue to raise the importance MW imager missions with CGMS and CEOS 3) S29 (Sounders for atmospheric chemistry) whereby WMO should restate the importance of sounders for atmospheric chemistry with both CGMS and CEOS	E. Andersson	ICT-IO5-10
Recommendation	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	9.4.3	To promote implementation of key actions of the EGOS-IP by means of a draft Recommendation to Cg-18 to be submitted through CBS process (incl. CBS TECO 2018).	CBS through ICT-IO5	Cg-18

9.5. Review of various Implementation Plans

9.5.1. The Meeting discussed the need to review the various Implementation Plans (EGOS-IP, GCOS, GCW, GFCS, GAW) and prepare a synthesis document for the Members to understand what CBS is doing to address these various plans. In particular, this will involve (i) looking at the actions from GCOS, GCW and GAW and identify those actions relevant to CBS and WIGOS, which may be missing from the EGOS-IP and could be proposed for consideration in a revised version of the EGOS-IP (or new WIGOS IP), and (ii) cross referencing the other actions from the GCOS, GAW and GCW IPs with those of the EGOS-IP. The Team agreed that it was important to undertake the effort.

9.5.2. The meeting reviewed the initial analysis prepared by the OPAG IOS Chair, and set up a breakout group to discuss this issue. The Team then concurred with the recommendations of the Breakout Group in **Annex IX**.

Issue #29	Review of Implementation Plans of WIGOS Component Observing Systems			
Background	The CBS Management Group requested the OPAG-IOS to review the various Implementation Plans (e.g. EGOS-IP, GCOS-200, GCW-IP, GAW-IP) relevant to WIGOS component observing systems to ensure that all CBS-relevant actions, in any of these existing IPs, will be captured and presented in the future WIGOS-IP. A synthesis document should be prepared to reflect the findings of the review with recommendations, and a summary of what will have to be considered in the future WIGOS-IP.			
Rationale for the decision/action or recommendation	Need to rationalize WMO response to the various implementation plans, feeding into the future WIGOS Implementation Plan (i.e. successor of EGOS-IP), responding to the WIGOS Vision 2040.			
Recommendation(s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	9.5.2	To invite ICT-IOS to propose mechanisms for undertaking the review of the various IPs in 2018. In particular, priority should be given to make sure that all component observing systems are represented in the WIGOS Vision 2040 to make it complete. This could also be a task of the review. This also facilitate the development of the future WIGOS IP, which is going to respond to the WIGOS Vision 2040	ICT-IOS	Feb. 2018
	9.5.2	to invite ICT-IOS to request the GCW Steering committee to update the GCW Implementation Plan with consideration of CBS efforts and guidance	ICT-IOS	Feb. 2018
	9.5.2	To invite ICT-IOS to request CHY to develop the WHOS Implementation Plan with consideration of CBS efforts and guidance	ICT-IOS	Feb. 2018
	9.5.2	To invite JCOMM and OOPC to develop the new GOOS Implementation Plan with consideration of CBS efforts and guidance	ICT-IOS	Feb. 2018

9.6. Updated or new Technical Regulations and Guidance

9.6.1. The meeting discussed issues for which new or updated Technical Regulations and/or guidance to Members may be needed (e.g. on the scheduling of reporting of upper air observations, exchange of surface-based GNSS observations).

9.6.2. The Team recalled that the Manual on the WMO Integrated Global Observing System (WMO-No. 1160), was approved by the Seventeenth World Meteorological Congress (Cg-17, 2015). Within the Manual, the following sections are relevant to the IPET: (i) Chapter 2.1 – Requirements, (ii) Chapter 2.2 – Design, Planning and Evolution, (iii) Appendix 2.1 – Observing Network Design Principles, (iv) Appendix 2.2 – Climate Monitoring Principles of the Global Climate Observing System, and (v) Appendix 2.3 – The WMO Rolling Review of Requirements.

9.6.3. Both since and as a result of Cg-17, the second session of the IPET (IPET-OSDE-2, April 2016), the 16th session of CBS (CBS-16, November 2016) and annual WMO Executive Council sessions, there have been a number of updates and changes to technical regulations that have been either approved or in the process of being developed. In particular, the Guide to the WMO Integrated Global Observing System (WMO-No. 1165) has been published and includes Chapter 5 with the Observing Network Design Principle Guidance that was developed by IPET-OSDE.

9.6.4. The 69th Session of the Executive Council (EC-69, 2017) also approved several recommended changes and updates to the Manual on the GOS and the Guide to the GOS based on Recommendation 4 (CBS-16), which responded to the WIGOS call for increased global standardization of observing technologies and techniques relating to (i) WIGOS station identifiers – WMO-No. 544, section 2.2.1.4, (ii) Automatic Weather Station (AWS) systems – WMO-No. 544, section 2.2.2, (iii) Aircraft Meteorological Stations – WMO-No. 544, section 2.5, (iv) Radar Wind Profiler (RWP) stations – WMO-No. 544, section 2.6, (v) Weather Radar Stations – section WMO-No. 544, 2.7, (vi) Voluntary Observing Ships' (VOS) scheme – WMO No. 488, part III, and WMO No. 544, section 3.2.1.3.3.1 and Appendix III.4.

9.6.5. The fifth session of the ICG-WIGOS (ICG-WIGOS-5, Jan. 2016) established a small WIGOS Editorial Board (WEdB) with responsibility to coordinate activities for the updating the WIGOS technical regulations. Part of the work of the WEdB will involve the integration of the Manual on the GOS into the Manual on WIGOS, which is aimed for approval by the eighteenth session of Congress (2019).

9.6.6. For technical materials related to the RBON, see agenda item 11.2.

9.6.7. The Team noted the following timeline concerning the update of WIGOS Regulatory material: By end of Feb. 2018, a draft of WMO No. 49 (Technical Regulations), Volume I, and the WIGOS Manual should be available for review by CBS TECO 2018 (Geneva, 21-26 March 2018). All Technical Commission will also be invited to review the draft material by end of June 2018. Then the material will be translated in all languages, and will be sent to all Members by end of September 2018 to be reviewed by them by end of 2018. Finally, the material will be submitted to Cg-18 for approval.

9.7. Future WIGOS IP responding to the WIGOS Vision 2040

9.7.1. The Team recalled that the current EGOS-IP was developed by the former Expert Team on the Evolution of Global Observing Systems (ET-EGOS) between 2009 and 2012 in response to the Vision for the GOS in 2015, and outcome of the Rolling Review of Requirements (RRR) at the time. The EGOS-IP was finally recommended by the 15th Session of the Commission for Basic Systems (Jakarta, Indonesia, 10-15 September 2012) through Recommendation 6 (CBS-15), which was eventually adopted by the Executive Council in 2013 through Resolution 10 (EC-65).

9.7.2. In compliance with the Manual on WIGOS (WMO-No. 1160), Chapters 2.1 and 2.2 on (i) requirements and (ii) design, planning and evolution respectively, the Organization will have to undertake the Rolling Review of Requirements and particularly develop a new Implementation Plan for the evolution of WIGOS Component Observing Systems (WIGOS-IP) responding to the Vision of WIGOS in 2040, and to replace the current Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP). Note that in parallel, and in compliance with GCOS requirements¹⁵, GCOS will undertake development of a new GCOS implementation plan to be presented to the UNFCCC in 2022, responding to the needs of Parties to the UNFCCC and its global stock take and gaps identified by the IPCC.

9.7.3. The new WIGOS-IP will take into account identified gaps, existing implementation plans (JCOMM, GAW, GCW, WHOS,...), the impact of various observing systems on WMO Application Areas, and the priorities of the Organization. It will guide Members and other partners to evolve and design observing systems while benefiting from new technologies and third-party data. The goal is to meet the needs of WMO Application Areas in the most cost-effective way and thereby to bring substantial benefits to society.

9.7.4. Now that we have a draft WIGOS Vision in 2040, which is meant to be submitted to the 18th Session of the World Meteorological Congress (Cg-18, 2019) for adoption by the WMO, and considering that this new Vision is now relatively stable, the Team agreed that it was now time for the IPET-OSDE to start planning for the development of the new WIGOS-IP responding to the WIGOS Vision in 2040.

9.7.5. The team concurred with initial milestones, activities and guidance for a plan to develop the new WIGOS IP responding to WIGOS Vision 2040 as provided in **Annex V**. The IPET-OSDE or its successor will play an important and critical role in developing the future WIGOS IP.

9.7.6. The Team noted that WMO will continue to operate under the current EGOS-IP until the future WIGOS IP is approved, expectedly in 2023. The Team agreed that after the WIGOS IP has been approved, it will also have to be updated on a four or five year basis, or alternatively that it should be complemented by a more detailed and regularly updated four-year plan (TBD).

Issue #30	Develop plan for developing the new Implementation Plans for the evolution of WIGOS Component Observing Systems (WIGOS-IP) responding to the Vision of WIGOS in 2040			
Background	Following up from the current Implementation Plan for the Evolution of Global Observing System (EGOS-IP), which is responding to the Vision for the Global Observing System in 2025, there will be the need to develop a WIGOS Implementation Plan (WIGOS-IP), which will be responding to the WIGOS Vision 2040, once approved by XCg-18.			
Rationale for the decision/action or recommendation	In compliance with the Manual on WIGOS (WMO-No. 1160), Chapters 2.1 and 2.2 on (i) requirements and (ii) design, planning and evolution respectively, the Organization will have to undertake the Rolling Review of Requirements and particularly develop a new Implementation Plan for the evolution of WIGOS Component Observing Systems (WIGOS-IP) responding to the Vision of WIGOS in 2040, and to replace the current Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP).			
Decision(s)/action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	9.7	Review the first version of the plan for developing the new WIGOS-IP and provide feedback to Chair and Secretariat	IPET-OSDE members	End Feb. 2018
	9.7	To relay IPET-OSDE draft	E. Andersson	ICT-

¹⁵ Annex A of "GCOS Implementation Needs", GCOS-200, and the actions contained in the same document

		plan for developing the new WIGOS-IP to the ICT-IOS		IOS-10
Recommendation(s)	<i>Ref.</i>	<i>What</i>	<i>To whom (e.g. EC-70, Cg-18, ...)</i>	<i>Time frame</i>
	9.7	Recommendation of CBS to EC-70 for initiating development of plan for developing the new WIGOS-IP	EC-70 through ICT-IOS-10, CBS TECO, CBS MG	Mar. 2018

10. VISION FOR THE EVOLUTION OF GLOBAL OBSERVING SYSTEMS

10.1. Vision for WIGOS in 2040

10.1.1. WMO regularly reviews its Vision of future global observing systems to support weather, climate and related environmental applications. Currently, a "Vision for WIGOS in 2040" is in preparation, with the aim of submitting it for approval to the 18th World Meteorological Congress in 2019.

10.1.2. Following preliminary work initiated in 2015 for the satellite component of WIGOS and in 2016 for the surface-based component with contribution of IPET-OSDE, an integrated overall draft "Vision" document is being developed by a drafting group led by the ICG-WIGOS Co-Chairs and with continued involvement of the lead authors of the surface and space-based contributions.

10.1.3. ICG-WIGOS-7 (Geneva, Switzerland, 15-17 January 2018) provided guidance on how to improve the document, e.g. better refer to cryosphere observations and GCW requirements, atmospheric composition and hydrology requirements, the role of partner organizations, etc.

10.1.4. Two more iterations of the review of the draft Vision are planned by teleconference (mid. February and mid. March). The draft Vision will then be frozen for its submission to EC-70 and information document and for the Executive Council to note work in progress. Erik Andersson, John Eyre and Frank Grooters will continue to contribute to the discussion on behalf of the IPET-OSDE. Between EC-70 and Cg-18, the draft Vision will be submitted for review by a wider audience.

<i>Type</i>	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
Action	10.1	to provide their feedback on the current version ¹⁶ of the draft Vision through the Chair and John Eyre	IPET-OSDE members	15 Mar. 2018

¹⁶ http://www.wmo.int/pages/prog/www/WIGOS-WIS/meetings/ICG-WIGOS-7/Doc-6-1_WIGOS-Vision-2040.docx

10.2. Updating the Vision for 2025

10.2.1. The meeting discussed whether there was a need for updating the Vision for the GOS in 2025¹⁷ and agreed it was not necessary. However, the Team recalled that it was keeping track of elements that are considered missing from that Vision, and should be considered in the new WIGOS Vision 2040. These elements are provided on the WMO Website¹⁸.

10.2.2. The Team invited its members to keep this webpage under review and to provide feedback on elements which they believe should be added.

Type	Ref.	What	By whom	Deadline
Action	10.2	to identify in the elements listed on missing Vision elements webpage (http://www.wmo.int/pages/prog/www/OSY/Documentation/Vision2025.html) whether some ought to be considered in the current draft WIGOS Vision 2040, and to provide their feedback to the IPET-OSDE representatives in the drafting group (i.e. John Eyre and Frank Grooters)	E. Andersson, S. Klink	asap

11.OBSERVING NETWORK DESIGN (OND) - PRINCIPLES AND GUIDANCE

11.1. Possible update of Observing Network Design Principles and related Guidance

11.1.1. The Team recalled that Observing Network Design (OND) Principles were developed by IPET-OSDE, and have then been adopted by Cg-17 and included in the WIGOS Manual.

11.1.2. According to its Terms of Reference, the IPET-OSDE was also tasked to propose guidance regarding the OND Principles. This work was completed and the Team's proposed guidance was eventually adopted by CBS-16 and included in the WIGOS Guide (WMO No. 1165, Chapter 5).

11.1.3. The Team considered whether there is any need to update the OND Principles and/or associated guidance. In particular, the Team discussed the need to develop specific guidance with regard to third party and private sector engagement for making their observations available to WMO in support of WMO Application Areas. After discussion, the Team agreed with the following:

- 1) Members should be encouraged to comply with the OND principles, in particular with regard to the observations exchange elements.
- 2) How to bring the message that Res. 40 (Cg-12) is not the only policy that ought to be followed by Members? Definition of the work "Essential" in Res. 40 (Cg-12) is critical. CBS TECO can be used as a mechanism to encourage Members to exchange more data in response to stated WIGOS observation requirements. RBON will also be a mechanism by which WMO should be able to substantially increase the amount of exchanged data. It was noted that the CBS led review on Emerging Data Issues is expected to propose amendments to the annex of Res. 40 (Cg-12) at CBS TECO 2018.

17 This Vision was approved by EC-61 (Geneva, 2009), and is available in English, French, Spanish, Russian, Chinese, and Arabic on the WMO Website - <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html>

18 <http://www.wmo.int/pages/prog/www/OSY/Documentation/Vision2025.html>

- 3) Further proposed updates to OND Principles and related guidance should be submitted to ICG-WIGOS via the WIGOS Editorial Board according to the timeline indicated in paragraph 9.6.7 above.
- 4) Changes are needed in the OND Principle Guidance with regard to tiered networks (Principle 7. Designing through a tiered approach), but this is not considered urgent.
- 5) One of the main problems WMO is facing with regard to OND Principles is how to assure compliance with the Principles. Indeed, many Members don't have resources to make observing systems evolve in compliance with the Principles. Outreach efforts are needed with the national observing network managers, and communication materials could be developed. Perhaps we could use good case studies where OND Principles have actually been used to design their observing networks. The Team agreed that we should be using CBS TECO 2018 for reinforcing the need on training regarding OPAG IOS issues, while making sure to include the OND principles in the list of required training topics. The Team requested its Chair to bring this issue to the attention of ICT-IOS-10. The Training Centres and the Regional Associations should also play a role in this regard.
- 6) The Team invited its members to review the OND Guidance and provide feedback to the Chair.
- 7) Principle 9 on "Making observational data available" is a critical one, and could be updated to better reflect usefulness of all data.
- 8) Members must also be informed about how their observations are being used by others, and benefit global NWP centres' forecasts.

Type	Ref.	What	By whom	Deadline
Action	11.1.3	to bring the issue of compliance to OND Principles and required training to the attention of ICT-IOS-10	E. Andersson	asap
Action	11.1.3	to review the OND Guidance and provide feedback to the Chair	IPET-OSDE members	IPET-OSDE-4

11.2. IPET-OSDE perspective on RBON Regulatory and Guidance material

11.2.1. The Team recalled that The 69th Session of the Executive Council (EC-69, 2017) concurred with Decision 21 (CBS-16) on the Regional Basic Observing Network (RBON) and adopted the RBON concept through Decision 21 (EC-69). RBON eventually replace the GOS Regional Basic Synoptic Network (RBSN) and the Regional Basic Climate Network (RBCN). This Decision recognized that the CBS is leading the ongoing development of the Concept incorporating feedback from all stakeholders, and that the CBS is initiating the development of regulatory material describing the RBON and the obligations of the WMO Members in its implementation, to be included in the next edition of the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160) to be submitted to Cg-18 in 2019. Since EC-69 (2017), the WIGOS Editorial Board has been working at drafting Regulatory Material corresponding to the RBON concept in consultation with ET-SBO Chair.

11.2.2. The Team also noted that the Third meeting of the WIGOS Editorial board (Geneva, 17-19 January 2018) had further developed such material (see agenda item 4.2). The meeting reviewed the draft material regarding and provided some feedback to the WIGOS Editorial Board through the Secretariat. In particular, the Team agreed that there was the need to reinforce requirements for improving exchange observational data, including in high resolution, and to possibly change the language from "should" to "shall" in some instances.

11.2.3. The goal will then be to finalize the draft with the Team's feedback by the end of February 2018 in order for it to be submitted to CBS Technical Conference (Geneva, 26-29 March 2018) and the CBS Management Group (Geneva, 29 March 2018) and to Cg-18 (2019) through EC-70 as information document (see also, the

timeline for developing WIGOS related Regulatory Material as detailed under paragraph 9.6.7).

Ref.: 13860/2018_1.1_OBS-WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

Issue #31	Review of RBON Regulatory Material			
Background	EC-69 adopted concept for RBON through Decision 21 (EC-69).			
Rationale for the decision/action or recommendation	CBS leading development of RBON Regulatory Material per Decision 21 (EC-69).			
Decision(s)/ action(s)	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
	11.2.3	To review the draft RBON Regulatory Material, and to provide feedback to the IPET-OSDE Chair	IPET-OSDE members	End Feb. 2018
	11.2.3	To provide IPET-OSDE feedback on draft RBON Regulatory Material to WIGOS Editorial Board Chair (Russell Stringer) and Secretariat (Igor Zahumensky). Note: comments can also be provided after the end of Feb. 2018 via the CBS President	IPET-OSDE Chair	End Feb. 2018

12. PREPARATION FOR FORTHCOMING CBS ACTIVITIES AND MEETINGS

12.1. IPET-OSDE updated work-plan for 2013-2016 and pending activities

12.1.1. The Meeting agreed on elements of a draft report and updated IPET-OSDE work-plan for 2013-2016 to be reviewed by and presented to the tenth session of ICT-IOS to be held the week after IPET-OSDE-3. The work plan with updated status is provided in **Annex III**.

12.1.2. It was noted that according to the new IPET-OSDE draft Terms of Reference, the central duties of the IPET-OSDE should continue in the next inter-sessional period. The Team agreed with the following:

<i>Type</i>	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
Action	12.1	to finalize the IPET-OSDE work plan for 2016-2019 with updated status	E. Andersson	asap

12.2. Reports to ICT-IOS-10 and CBS TECO 2018

12.2.1. The Team requested the Chair to finalize the IPET-OSDE report to ICT-IOS-10 and to convey IPET-OSDE recommendations to CBS governance process, including CBS TECO 2018 through ICT-IOS-10.

<i>Type</i>	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
Action	12.2	to finalize the IPET-OSDE report to ICT-IOS-10 and to convey IPET-OSDE recommendations to CBS governance process, including CBS TECO 2018 through ICT-IOS-10	E. Andersson	asap

13.ANY OTHER BUSINESS

13.1. Under this item, the Team discussed other business requiring its attention, but not covered above. In particular, the Team discuss the requirements for promoting international and global exchange of surface-based GNSS observations. Indeed, the situation with international exchange of surface based GNSS data is complicated and impacts agreement on international data exchange, cooperation with the private sector and also Resolution 40 (Cg-12).

13.2. In some instances, the operation of national networks of ground based GNSS observing stations has been transferred to the private sector, with contractual conditions not allowing cost-effective international exchange of the data. It could be argued that such data are not identified as Essential data in Res. 40 (Cg-12), and that there is therefore no obligation on Members to exchange such data on a free and unrestricted basis.

13.3. The Team recalled that ground-based GNSS observations provide information on the total water vapour column in the atmosphere, and that recent impact studies have shown that such data are having substantial positive impact on NWP (see references in **Annex XVIII**). A specific science question (S19 – Ground-based GNSS¹⁹) is also proposed to further address the issue.

13.4. The Team agreed that the issue ought to be brought forward to CBS TECO 2018 through ICT-IO5-10 in the view to inform CBS members on the critical importance of such data, and to come up with Cg-18 decision in this regard for:

- Facilitating international exchange of the data, perhaps through a revision of Resolution 40 (Cg-12). For example, there is no definition in Res. 40 (Cg-12) on what is Essential and Additional; it is up to each member to decide which data are distributed under these categories.
- Consideration of the possibility to commit surface-based GNSS observations observing stations to RBON. RBON Technical Regulations should provide for each Region to be able to make commitment on such data, which will be distributed internationally. A possible recommendation to Cg-18 could therefore include that each region will be requested to include surface based GNSS data in their RBON data set.
- Members, when they negotiate contracts with third parties, should also be encouraged to assure that the data are globally exchanged over the GTS for use by the NMHSs of WMO Members.

<i>Type</i>	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
Action	13.4	to provide further feedback on the usefulness of ground-based GNSS data to the Co-rapporteurs on Evaluation and Impact Studies (C-SEIS)	IPET-OSDE members	IPET-OSDE-4

14.ACTION PLAN

14.1. Actions decided by this meeting, are recorded in **Annex II**. The updated workplan – with status of tasks – for the IPET-OSDE, taking into account the outcome of this IPET-OSDE-3 Session, is provided in **Annex III**.

¹⁹ Promote undertaking impact studies to assess the impact of ground-based GNSS on NWP. This will help sensing the potential need to exchange data internationally. In addition to regional impacts, global impacts or at least wide-regional impacts are encouraged.

15.CLOSURE OF THE SESSION

15.1. The Chair thanked the Team members and the Secretariat for contributing to the successful outcome of the meeting. There has been excellent contribution from all team members to the discussion.

15.2. The Secretariat also thanked the chair for his leadership, and all Team members for their active contribution to the meeting. He recalled the importance of the work of this Team, and was looking forward to their further contribution to WMO and the Rolling Review of Requirements (RRR).

15.3. The meeting closed at 13:00 on Thursday 1 February 2018.

ANNEX I
LIST OF PARTICIPANTS

(IPET-OSDE3, Geneva, Switzerland, 29 January – 1 February 2018)

1. IPET-OSDE MEMBERS

<p>ANDERSSON, Erik (chair)</p>	<p>European Centre for Medium-Range Weather Forecasts Shinfield Park Reading RG2 9AX United Kingdom of Great Britain and Northern Ireland Tel: +44 118 949 9060 Fax: +44 118 986 9450 Email: erik.andersson@ecmwf.int</p>
<p>KLINK, Stefan (co-chair)</p>	<p>Deutscher Wetterdienst (DWD) Frankfurter Strasse 135 D-63067 OFFENBACH AM MAIN Germany Tel: +49 69 8062 4492 Fax: +49 69 8062 11994 Email: stefan.klink@dwd.de</p>
<p>FAHMY, Zeinab (core-member)</p>	<p>Egyptian Meteorological Authority Koubry El-Quobba , 11784 CAIRO Egypt Tel: (+202) 26849857 Fax: (+202) 26849857 Email: zanb_f@hotmail.com</p>
<p>SATO, Yoshiaki (core-member)</p>	<p>Japan Meteorological Agency (JMA) 1-3-4 Otemachi, Chiyoda-ku TOKYO 100-8122 Japan Tel: +81 3 3212 8341 (ext.4224) Fax: +81 3 3211 2032 Email: y-sato@met.kishou.go.jp</p>
<p>PARK, Seiyong (core-member)</p>	<p>Korea Meteorological Administration (KMA) 61 Yeouidaebang-ro, 16-gil, Dongjak-gu Seoul 156-720 Republic of Korea Tel: 82-70-7850-6856 Fax: 82-2-2181-0908 Email: sypark0@korea.kr</p>
<p>EYRE, John</p>	<p>Met Office FitzRoy Road EXETER EX1 3PB</p>

Ref.: 13860/2018-11 OBS- WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

<p>(core-member)</p>	<p>Devon United Kingdom of Great Britain and Northern Ireland Tel: 44-1392-885175 Fax: Not Applicable Email: john.eyre@metoffice.gov.uk</p>
<p>GOLDSTRAW, Stuart (core-member) <i>(participated via teleconference)</i></p>	<p>Met Office FitzRoy Road EXETER EX1 3PB Devon United Kingdom of Great Britain and Northern Ireland Tel: +447785372591 Fax: Not Applicable Email: stuart.goldstraw@metoffice.gov.uk</p>
<p>MA, Lijuan (associate-member) <i>(participated via teleconference)</i></p>	<p>China Meteorological Administration 46 Zhongguancun Nandajie 100081 BEIJING China Tel: +86-10-68406544 Mobile: +86-13811886125 Email: malj@cma.gov.cn</p>
<p>MUNRO, Rosemary (associate-member)</p>	<p>EUMETSAT Postfach 100555 D-64205 DARMSTADT Germany Tel: +49 6151 807 452 Fax: +49 6151 807 838 Email: rosemary.munro@eumetsat.int</p>
<p>BOUKABARA, Sid Ahmed (associate-member)</p>	<p>NOAA/NESDIS Center for Satellite Applications and Research (STAR) 5200 Auth Rd MD 20746-4325 United States of America Tel: 301 683 3615 Fax: 301 683 3526 Email: sid.boukabara@noaa.gov</p>
<p>MARSHALL, Curtis (associate-member)</p>	<p>NOAA - National Weather Service 1325 East-West Highway MD 20910 United States of America Tel: +01 301 472 9244 Fax: +01 301 7131253 Email: curtis.marshall@noaa.gov</p>

2. INVITED EXPERTS

<p>REA, Anthony (Chair, OPAG-IOS)</p>	<p>Bureau of Meteorology G.P.O. Box 1289 MELBOURNE 3001 VIC Australia Tel: 61396694222 Fax: 61396694168 Email: anthony.rea@bom.gov.au</p>
<p>GROOTERS, Frank (ET-ABO member)</p>	<p>Consultant Prunuslaan 17 NL-3723 WC Bilthoven The Netherlands Tel: +31 30 2293250 / +31 6 11225867 Email: fgrooters@gmail.com</p>
<p>FREYDIER, Léa</p>	<p>Léa Freydier Praktikant/in Federal Department of Home Affairs FDHA Federal Office of Meteorology and Climatology MeteoSwiss Operation Center 1 CH-8058 Zurich-Airport Zurich Switzerland Tel: +41 58 460 92 39 Email: lea.freydier@meteoswiss.ch</p>
<p>VAN DER MEULEN, Jitze</p>	<p>Senior scientist KNMI RDWD Utrechtseweg 297 3732 HA, De Bilt Kamer A 1.54 Postbus 201, 3730 AE De Bilt the Netherlands Tel: +31 30 2206432 Fax: +31 30 2210407 Email: meulenvd@knmi.nl</p>
<p>TRICHTCHENKO, Larisa (participated via teleconference) (IPT-SWEISS)</p>	<p>Senior Scientist, Natural Resources Canada, 2617 Anderson Rd Ottawa, ON Canada Tel: 1-613-837-9452 Email: larisa.trichtchenko@canada.ca</p>

Ref.: 13860/2018-11 085- WIGOS/OSD
 Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

3. SECRETARIAT

WMO SECRETARIAT

7 bis, avenue de la Paix
CH-1211 Geneva 2
Switzerland

Ref.: 13860/2018-11 OBS- WIGOS/OSD
Approved by Fernando Belda Espluques, Wed May 23 15:04:38 UTC 2018

<p>BELDA, Fernando Director, Observing and Information Systems Department (OBS)</p>	<p>Tel: (+41 22) 730 8035 Fax: (+41 22) 730 8021 E-mail: fbelda@wmo.int</p>
<p>CHARPENTIER, Etienne Chief, Observing Systems Division (OSD), OBS Department</p>	<p>Tel.: (+41 22) 730 8223 Fax: (+41 22) 730 8478 E-mail: echarpentier@wmo.int</p>
<p>LOCKETT, Dean Scientific Officer, Aircraft Observations Unit (AIR), OSD, OBS Department</p>	<p>Tel.: (+41 22) 730 8323 Fax: (+41 22) 730 8021 Email: dlockett@wmo.int</p>
<p>BOJINSKI, Stephan Satellite Utilization and Products Division WMO Space Programme OBS Department</p>	<p>Tel : +41 22 730 8319 Fax: +41 22 730 8478 E-mail: sbojinski@wmo.int</p>
<p>BRAATHEN, Geir Atmospheric Environment Research Division Research Department</p>	<p>Tel: +41-22 730 8235 Fax: +41 22 730 8036 E-mail: GBraathen@wmo.int</p>
<p>BROCK, Greg Scientific Officer, Aeronautical Meteorology (AEM) Division, WDS Department</p>	<p>Tel: +41-22 730 8408 Email: gbrock@wmo.int</p>
<p>CAPONI, Claudio Capacity Building in Hydrology and Water Resources Management Office, Climate and Water Department</p>	<p>Tel: +41-22 730 8407 Email: ccaponi@wmo.int</p>
<p>GRIMES, Sarah Officer in Charge, Marine Meteorology and Ocean Affairs Division (MMO), WDS Department</p>	<p>Telephone: +41-22 730 82 37 Telefax: +41-22 730 81 28 Email: sgrimes@wmo.int</p>
<p>HAROU, Abdulaye Chief, Data Processing and Forecasting Systems Weather and Disaster Risk Reduction Services Department (WDS)</p>	<p>Tel: +41 22 730 8231 Fax: +41 22 730 8128 Email: aharou@wmo.int</p>

Ref.: 13860/2018_1.1_OBS_WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

NUNES, Luis Scientific Officer, WIGOS Office	Tel.: +41 22 8138 Fax: +41 22 730 8021 Email: lnunes@wmo.int
NITU, Rodica Project Manager, GCW OBS Department	Tel: + 41 22 730 8482 Email: Rnitu@wmo.int
OAKLEY, Tim GCOS Secretariat	Tel: + 41 22 730 8068 Email: toakley@wmo.int
RICHTER, Carolin Director, GCOS Secretariat	Tel: +41 22 730 8275 Fax: +41 22 730 8052 Email: CRichter@wmo.int http://gcos.wmo.int
RIXEN, Michel WCRP	Tel: + 41 22 730 8528 Email: MRixen@wmo.int
ZAHUMENSKY, Igor Scientific Officer, WIGOS Project Office	Tel.: (+41 22) 7277 Fax: (+41 22) 730 8021 E-mail: izahumensky@wmo.int

ACTION SHEET RESULTING FROM IPET-OSDE-3

Note: The full list of IPET-OSDE Actions, including from previous meeting, sorted by topic and with status is available on the Team's shared Google Drive¹, and has been updated with the list of actions from this meeting (note that the action numbers are different in the version of the Google drive).

No.	Type	Ref.	What	By whom	Deadline
1	RRR/General	E3/2.1	to share its generic Presentation on the Rolling Review of Requirements (RRR) with the Team members	Secretariat	Asap
2	URs-SoGs	E3/4.1.3	to invite CIMO to assist by giving guidance with regard to observing station metadata fields accuracy requirements in OSCAR/Surface and advise on the critical variables for which the desired level of accuracy ought to be provided, e.g. barometer height	Secr.	asap
3	URs-SoGs	E3/7.1.1.5	to draft an initial version of guidance on how to use and interpret the user requirements in OSCAR/Requirements, for review by the Team at its next meeting, as an extension of the existing general documentation of the RRR process	Secr.	IPET-OSDE-4
4	URs-SoGs	E3/7.1.1	To agree on the list of OSCAR/Requirements evolution(s) to be proposed	IPET-OSDE-3	Jan. 2018
5	URs-SoGs	E3/7.1.1	To review, concur with or adjust the proposal of the Review Group	IPET-OSDE-2	Jan. 2018
6	URs-SoGs	E3/7.1.1	To work with MeteoSwiss for implementing required changes in OSCAR concerning lists of variables	Secretariat.	TBD
7	URs-SoG	E3/Annex 13	To prepare proposal of IPET-OSDE regarding the review of variables to the ICG-WIGOS TT-WMD (proposal to be reviewed by John, Luis, Etienne, Léa, Erik before submission to TT-WMD)	L. Freydier	7 Feb. 2018
8	URs-SoGs	E3/7.1.1	To make sure that their Application Area "owner", i.e. the relevant Commission or Expert Group, is agreeing with the proposed requirements in OSCAR/Requirements	All PoCs	Ongoing
9	URs-SoGs	E3/7.4.3	To update the definition of uncertainty (one or two standard deviation). One Sigma has so far been consistently adopted in OSCAR/Requirements. The PoC proposed to multiply all figures of uncertainty by two. The Team felt that implementation of this proposal would introduce inconsistencies elsewhere, and decided not to adopt the proposal. The Team decided to introduce a note in OSCAR/Requirements to explain the definition of uncertainty used	J. Eyre	asap
10	URs-SoGs	E3/7.4.3	To update the definition and the database and make definition in the documentation of the database and RRR guidance document. In particular, IPET-OSDE-3 decided to keep current definition, and to continue using one sigma for the measure of uncertainty.	J. Eyre and Secretariat	asap

¹ <https://drive.google.com/open?id=170GPiNImfcd-jCXKvsAHpY5EFRZpASGMUU7iLGHCxZo>

No.	Type	Ref.	What	By whom	Deadline
11	URs-SoGs	E3/7.4.3	To study the issue of introducing the correct definition for horizontal and vertical resolution in OSCAR and make proposal at next IPET-OSDE-meeting	Chair and J. Eyre	IPET-OSDE-4
12	URs-SoGs	E3/7.4.3	To study the issue and consider proposals for possible update or addition to the list of variables	Chair and J. Eyre	End. 2018
13	URs-SoGs	E3/7.4.3	To take note of the requirement to sometimes express uncertainty in percent and sometimes in absolute terms. Consider removing the hard-coding of the units used for uncertainties while noting that the units for uncertainty is a characteristic for each 'variable' and is common across all AAs.	Secr. and Chair	Asap
14	URs-SoGs	E3/7.4.3	To investigate how to make the OSCAR database capable of displaying subscripts and superscripts, as necessary for chemical species, for example.	Secr.	Asap
15	URs-SoGs	E3/7.4.3	to consider the comments from OOPC for the review of their SoG	All PoCs	IPET-OSDE-4
16	URs-SoGs	E3/7.4.3	Team members are invited to provide feedback and suggestions for changes to all SoGs to the Points of Contact and the IPET-OSDE Chair	IPET-OSDE members	End May 2018
17	URs-SoGs	E3/7.4.3	IPET-OSDE vice-Chair, Stephan Klink will, also be assisting to follow up regarding IPET-OSDE members providing feedback and suggestions for changes to all SoGs to the PoCs and IPET-OSDE-Chair	S. Klink	End 2018
18	URs-SoGs	E3/7.4.3	to follow more strictly the terminology for SoGs, as specified in the SoGs template, and to propose short summaries at the end of the SoG.	All PoCs	IPET-OSDE-4
19	URs-SoGs	E3/7.4.3	to invite the PoCs to advertise the SoGs at the national level	Secr.	IPET-OSDE-4
20	URs-SoGs	E3/7.4.5	To enter the observational user requirements submitted in Excel sheet in the OSCAR/Requirements database. Observational requirements for climate science should particularly cover the observational needs of climate process studies (and not duplicate those provided by GCOS for Climate Monitoring).	PoC in collaboration with Secretariat (OSD)	asap
21	URs-SoGs / AC	E3/7.4.3	to make sure that Points of Contact will be nominated by CAS for each of the three new sub-Application Areas (sub AAs)	Secr.	asap
22	URs-SoGs / AC	E3/7.4.3	new PoCs of AAs related to AC, once nominated, to do the gap analysis taking into account both surface-based and space-based observing systems for their sub-AA	PoCs AC	End 2018
23	URs-SoGs / AC	E3/7.4.3	to distribute the requirements spreadsheet on AC related AAs to the IPET-OSDE members for their review	Secr.	asap
24	URs-SoGs / AC	E3/7.4.3	Decided that GAW shall be the sole source and owner of requirements for variables that are related to atmospheric composition (gases, aerosols) and UV radiation in their three (sub-)AAs. Implement this decision in the RRR documentation.	Secr.	Done
25	URs-SoGs / AC	E3/7.4.3	To update the OSCAR/Requirements update procedure, so that the PoC for AC AAs should check whether there is any possible conflict with the WIGOS Metadata Standard (e.g. with respect to variable definitions); if not, the Chair of IPET-OSDE has authority to approve a new variable.	Secr.	ASAP

No.	Type	Ref.	What	By whom	Deadline
26	URs-SoGs / Aeromet	E3/7.4.3	To update the definition of horizontal and vertical resolution in OSCAR/requirements for Aeronautical Meteorology	E. Andersson	Mid-2018
27	URs-SoGs / Aeromet	E3/7.4.3	To introduce new variables in OSCAR, once proposal has been prepared by PoC for Aeronautical Meteorology.	PoC Aeromet	End 2018
28	URs-SoGs / Climate Appl.	E3/7.4.3	To update the SoG Webpage to reflect the Team's decision with regard to the status of Climate Applications	Secr.	asap
29	URs-SoGs / GCOS	E3/7.4.3	Update OSCAR/Requirements for the AA "Climate Monitoring" based on GCOS-200, decisions on requirements by the GCOS Steering Committee and information from WCRP, and to make them OSCAR compliant	WMO Secretariat (GCOS)	
30	URs-SoGs / GCOS	E3/7.4.3	WCRP to consider any observational requirements additional to those provided by GCOS for the AA "Climate Monitoring"	WCRP Secretariat	
31	URs-SoGs / GCW	E3/6.2.4	To review one Application Area at a time, and it will take about two months for GCW to complete its review of all SoGs	GCW	31 Mar. 2018
32	URs-SoGs / HRNWP	E3/7.4.3.4	To contact PoC and suggest revision of the questioned part of SoG HRNWP(i.e. the added sentence " <i>Ground based microwave radiometers have the same abilities with a good accuracy, vertical and temporal resolutions, but with marginal horizontal resolution</i> ".)	E. Andersson	asap
33	URs-SoGs / HRNWP	E3/7.4.3.4	To revise the questioned part of SoG HRNWP (i.e. the added sentence " <i>Ground based microwave radiometers have the same abilities with a good accuracy, vertical and temporal resolutions, but with marginal horizontal resolution</i> ")	PoC HRNWP	asap
34	URs-SoGs / HRNWP	E3/7.4.3	To provide a proposed update of the Statement of Guidance for HRNWP to reflect the higher demand concerning the timeliness of observations, associated with more frequent update of the analysis, to be relayed to the PoC by the IPET-OSDE Chair.	S. Klink	End Feb. 2018
35	URs-SoGs / HRNWP	E3/7.4.3.6	The Team invited the PoC for HRNWP to express the requirements regarding the best split to be recommended for upper air reports for improving timely availability of upper air reports (e.g. whether based on when a certain level (e.g. 300 hPa, in addition to the already established 100 hPa level) is reached, or whether based on some specific reporting frequency, e.g. every 30 minutes)	T. Montmerle	End Mar. 2018
36	URs-SoGs / HRNWP	E3/7.4.3.6	to consider this issue, and to task ET-SBO to propose a solution on the best split to be recommended, for upper air reports for improving timely availability of upper air reports (e.g. whether based on when a certain level (e.g. 300 hPa, in addition to the already established 100 hPa level) is reached, or whether based on some specific reporting frequency, e.g. every 30 minutes)	ICT-IO5-10	Feb. 2018
37	URs-SoGs / Hydrology	E3/7.4.3	Submit requirements for flood forecasting and different categories of basins	CHy (S.Pecora)	Dec. 2018
38	URs-SoGs / Hydrology	E3/7.4.3	Update the SoG on the basis of the requirements developed for different sub-applications	CHy (S.Pecora)	Mar. 2019
39	URs-SoGs / NVSRF	E3/7.4.3	to review observational user requirements in OSCAR/Requirements	PoC NVSRF	Apr-19

No.	Type	Ref.	What	By whom	Deadline
			database for NVSRF		
40	URs-SoGs / NVSRF	E3/7.4.3	to update the Statement of Guidance of the NVSRF	PoC NVSRF	Apr-19
41	URs-SoGs / NVSRF	E3/7.4.3	to review and propose changes to SoG for NVSRF	F. Grooters	asap
42	URs-SoGs / NVSRF	E3/7.4.3	to review and proposed update to section about Sentinel in the SoG for NVSRF	J. Eyre	asap
43	URs-SoGs / NWP	E3/7.1.1	Nominate new PoC for Global NWP	CBS/DPFS	Mar. 2018
44	URs-SoGs / Ocean	E3/7.1.1	Nominate PoC for Ocean Application Area	JCOMM	Mar. 2018
45	URs-SoGs / Ocean	E3/7.4.3	Taking into account JCOMM-5 Decision 14 (e.g. with regard to consideration of sea-ice and snow requirements), the PoC to review observational user requirements in OSCAR/Requirements and to update them if necessary	PoC Ocean	IPET-OSDE-4
46	URs-SoGs / Ocean	E3/7.4.3	Taking into account JCOMM-5 Decision 14 (e.g. with regard to consideration of sea-ice and snow requirements), PoC to review Statement of Guidance and to update it if necessary.	PoC Ocean	IPET-OSDE-4
47	URs-SoGs / Ocean	E3/7.4.3	PoC to consider making proposal for renaming the Application Area, and possibly propose sub-applications for which independent sets of observational user requirements could be defined.	PoC Ocean	IPET-OSDE-4
48	URs-SoGs / Ocean	E3/7.4.3	PoC to consider the comments from OOPC in its letter dated 11 December 2017, to liaise with OOPC co-Chairs and to update the SoG accordingly	PoC Ocean	IPET-OSDE-4
49	URs-SoGs / Ocean	E3/7.4.3	To consider that the requirements in Coastal zones are different than the global ones, and to populate the user requirements in the database accordingly	PoC Ocean	IPET-OSDE-4
50	URs-SoGs / SSLP	E3/7.4.3.11	To introduce elements on initialization of the stratosphere in the SoG for SSLP to provide better predictability at seasonal time scales	PoC SSLP	IPET-OSDE-4
51	OSCAR (capabilities)	E3/7.2.4	To raise with ICT-IOS the issue that OSCAR/Space is not a natural place for hosting WIGOS metadata, and have ET-SAT to address the issue	IPET-OSDE Chair	Feb. 2018
52	OSCAR (capabilities)	E3/7.2.4	To relay IPET-OSDE recommendation with regard to OSCAR/Space to CBS Management Group via ICT-IOS-10 and CBS TECO 2018, and communicate about resource requirements.	IPET-OSDE Chair	ICT-IOS-10
53	OSCAR (capabilities)	E3/7.3.2	To specify the proposed gap analysis proposal using OSCAR in the view to estimate the cost of and options for its development.	Secretariat	Once approved by ICG-WIGOS
54	OSCAR (capabilities)	E3/7.4.3	To assist ICG-WIGOS Task Team on the WIGOS Metadata for updating the WIGOS Metadata Standard for compliance with Space Weather requirements	PoC	Cg-18
55	OSCAR (capabilities)	E3/7.4.3	To clarify requirements for issuing WIGOS Station IDs for surface-based Space Weather observing platforms	OPAG-ISS	IPET-OSDE-4
56	OSCAR (capabilities)	E3/7.4.3	to liaise with the PoC for Space Weather and assure that the WIGOS Metadata Standard complies with Space Weather observing systems characteristics	TT-WMD	Cg-18
57	OSCAR (capabilities)	E3/7.4.3	To consider proposed update of the WIGOS Metadata Standard complying	OSCAR/Surface	2020

No.	Type	Ref.	What	By whom	Deadline
			with Space Weather observing systems requirements, and take steps to update OSCAR/Surface and its data model accordingly	Project Committee	
58	CBS Planning	E3/4.19	to have a look at the report from the WIGOS TT-WDP and to provide their feedback to WIGOS PO through the IPET-OSDE Chair and OPAG-IOS Chair	IPET-OSDE members	asap
59	Impact Studies	E3/8.2.2	to submit the updated list of science questions to ICT-IOS-10	E. Andersson	Feb. 2018
60	Impact Studies	E3/8.3.5	To recommend composition of the Scientific Organizing Committee for the seventh WMO workshop on the impact of various observing systems on Numerical Weather Prediction (NWP)	E. Andersson	ICT-IOS-10
61	EGOS-IP	E3/9.2.1	To define list of specific EGOS-IP Actions for inclusion in draft Cg-18 Decision, based on the outcome of the EGOS-IP review at IPET-OSDE-3 and the discussions at ICT-IOS-10.	E. Andersson	Mar. 2018
62	EGOS-IP	E3/9.3.3	To (i) undertake a review of the questionnaire to NFPs and further refine the questions, (ii) undertake a review of the methodology for the questionnaire, and (iii) agree on schedule for interaction with the NFPs (Chair, assisted by Secr.)	E. Andersson	End 2018
63	EGOS-IP	E3/9.3.3	To thank the NFPs (chair, assisted by Secr.)	E. Andersson	End Feb. 2018
64	EGOS-IP	E3/9.3.3	To ask NFPs about their responsibility level and profile within their Country	Secr.	ongoing
65	EGOS-IP	E3/9.4.3	To issue a new version of the letter to the Permanent Representatives on Members contributions toward implementing actions of the EGOS-IP (only to those Members which have not nominated NFPs)	Secretariat	30-Jun-18
66	EGOS-IP	E3/9.4.3	To review Annex 1 of the letter and possibly propose changes	IPET-OSDE members	End Feb. 2018
67	EGOS-IP	E3/9.4.3	To review the list of key EGOS-IP actions and possibly propose changes	IPET-OSDE members	End Feb. 2018
68	EGOS-IP	E3/9.4.3	To invite ICT-IOS to address IPET-OSDE concerns with regard to specific EGOS-IP actions (1) How to address the decline of GUAN in the tropical regions, (2) S20 (MW imagers for SST – Ensure availability of microwave imagers with all necessary channels to monitor SST) whereby WMO should continue to raise the importance MW imager missions with CGMS and CEOS, and (3) S29 (Sounders for atmospheric chemistry) whereby WMO should re-state the importance of sounders for atmospheric chemistry with both CGMS and CEOS	E. Andersson	ICT-IOS-10
69	EGOS-IP	E3/9.7	Review the first version of the plan for developing the new WIGOS-IP and provide feedback to Chair and Secretariat	IPET-OSDE members	End Feb. 2018
70	EGOS-IP	E3/9.7	To relay IPET-OSDE draft plan for developing the new WIGOS-IP to the ICT-IOS	E. Andersson	ICT-IOS-10
71	EGOS-IP	E3/Annex 14	EGOS-IP Action C2, baseline needs to be established and IPET-OSDE should define those candidate research observing systems that show the most promise for future operations within the life of the draft Vision for the WIGOS in 2040. Discussion paper to be provided to team members	Secr.	asap

No.	Type	Ref.	What	By whom	Deadline
			for their feedback		
72	EGOS-IP	E3/Annex 14	EGOS-IP Action C2, cannot measure progress until candidate observing systems are identified. Plan for discussion on this issue to be provided at next IPET-OSDE meeting	Secr.	IPET-OSDE-4
73	OND	E3/4.1.3	The Observing Network Design guidance should be updated to clarify the requirements for metadata accuracy. Application Area Points of Contact are requested to provide feedback on how to record accuracy requirements for the identified key metadata fields in OSCAR/Requirements	PoCs	ongoing
74	OND	E3/4.1.3	Based on feedback from the PoCs per action 74, to advise on how proposed level of some metadata fields accuracy will be achieved, and how it should be recorded in OSCAR/Surface.	CIMO	After completion of action 74
75	OND	E3/11.1.3	to bring the issue of compliance to OND Principles and required training to the attention of ICT-IOS-10	E. Andersson	asap
76	OND	E3/11.1.3	to review the OND Guidance and provide feedback to the Chair	IPET-OSDE members	IPET-OSDE-4
77	Vision	E3/6.1	Surface Vision 2040: items from GCOS IP needed to be reflected in the Vision. Make sure that the space-based parts are covered properly in the Vision consistently with GCOS-IP (rec. to ICT-IOS to do that). We need to consider the timeline proposed by ICG-WIGOS; John to contribute.	ICT-IOS to consider	Feb. 2018
78	Vision	E3/10.1	to provide their feedback on the current version of the draft Vision through the Chair and John Eyre	IPET-OSDE members	15 Mar. 2018
79	Vision	E3/10.2	to identify in the elements listed on missing Vision elements webpage (http://www.wmo.int/pages/prog/www/OSY/Documentation/Vision2025.html) whether some ought to be considered in the current draft WIGOS Vision 2040, and to provide their feedback to the IPET-OSDE representatives in the drafting group (i.e. John Eyre and Frank Grooters)	E. Andersson, S. Klink	asap
80	Planning & Reporting to CBS	E3/12.1	to finalize the IPET-OSDE work plan for 2016-2019 with updated status	E. Andersson	asap
81	Planning & Reporting to CBS	E3/12.2	to finalize the IPET-OSDE report to ICT-IOS-10 and to convey IPET-OSDE recommendations to CBS governance process, including CBS TECO 2018 through ICT-IOS-10	E. Andersson	asap
82	DRR	E3/7.4.5	to review all SoGs and identify whether some SoGs should be updated to better reflect DRR requirements	WMO DRR Programme	IPET-OSDE-4
83	Urban	E3/7.4.5	PoCs of all other AAs than AC related, HRNWP and NVSRF to consider Urban requirements when updating their SoGs	All PoCs	End 2018
84	Other issues	E3/11.2.3	To review the draft RBON Regulatory Material, and to provide feedback to the IPET-OSDE Chair	IPET-OSDE members	End Feb. 2018
85	Other issues	E3/11.2.3	To provide IPET-OSDE feedback on draft RBON Regulatory Material to WIGOS Editorial Board Chair (Russell Stringer) and Secretariat (Igor Zahumensky). Note: comments can also be provided after the end of Feb. 2018 via the CBS President	IPET-OSDE Chair	End Feb. 2018

No.	Type	Ref.	What	By whom	Deadline
86	Other issues	E3/13.4	to provide further feedback on the usefulness of ground-based GNSS data to the Co-rapporteurs on Evaluation and Impact Studies (C-SEIS)	IPET-OSDE members	IPET-OSDE-4

**UPDATED WORK PLAN WITH STATUS FOR THE
INTER PROGRAMME EXPERT TEAM ON OBSERVING SYSTEM DESIGN AND EVOLUTION (IPET-OSDE)
FOR THE PERIOD 2016-2019**

(CBS Management Group, March 2017, status updated in February 2018 by IPET-OSDE-3)

Id	Priority	Objective	Outcome	Deliverable	Activity	Leader	Due	Other ETs	Effort	Status Report
1	1	To contribute to the implementation of WIGOS, including WIGOS Manual, and provide relevant advice and support to the chairperson of ICT-IOS	Address relevant items of WIGOS Implementation Activities agreed by Congress XVI, and then ICG-WIGOS	Relevant WIP activities addressed	Meeting	Chairperson IPET-OSDE	Ongoing	ICG-WIGOS , IPET-WIFI		<p>OND Principles included in WIGOS Manual per Cg-17 Decision</p> <p>OND Guidance included in WIGOS Guide per Recommendation 3 (CBS-16)</p> <p>Contributing to WIGOS Vision 2040.</p> <p>Contributing to RBON regulatory material.</p>
2	1	Survey and collate user requirements for observations for WMO and WMO-sponsored programmes	Review and update WMO database of observational user requirements, through Points of Contact for application areas.	OSCAR/ Requirements up-to-date	Review by FPs	Chairperson IPET-OSDE	Ongoing / Annual review			Ongoing; PoCs regularly contacted for updates

Id	Priority	Objective	Outcome	Deliverable	Activity	Leader	Due	Other ETs	Effort	Status Report
3	1	Survey and collate observing systems capabilities for surface-based and space-based systems that are components or candidate components of WIGOS	Review and update WMO database of observing system capabilities, in collaboration with other OPAG-IOS ETs and other Technical Commissions as appropriate.	OSCAR/Space & OSCAR/Surface up to date	Review by Members (coordination via NFPs)	Chairperson IPET-OSDE	Ongoing / Annual review	ICT-IOS, ET-ABO, ET-SBO, ICG-WIGOS /TT-WMD		Ongoing for space-based, and recorded in OSCAR/Space. Ongoing for surface-based through OSCAR/Surface implemented operationally in May 2016
4	1	Maintain Rolling Review of Requirements (RRR) for observations in several application areas, using subject area experts, including appropriate liaison with Technical Commissions and programmes and co-sponsored programmes (e.g. CAS, JCOMM, CAeM, CAgM, CHy, CCI, GCOS, GFCS, and GCW)	Continue RRR process for the listed application areas and expand to new areas as required: review and update as necessary Statements of Guidance on the extent to which present/ planned observing system capabilities meet user requirements, through Points of Contact on application areas.	Statements of Guidance for all Application Areas	Application Area Contact Points; Meeting	Chairperson IPET-OSDE	Ongoing / Annual review			Ongoing; SoGs updated by PoCs, and overall reviewed by IPET-OSDE-1, 2 and 3. Several updates to user requirements made during the period.
5	1	Prepare and maintain reviews of observation impact studies undertaken by NWP centres and provide information for consideration by IPET-OSDE and OPAG-IOS	C-SEIS and NWP experts, review results of impact studies relevant to the evolution of observing systems. Organize and hold next NWP Impact Studies Workshop in 2016 and 2020.	Findings of impact studies	Impact studies	C-SEIS	2016 and 2020 workshops			Report of and 6 th NWP "Impact" workshop (Shanghai May 2016) published. Recent findings and proposals for new impact studies discussed at

Id	Priority	Objective	Outcome	Deliverable	Activity	Leader	Due	Other ETs	Effort	Status Report
										IPET-OSDE2, the Shanghai workshop, and approved by CBS-16 in Nov. 2016 through Recommendation 31 (CBS-16). Further updates to science questions made at IPET-OSDE-3.
6	1	Promote CBS activities in support of GCOS goals	Review the implications of the progress on the GCOS Implementation Plan for the activities of CBS. Bring relevant issues to the attention of the IPET-OSDE	RRR consistent with GCOS	Meeting	Rapporteur on GCOS matters	2013 2016			Ongoing interactions between IPET-OSDE Chairperson and GCOS.
7	1	Promote CBS activities in support of GFCS goals	Review the implications of the GFCS IP for the activities of CBS. Bring relevant issues to the attention of the IPET-OSDE	RRR consistent with GFCS	Meeting	Chairperson IPET-OSDE	2016			Relevant activities reviewed at IPET-OSDE1, 2 and 3. GCOS/GFCS interaction encouraged.

Id	Priority	Objective	Outcome	Deliverable	Activity	Leader	Due	Other ETs	Effort	Status Report
8	1	Promote CBS activities in support of GCW goals	Review the implications for the activities of CBS of the GCW developments, including the GCW Implementation Strategy, and the Cryosphere theme report for the IGOS partnership. Bring relevant issues to the attention of the IPET-OSDE	RRR consistent with GCW	Meeting	Chairperson IPET-OSDE	2016			Relevant activities reviewed at IPET-OSDE-1, 2 and 3. CBS CWP submitted to the AOS1. GCW progressing with agreed IPET-OSDE actions
9	1	Monitor progress and actions by Members and partner Organizations per the approved Implementation Plan for the Evolution of the Global Observing Systems (EGOS-IP), fully responding to the "Vision for the GOS in 2025", and promote activities in support of progress	Seek feedback from National Focal Points, Expert Teams, relevant Technical Commissions, and other groups on the implementation of EGOS-IP, and keep the EGOS-IP progress report up to date. Initiate and monitor activities which promote progress.	EGOS-IP progress report	Survey with FPs, TCs; meeting	Chairperson IPET-OSDE	Ongoing / Annual review			Ongoing. Feedback against the new EGOS-IP requested to the NFPs for 2013, 2014, 2015 and 2017. Feedback has been reviewed at IPET-OSDE-1, 2 and 3. New feedback by EGOS-IP "action owners" reviewed by IPET-OSDE-2 and 3. Survey with NFPs carried out in Nov. 2017, and results analysed and discussed at IPET-OSDE-3

<i>Id</i>	<i>Priority</i>	<i>Objective</i>	<i>Outcome</i>	<i>Deliverable</i>	<i>Activity</i>	<i>Leader</i>	<i>Due</i>	<i>Other ETs</i>	<i>Effort</i>	<i>Status Report</i>
10	1	Propose guidance regarding observing system network design principles	Draft guidance document on network design (to be further discussed at IPET-OSDE-1 in 2014)	Guidance document on network design	Meeting	Chairperson IPET-OSDE	End-2013 2014			Action completed. 2 workshops organized in Nov. 2013 and Feb. 2015. OND Principles approved with WIGOS Manual. OND guidance complete and included in WIGOS Guide by CBS-16 through Recommendation 3 (CBS-16)

Ref.: 13860/2018-11.085-WIGOS/OSD
 Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018



**PROCEDURE FOR UPDATE, VALIDATION AND APPROVAL
OF STATEMENTS OF GUIDANCE WITHIN THE WMO ROLLING
REVIEW OF REQUIREMENTS PROCESS**

(As of 3 April 2014, and approved by IPET-OSDE-1)

1. The Point-of-Contact (PoC) for the Application Area reviews the latest version of the SoG and proposes amendments, in the form of a Microsoft Word document using the "track changes" option. (If there is no pre-existing version, then the PoC drafts the first version of the SoG.) In performing this update, the PoC is expected to refer to some or all of the following: (i) the latest version of the user requirements for the Application Area; (ii) the latest version of the database Observing System Capabilities; (iii) his / her own expertise on the Application Area; (iv) advice from other international experts on the Application Area including, where relevant, WMO constituent bodies, and WMO Programmes and co-sponsored Programmes);
2. The PoC refers the new draft version of the SoG to the Chair of the ET-EGOS, with copy to the WMO Secretariat staff responsible for ET-EGOS;
3. The Chair of the ET-EGOS decides the appropriate review process for the new draft. If a meeting of ET-EGOS is imminent, the new draft becomes a document for this meeting and is reviewed by the Meeting. If a meeting is not imminent, the new draft may be referred to the ET-EGOS for comment(s) by correspondence;
4. The Chair of the ET-EGOS refers the comments of the ET-EGOS to the PoC, either by reference to the report of an ET-EGOS meeting or otherwise, as appropriate;
5. The PoC updates the draft to take account of comments received. Contentious issues are discussed with the Chair of ET-EGOS, as necessary. Microsoft Word "track changes" option continues to be used at this stage;
6. The PoC refers the revised draft version of the SoG to Chair of ET-EGOS, with copy to WMO Secretariat staff responsible for the ET-EGOS;
7. The Chair of the ET-EGOS considers the revised draft and adopts it, or refers it back to the PoC with comments for further revision (by steps 5 and 6 mentioned above);
8. The Chair of the ET-EGOS informs the WMO Secretariat staff responsible for the ET-EGOS when the revised version has been adopted;
9. The WMO Secretariat staff responsible for the ET-EGOS updates the WMO documentation (website, etc.) with the new version of the SoG, with due attention to version control procedures; and
10. At each ET-EGOS meeting, the WMO Secretariat staff responsible for the ET-EGOS reports to the ET on changes since the last meeting, in relation to the SoG version and its review and adoption status.

**PROPOSED MILESTONES AND ACTIVITIES TO BE UNDERTAKEN TO
DEVELOP THE WIGOS-IP**

Table 1: Milestones to be considered when planning the development of the WIGOS-IP

Date	Milestone	Progress
Feb. 2018	ICT-IOS-10	Reviews and concurs with the plan for developing the WIGOS-IP (may suggest some adjustments)
Mar. 2018	CBS TECO	Reviews the plan for developing the WIGOS-IP and provide feedback
Mar. 2018	CBS MG	Reviews and concurs with the plan for developing the WIGOS-IP (may suggest some adjustments)
Mid 2018	EC-70	Notes plan for developing the WIGOS-IP
Mid 2019	Cg-18	WIGOS Vision 2040 adopted together with plan for developing the WIGOS-IP
Mid 2020	EC-72	Notes progress and provide further guidance
Mid 2021	EC-73	Notes progress and provide further guidance
End 2021		First draft available for wide consultation
Beginning 2022		Wide consultation of first draft with Technical Commissions, Regional Associations and partner organizations
Mid 2022	EC-74	Submission to EC-74 for its noting and concurrence to submit to Cg-19
End 2022		Second draft available
Mid 2023	Cg-19	WIGOS-IP approved by Cg-19

Table 2: Activities to be considered when planning the development of the WIGOS-IP

No.	Activity	Outcome	Due date
1	Reviewing the list of WMO Application Areas and update it as necessary in order to align with WMO's mandate to respond to societal needs in weather, water, climate, environment and cryosphere;	List of Application Areas	End 2019
2	Working with experts in each Application Area to adjust database and methodology (e.g. for consideration of multiple time scales) and update the observational user requirements recorded in OSCAR;	OSCAR/Requirements up to date	End 2020 and then ongoing
3	Look at specific seamless prediction requirements (across applications contributing to global earth prediction	Seamless prediction requirements identified	End 2020 and then ongoing

No.	Activity	Outcome	Due date
	systems, and across temporal scales) and define how such requirements can be considered in the Rolling Review of Requirements framework;		
4	Working with Members and other relevant partners (e.g. Space Agencies) and groups (e.g. CGMS, CEOS) to make sure that the capabilities of surface- and space-based observing systems as recorded in OSCAR/Surface and OSCAR/Space reflect the reality of the observing systems implemented and operated by Members;	OSCAR/Space and OSCAR/Surface up to date and accurate	End 2020 and then ongoing
5	Working with operational centres to get the most accurate assessment through the WIGOS Data Quality Monitoring System (WDQMS) about observational data that are effectively being exchanged routinely through WMO (e.g. to address gaps in terms of timeliness, uncertainty, and space/time resolutions);	Data available to end users assessed through WDQMS	End 2020 and then ongoing
6	Reviewing results of impact studies and promoting new ones as necessary, paying particular attention to the requirements for seamless prediction and high impact weather and climate prediction;	List of recommended impact studies	Mid 2020 (EC-72) then ongoing
7	Conducting critical review and gap analysis for each of the WMO Application Area and update the Statements of Guidance taking into account the results of the impact studies;	Statements of Guidance up to date	End 2021
8	Conducting impact per cost studies concerning observing systems;	Impact per cost study completed	Mid 2021 (EC-73)
9	Investigate how big data, crowdsourcing and other sources of observations from the private sector, the general public and third parties could be used in complement to traditional sources of high quality (reference) observations, and whether investment of NMHSs in such traditional observing systems could and should be adjusted accordingly; develop corresponding strategy and guidelines. Perform assessment of quality of third party data and communicate results to decision makers (e.g. build on GAW's efforts in this regard)	Strategy and plan for using big data, crowdsourcing and other sources of observations from the private sector, the general public and third parties.	Mid 2021 (EC-73)
10	Review emerging technologies and identify how their use could be made more operational	Guidance on use of emerging technologies	Mid 2021 (EC-73)
11	Take steps to facilitate (i) better integration of <i>in situ</i> , remote sensing data and other products to be assimilated by models of various Application Areas;	Strategy and plan for integration of <i>in situ</i> and remote sensing data	Mid 2022 (EC-74)
12	Elaborate strategies and guide Members for observing network design, based on the OND Principles (see chapter 2.2.2.1 of WMO No. 1160), paying particular attention to the requirements of seamless prediction and high	Strategy and guidance to Members on Observing Network Design	Mid 2022 (EC-74)

No.	Activity	Outcome	Due date
	impact weather and climate prediction. Provide guidance on optimization of existing networks, upgrade of equipment, and combination of existing infrastructures.		
13	Promote partnership with other organizations, private sector and third parties to further develop observing networks in the regions	Guidance on how to develop partnerships	Mid 2022 (EC-74)
14	Identify Urban observations needs for urban services that meet the special needs of cities through a combination of dense observation networks, high-resolution forecasts, multi-hazard early warning systems, and climate services. Develop a strategy and guidance to Members regarding Urban observations building on existing efforts and material delivered to Cg-18 in this regard.	<ul style="list-style-type: none"> - Urban observations needs identified - Strategy and guidance to Member on Urban Observations 	Mid 2022 (EC-74)
15	Promote development of the CryoNet consistent with the Observing Network Design (OND) Principles to maximize impact of cryospheric observations on relevant Application Areas;	<ul style="list-style-type: none"> - Relevant impact studies completed - Plan for CryoNet network design 	Mid 2022 (EC-74)
16	Develop observing networks implementation metrics to monitor their level of completeness; develop metrics for assessing overall capability of a Country with regard to its surface-based observing system;	<ul style="list-style-type: none"> - Observing Network Implementation metrics - Country capability metric 	Mid 2022 (EC-74)
17	Communicating and advertising the WIGOS-IP and its benefits to Members and encourage them to take action in order to fill the identified priority gaps; Communicate with Members about the need and benefits on integrated observing systems, and value of high quality observing systems for planning, climate adaption, emergency response and disaster risk reduction Develop communication strategy with Members about the need and benefits on integrated observing systems, and value of high quality observing systems for reference purposes.	WIGOS-IP communication plan	End 2023
18	Monitor implementation by Members of the actions of the WIGOS-IP and consider further recommendations to be made to Members through WMO Executive Bodies for accelerating implementation of the actions of the WIGOS-IP;	Status of actions of WIGOS-IP known with recommendations	2024 and ongoing
19	On the basis of the outcome of the above activities, and taking into account other existing implementation plans (e.g. WIGOS, GAW, GCW) for consistency, and priorities of the Organization, elaborating the new GCOS-IP through the GCOS science panels and wide public consultation;	GCOS-IP	Mid 2021 (first draft for wide consultation) End 2022 Final version (present to UNFCCC COP)
20	Communicating and advertising the new GCOS-IP and its benefits to Members and	GCOS-IP communication plan	Start 2023

IPET-OSDE3, Final Report

<i>No.</i>	<i>Activity</i>	<i>Outcome</i>	<i>Due date</i>
	other relevant observing agencies encourage them to take action in order to fill the identified priority gaps;		
21	Monitor implementation of the actions of the GCOS-IP and consider further recommendations accelerating implementation of the actions of the GCOS-IP;	Status of actions of GCOS-IP known with recommendations	2023 and ongoing
22	Establish GCOS Surface Reference Network	Plans and design complete	Initial operation 2020
23	Establish globally consistent radar networks	Data requirements and standards	Initial design 2020
24	Ensure all data is discoverable, open and freely accessible to all users.	Data access information	2023
25	Implementation of HydroHubs' main components (mainly WHYCOS, WHOS)	Enhancement of Hydrometry networks and capacity building; Collected data visible and accessible on the WHOS system	2020

Ref.: 13860/2018-11 OBS- WIGOS/OSD
 Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

STATUS OF EXISTING STATEMENTS OF GUIDANCE

(as of 1 February 2018)

This document provides for an overview of the status of statements of guidance regarding the WMO Application Areas.

No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
1	Global NWP	Erik Andersson (ECMWF)	June 2016	Dec. 2017	<p>The Point of Contact (PoC), Dr Erik Andersson (ECMWF¹), reviewed and updated the Statement of Guidance for Global Numerical Weather Prediction (GNWP) in December 2017. Changes included consideration of the following:</p> <ul style="list-style-type: none"> • GNWP Centres have shown that in a four-dimensional assimilation system wind can be directly constrained from assimilating radiances (e.g. MHS), through the tracer effect; • Benefit of dissemination of high-resolution BUFR radiosonde data has been demonstrated; • Wind Gust identified as important element where availability of more timely and accurate data would bring benefits, not least for the verification of damaging wind storms; <p>Wind profiles at all levels outside the main populated areas, particularly in the tropics and in the stratosphere is part of the critical atmospheric variables that are not adequately measured by current or planned systems.</p>

¹ European Centre for Medium-Range Weather Forecast

No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
2	High Resolution NWP (previously Regional NWP)	Thibaut Montmerle (France)	July 2016	Dec. 2017	<p>Statement of Guidance (SoG) was updated by PoC in 2017 with the following considerations:</p> <ul style="list-style-type: none"> • Following IPET-OSDE-2 guidance and discussion with Elena Saltikoff of the radar community, the PoC has modified the section about "3D Clouds and Precipitation" in order to add some comments about the capability of weather radar to describe the 3D structure of precipitation. • Comments about clouds and precipitation are now more clearly separated, and distinction about precipitation intensity at ground and 3D observation of precipitation (liquid or solid) is more clear. • The PoC also added a brief comment about the interest of ground based radiometer, which is an interesting instrument allowing to sample information on humidity with high temporal resolutions. • Following the modifications related to radar reflectivities, a request was made for a new requirement about "precipitation (liquid or solid)". <p>While thanking the PoC for his recent update of the SoG, the Team questioned introduction of changes related to the 3rd bullet above. The Team also suggested revisions to reflect the higher demand concerning the timeliness of observations, associated with more frequent update of the analysis.</p>
3	Nowcasting and Very Short Range Forecasting	Alexander Kann (Austria)	June 2015	Nov. 2017	<p>SoG was updated by new PoC in late 2017 taking into account guidance from IPET-OSDE-2. IPET-OSDE-3 requested PoC to review and proposed update to section about Sentinel in the SoG for NVSRF.</p> <p>See also note 3.</p>
4	Sub-seasonal to longer prediction	Yuhei Takaya (Japan)	June 2016	Not available	<p>Approved by IPET-OSDE Chair, June 2016</p> <p>The SoG has not been updated since IPET-OSDE-2. However, it is planned to revisit this document at the next IPET-OPSLC meeting (sometime in 2019), and if needed, an update will be made.</p> <p>Also, in the context of redesign of the tropical Pacific observing system (TPOS), and the associated TPOS 2020 project (http://tpos2020.org/), impact studies are foreseen, which results should eventually lead to further update of the SoG.</p> <p>In the context of the initialization of the ocean and sea-ice in Polar regions, the Team noted that the plans of the EU-funded APPLICATE project (https://appliccate.eu/) for specific observation impact studies that may be relevant.</p> <p>IPET-OSDE-3 agreed that elements on initialization of the stratosphere could be introduced in the SoG to provide better predictability at seasonal time scales.</p>

No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
5	Aeronautical Meteorology	Jitze van der Meulen (NL)	June 2016	Jan. 2018	<p>Approved by IPET-OSDE Chair, June 2016</p> <p>With regard to observational user requirements, small update was made by the PoC in January 2018, based on comments provided by experts nominated by the CAeM MG and secretariat. These were mostly linguistic improvements, and some new text was added. The PoC considered the request to introduce requirements related to icing, turbulence and lightning. It is found that for these phenomena particular objective variables have to be chosen (like Eddy Dissipation Rate, EDR for turbulence or Undercooled Liquid Water Content for icing) or defined (lightning (3D) in LT). Currently no detailed requirements can be stated and progress should be made in further research to define these requirements. Also an appropriate definition of horizontal and vertical resolution should be stated for OSCAR/requirement. It might be expressed in terms of grid sizes (square root of the inverse of the density of measuring points) but alternatives might be more feasible.</p> <p>Proposed updates of the SoG were provided and explained to the meeting. At the end of the SoG a special note is provided on the definition of the stated requirements on measurement uncertainty. The PoC suggested that, for statements of uncertainty requirements WMO should follow the international regulations (explained in WMO-No. 8, the CIMO Guide) which differ from the definition used in OSCAR. This would imply a conversion of data and good understanding by the PoCs providing the requirements data.</p>
6	Forecasting Atmospheric Composition	Oksana Tarasova (WMO)	Not available	Not available	<p>See also note 1</p> <p>IPET-OSDE-3: PoC to be nominated and gap analysis performed taking into account both surface-based and space-based observing systems.</p> <p>Overlap with DPFs responsibility for Air Quality Forecasting still to be resolved.</p>
7	Monitoring Atmospheric Composition	Oksana Tarasova (WMO)	Not available	Not available	<p>See also note 1</p> <p>IPET-OSDE-3: PoC to be nominated and gap analysis performed taking into account both surface-based and space-based observing systems.</p>
8	Providing Atmospheric Composition information to support services in urban and populated areas	Oksana Tarasova (WMO)	Not available	Not available	<p>See also note 1</p> <p>IPET-OSDE-3: PoC to be nominated and gap analysis performed taking into account both surface-based and space-based observing systems.</p>

No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
9	Ocean Applications	Guimei Liu (China)	June 2016	Not available	<p>Approved by IPET-OSDE Chair, June 2016 New Point of Contact need to be nominated.</p> <p>JCOMM-5 requested the JCOMM Services and Forecasting Systems Programme Area to assist the Point of Contact for Ocean Applications in reviewing the Statement of Guidance for Ocean Applications, and updating it as needed in order for this document to continue reflecting the reality of the gaps while the ocean observing system is being implemented; in particular, consideration should be given to identifying whether additional critical variables such as sea-ice and snow could be added to the list, and (iii) the RRR to note the efforts and work of the Tropical Pacific Observing System (TPOS) Project TPOS-2020 and consider how to incorporate their recommendations.</p> <p>Comments received from OOPC to be considered (<i>Annex XVI</i> of IPET-OSDE-3 report).</p> <p>PoC, once nominated is requested to:</p> <ul style="list-style-type: none"> • review observational user requirements in OSCAR/Requirements and to update them if necessary • review Statement of Guidance and to update it if necessary. • consider making proposal for renaming the Application Area, and possibly propose sub-applications for which independent sets of observational user requirements could be defined. • consider the comments from OOPC in its letter dated 11 December 2017, to liaise with OOPC co-Chairs and to update the SoG accordingly • consider that the requirements in Coastal zones are different than the global ones, and to populate the user requirements in the database accordingly.
10	Agricultural Meteorology	Mr Robert Stefanski (WMO)	June 2011 (approved by ET-EGOS-6)	Not available	<p>IPET-OSDE-3 noted that overall progress is delayed due to changes with regard to the relevant Expert Team in the Commission for Agricultural Meteorology (CAgM). However, work is progressing with regard to consideration of soil moisture requirements. Another issues to be considered will be how to handle rainfall measurements from simple rain gauges from farmers: the Regional Instrument Center (RIC) in Italy has tested simple rain gauges, and a report is pending. The Team invited the Point of Contact to update the observational user requirements in OSCAR/Requirements according to recent findings</p>

No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
11	Hydrology	Silvano Pecora (Italy)	July 2014	Not available	<p>Approved by Chair of IPET-OSDE 30/7/2014</p> <p>IPET-OSDE-3 noted that the list of global user requirements in OSCAR/Requirements for Hydrology is probably useless, as for instance water discharge is not even in the list. The PoC has suggested to hide these requirements from the database. He proposed that user requirements for Hydrology in OSCAR/Requirements should be organized by type of basin and sub-application. One could start for example with flood forecasting for one type of basin; the rest will follow.</p> <p>Team concurred with the plan proposed by the PoC, and is looking forward to completion of following actions: (i) to submit requirements for flood forecasting and different categories of basins, and (ii) to update the SoG on the basis of the requirements developed for different sub-applications.</p>
12	Climate Monitoring	GCOS Secretariat	2017	Not available	<p>The following GCOS reports are considered as SOG by IPET-OSDE:</p> <ul style="list-style-type: none"> (iii) GCOS Reports on the Adequacy of the global climate observing systems (iv) GCOS Implementation Plans and their updates (v) Satellite Supplements to the GCOS Implementation Plan and their updates (vi) Progress Reports on the Implementation of the Global Observing System for Climate in Support of the UNFCCC <p>The current following versions are used as SoG:</p> <ul style="list-style-type: none"> • Status of the Global Observing System for Climate - GCOS 195 • The Global Observing System for Climate: Implementation Needs - GCOS 200 <p>The decision to capture the GCOS requirements under one application area entitled 'Climate Monitoring' has been agreed by all three GCOS expert panels (AOPC, OOPC and TOPC). Work is currently ongoing to map the Essential Climate Variables (ECVs) requirements, which are listed in an Annex to the GCOS Implementation Plan, to the measurement requirements so these can be updated in OSCAR. If no match is identified then GCOS will propose new measurement definitions to be considered by IPET-OSDE. This is expected to be completed soon after the panel meetings which will take place in March and April 2018. GCOS also noted, with appreciation, the inclusion of a long-term 'stability' value in the OSCAR requirements and will work with its experts to include these in the updated requirements</p>

No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
13	Climate Applications (other aspects - CCI)	William Wright (Australia)	May 2012 (approved by ET-EGOS-7)	Not available	<p>IPET-OSDE-3 decided to discontinue this Application Area, but to keep the Statement of Guidance² up to date and link from the SoG Webpage, below the table that contains the list of existing Application Areas. CCI will keep the document updated and assure whether important requirements are missing from a CCI/climate applications view. However, there is no intention to submit quantitative observational user requirements since it is assumed that such requirements are mostly captured by the GCOS 'Climate Monitoring' application area as well as by other existing application areas.</p> <p>IPET-OSDE-3 also invited CCI to consider approaching IPET OSDE in the future in case it is believed that independent sets of observational user requirements related to climate applications could be provided quantitatively in OSCAR/Requirements.</p>
14	Space Weather	Terry Onsager (USA)	May 2012 (approved by ET-EGOS-7)	Nov. 2017	<p>New version of SoG (with Gap Analysis) has been submitted by IPT-SWeISS to the WMO Secretariat for approval in December 2017. The review of OSCAR/Space SW-related dataset, requirements and Gap re-analysis is scheduled for 2018. Highlights include:</p> <ul style="list-style-type: none"> Solar wind observations in real time have recently become available from the NOAA DSCOVR Space Weather service mission. In addition, NASA/ESA ACE scientific mission continues to serve as a backup. The required long-term continuity of in-situ solar wind measurements from the L1 position as well as coronagraph imagery remains one of the highest priorities. The US Space Weather Forward Observatory (SWFO) mission is currently in the pre-formulation phase and would satisfy both of these requirements. SWFO would be a two spacecraft mission with nominal launches of 2022 and 2027, providing a total mission life of 10 years. Completion of SWFO is dependent on successful funding in the US budget process. <p>See also note 5.</p>
15	Climate Science	Michel Rixen (WCRP)	Not available	Not available	<p>WCRP related observational user requirements were initially organized under a number of separate WCRP-managed Application Areas dealing with respective Earth System domains (GEWEX for atmosphere-land, CliC for cryosphere, SPARC for stratosphere-troposphere, CLIVAR for ocean-atmosphere), air-sea fluxes (joint with SOLAS) and general climate modelling requirements. Many of those entries were as old as 1998. Those have now been consolidated and reviewed into a single Climate Science Application Area. Former observational user requirements of WCRP applications have now been hidden in OSCAR/Requirements.</p> <p>The Data Advisory Council and the Modelling Advisory Council meet on an annual basis, and will be looking at how to deliver a new Statement of Guidance for Climate Science. It is expected to have a draft SoG available within 18 months.</p>

² 'An analysis of current and emerging capacity gaps in surface and upper air observations to support climate activities' by William Wright (Australia). This document contains important qualitative requirements for climate applications.

Notes:

1. GTOS: Situation with regard to GTOS evolved. The Chairman of GTOS Steering Committee resigned in March 2013, and the John Latham (FAO) is not responsible anymore for GTOS since 2012. WMO is trying to resolve this issue with FAO at the higher level, and discussing new responsibilities and resources with FAO management. Meanwhile, GCOS took over full responsibility for the TOPC and GEWEX. The Point of contact is now the Director of the OBS Department at the WMO Secretariat, Fernando Belda. See also notes 5 and 6 below. IPET-OSDE-1 noted that GTOS may not be seen as a true Application Area, and may include observational user requirements for several applications. For example, some of the requirements may fall under Hydrology.
2. IPET-OSDE-1 recommended that the Atmospheric Chemistry application area should be split into sub-applications. This has now been done, and it has been replaced, and split into the following three new application areas, i.e. (i) Forecasting Atmospheric Composition, (ii) Monitoring Atmospheric Composition, and (iii) Providing Atmospheric Composition information to support services in urban and populated areas. Statements of Guidance for the three new application areas are under preparation.
3. ET-EGOS-7 considered that the GCW could not be regarded as an Application Area. However, there are many sub-applications to be addressed in the GCW context, and the Team agreed to use the IGOS Cryosphere Theme document as a basis for addressing GCW requirements in the new EGOS-IP.

ET-EGOS-6 responded to the requirements of CBS-Ext.(2010) to ensure that any particular requirements of Polar Meteorology are captured through the ongoing RRR process. The Team agreed that the Global Cryosphere Watch (GCW) should not to be regarded as this stage as a specific Application Area. Instead, the Team requested the Points of Contact of all Application Areas to review the information provided by the Secretariat during the meeting (ET-EGOS-6 doc 8.3.2(10/3)) and revise their user requirements and SoGs if necessary. ET-EGOS-6 proposed to adopt the same approach than for GCOS, i.e. regarding a list of documents maintained by the GCW as Statement of Guidance. Such documents include for example the Integrated Global Observing Strategy (IGOS) Cryosphere Theme ("CryOS") report.
4. Per ET-EGOS-5 recommendation, the Synoptic Meteorology Application Area has been merged into the Nowcasting and Very Short Range Forecasting Application Area.
5. ET-EGOS-5 suggested that the following applications should be addressed:
 - (i.) Space Weather. Space weather events affect the meteorological infrastructure through their impact on environmental satellites, navigation satellites (e.g. GPS) and space-based telecommunication systems; they also represent a potential hazard for aviation and some large ground-based facilities. [Refining ground-based and space-based observation requirements is a prerequisite towards the standardisation of Space Weather instruments that WMO is now expected to support.](#);
 - (ii.) GTOS requirements for understanding the global carbon cycle and related climate change issues. For consistent and comprehensive monitoring of the carbon cycle, ecosystems, forests and land dynamics in general, both long-term sustained observations of Essential Climate Variables as well as regionally-focussed, intermittent measurements of other variables (and their fluxes) for process-type studies are required. A comprehensive gap analysis of existing capabilities in relation to needs is yet to be undertaken. Such an analysis should build on the existing SoG for Climate Monitoring (ie. the GCOS Second Adequacy Report, the GCOS IP and its 2010 Update) as well as the status reports on the development of standards for terrestrial ECV (<http://www.fao.org/gtos/topcECV.html>).

ET-EGOS-5 invited the Inter-programme Coordination Team on Space Weather (ICT-SW) to address user requirements on space weather, and provide feedback to the ET-EGOS Chair on the list of relevant Applications.

6. ET-EGOS-5 recognized that many GTOS requirements are being already considered by GCOS, but not all of them. The Team requested the Secretariat to identify PoC who should be invited to identify those requirements that are not covered by GCOS (i.e. the non GCOS requirements of GTOS).

Reference: Current versions of Statements of Guidance - <http://www.wmo.int/pages/prog/www/OSY/GOS-RRR.html#SOG>

**PROPOSED TOPICS FOR NWP IMPACT STUDIES RELEVANT TO THE EVOLUTION OF
GLOBAL OBSERVING SYSTEMS**

(as proposed by IPET-OSDE3, February 2018, and submitted to ICT-IOS-10 for its review)

**SCIENCE QUESTIONS REQUIRING NWP IMPACT ASSESSMENTS FOR
OBSERVING SYSTEM DESIGN AND EVOLUTIONS**

Short name: Full name	Science question
Surface-based	
S1 AMDAR: Coverage of AMDAR	Encourage studies of impact assessment of AMDAR and MODE-S in data-sparse regions. Examples include for instance (1) trade space studies between additional vertical profiles over land versus en route data over the oceans, and (2) increasing measurements over poles versus tropics. Provide general guidance for AMDAR extension priorities.
S2 Radar: Radar observations	What are the impacts of current radar observations, particularly radar polarization, but also wind profiles, radial winds and reflectivity?
S3 PBL: Observations of the PBL for regional and high-resolution NWP	What should be the focus of improvements for observations of the planetary boundary layer (PBL) in support of regional and high-resolution NWP? Which variables and what space-time resolution?
S4 HighElev: High elevation surface observing stations	Estimate the actual and potential impacts of high elevation meteorological data from the high mountain regions, for example using OSSE, OSE or FSOI, on appropriate environmental models.
Space-based	
S5 SatLand: Satellite sounding over land and ice	What is the impact of new developments in the assimilation of radiance data over land, snow and sea ice?
S6 Sounders: Impact of multiple satellite sounders	What benefits are found when data from more than one passive sounder are available from satellites in complementary orbits?
S7 AMVs: Atmospheric Motion Vectors	Which AMV characteristics (temporal resolution, height, etc.) should be enhanced from the next generation of satellites (such as Geo)?
General	
S8 UA: Regional upper-air network design studies	Upper-air network design studies such as those that have been performed for the EUMETNET Composite Observing System (EUCOS) are required also in other Regions, especially in Region I where the basic networks are under pressure. Assessments of recent changes in the networks, including the impact of launching radiosondes once per day or at non-synoptic times.

S9 Sfc and Sat : Impact of satellite observing capabilities on the design of the surface-based observing systems	What is the impact of the increasing capabilities of space-based observing systems on the design and evolution of surface-based observing systems? With special emphasis on the impact on network design in areas with very sparse surface-based networks. Examples include (1) For marine observing systems: What density of surface pressure observations over the ocean is needed to complement high-density surface wind observations from satellites? And (2) For upper air observations: What network of in situ profiling observations is needed in the stratosphere to complement current satellite observations (including radio occultation)? Assessments addressing the Tropics are encouraged.
S10 AdjEns: Application of adjoint and ensemble methods	What insights can be gained from adjoint and ensemble-based impact measures tailored for applications such as severe weather, aviation and energy? Specific impact metrics may be required.
S11 Ocean: Impact in ocean-coupled assimilation	Which ocean observations are particularly important for NWP? Investigate the role of ocean observations, in particular profile observations provided for example by the moored buoy arrays, in coupled atmosphere-ocean data assimilation with a focus on the 7-14 day range.
S12 Land: Impact in land-coupled assimilation	Which land-surface observations are particularly important for NWP at all forecast time ranges? Investigate the role of surface observations in coupled atmosphere-land data assimilation with a focus on the 7-14 day range.
S13 Data frequency/Timeliness	Assess the impact of increased frequency and/or timeliness/latency of observations? Consider the case of AMDAR, radiosonde, GEO satellites AMVs and ground-based remote sensing observations (such as Doppler radar, wind profiler, ground based GNSS receivers) for regional and global NWP.
S14 Atmospheric composition	Study observation impact in atmospheric composition and air quality application and the impact of atmospheric composition observations (e.g. aerosol) on NWP.
S15 OSSEs	Observing system simulation experiments are encouraged in support of satellite system design criteria such as orbit optimization for GNSS-RO satellites, or for emerging technology sensors (such as Geo-based hyper spectral IR or MW sounders, Small/Cube satellites, etc).
S16 Impact Assessment for Seasonal And Climate Applications	Observational Impact Studies are encouraged for extended range prediction systems, especially using coupled models. These could be used to investigate ways to optimize the design of climate observing systems networks.
S17 Ground-Based GNSS	Promote undertaking impact studies to assess the impact of ground-based GNSS on NWP. This will help measure the potential need to exchange data internationally. In addition to regional impacts, global impacts or at least wide-regional impacts are encouraged.

**OUTCOME OF BREAKOUT GROUP 7 ON THE MONITORING OF STATUS OF
ACTIONS OF THE EGOS-IP – METHODOLOGY**

Composition of the group:

- Yoshiaki Sato
- Zeinab Fahmy
- Erik Andersson
- SeiYoung Park
- Anthony Rea
- Stefan Klink
- Dean Lockett

Discussion:

- Review the survey questions
 - Consider hyper-linking the survey to the EGOS-IP
 - Add a copy of the questions as a link from the Introduction page
 - Consult with OPAG-ISS on WIS related questions
 - Use full-spelling of acronyms
 - Add some questions on the EGOS-IP itself and its user and understanding by the Member.
 - Add some questions about the FP and how they responded to the survey.
 - Add something about the survey itself at the end.
 - For some questions, a short definition to provide context would be useful – e.g. “what is change management?”
 - Focus on current known issues (e.g. particular frequency issues).
 - Collecting versus international sharing of hourly data should be more precisely defined.
 - Q16 – specific observing systems should be listed
 - OSCAR will eventually reduce requirement for network statistical questions.
 - G7 not requires – should be available from monitoring information.
 - Stations closed versus silent should be considered.
 - G14 questions can be answered by monitoring.
 - G45 – WRD provides information to answer this question.
 - Other teams to be consulted regarding the survey.
- Potentially reduce the number of EGOS-IP actions to ask feedback about
- Easier analysis of responses by using a tool such as Survey Monkey
- High-level letter to the PRs, personalize it, review, make it more individual? Language
- Regional engagement? The omissions, who did not respond, why?

OSCAR UPDATING/MAINTENANCE PROCEDURE ¹PROPOSED UPDATE TO THE OSCAR UPDATING/MAINTENANCE PROCEDURE ²

WIGOS Information Resource

OSCAR/Space updating/maintenance procedure
V1.4

Document change record

Date and Version	Description	Authorized by
10.04.2013 / v0.1	Initial draft	
29.04.2013 / v0.2	Edits by J. Lafeuille	
29.04.2013 / v0.3	Editorial changes, paragraph on content versioning, paragraph on user feedback	
1.10.2013 / v1.0	Implementation	J. Lafeuille C/SBOS
21.2.2014 / v1.1	Insertion of Section 3 OSCAR/Requirements updating process	
3.4.2014	Section 3 approved by IPET-OSDE-1	IPET-OSDE1
29.2.2016 / v1.2 (Draft)	- Section 4.2 and Step 2.1 for OSCAR/Space V. 2 - Section 8: IPET-SUP	
14.4.2016 / v1.3	Reviewed by IPET-OSDE-2 (no change)	IPET-OSDE-2
3.11.2017 / v1.4	Rationalization of management of variables in WIGOS context. Making it mandatory to record source of the requirements.	
1.2.2018 / v.15	Point of Contacts for Application Areas are responsible for making sure that the Application Area "owner", i.e. the relevant Commission or Expert Group, is agreeing with the proposed requirements in OSCAR/Requirements	IPET-OSDE-3

1 Note: the OSCAR/Requirements parts added to the ET-SAT approved document are highlighted in green. IPER-OSDE concurred with the Space part, and approved the Requirements part.

2 Note: the OSCAR/Requirements parts added to the ET-SAT approved document are highlighted in green. IPER-OSDE concurred with the Space part, and approved the Requirements part.

OSCAR UPDATING/MAINTENANCE PROCEDURE

1. INTRODUCTION

1.1 Purpose and scope

This procedure defines the roles, responsibilities and steps to be followed to update content, functionality and interface of the OSCAR/Requirements and OSCAR/Space modules with the aim to ensure that OSCAR content is up-to date, correct, quality-controlled, accessible and fit for purpose.

Note: OSCAR/Space feeds another information resource, the CGMS Satellite Status list, which is thus indirectly covered by this procedure.

1.2 Document plan

The document contains seven sections:

- Section 1: Introduction
- Section 2: Roles
- Section 3: [OSCAR/Requirements updating process](#)
- Section 4: OSCAR/Space content updating process
- Section 5: Updating of functionality and interface
- Section 6: User feedback and evaluation
- Section 7: Resources for Oscar updating and maintenance
- Section 8: Evolution of the procedure

1.3 Background documents

- OSCAR/Space Software Requirements Specification
- WIGOS Information Resource (WIR) functional requirements specification
- ISO/IEC 14764:2006 Software Maintenance
- [CIMO Guide Part 3 Chapter 1 Quality management](#)
- [Rolling Review of Requirements \(RRR\) process](#)

1.4 Definitions

Acronym	Definition
OSCAR	Observing System Capability Analysis and Review Tool
WIGOS	WMO Integrated Global Observing system
WIR	WIGOS Information Resource
CEOS	Committee on Earth Observation Satellites
CGMS	Coordination Group for Meteorological Satellites

2. Roles

The updating and maintenance processes involve the following roles. In practice, one person can take multiple roles.

Role name	Description
SP Office	Space Programme Office (Including external contractors acting by delegation of the SP Office staff and in accordance with the present procedure)
PoC	Point of Contact in charge of reviewing and updating the requirements for a given Application Area identified in the RRR process
IPET-OSDE	CBS Inter-Programme Expert Team on Observing System Design and Evolution
ET-SAT	CBS Expert Team on Satellite Systems
Satellite Operators	Satellite operators with missions recorded in OSCAR
Science Groups	International Science Groups that partner with WMO, e.g. IPWG, IROWG, ICTSW IPT-SWeISS
WIR Project Manager	Person responsible for coordinating the overall WIGOS Information Resource (WIR) developments including OSCAR developments
OSCAR Developer	Person(s) responsible for the technical developments of the OSCAR tool
OSCAR Technical Administrator	Person(s) responsible for the maintenance and operation of the OSCAR tool [Note: possibly different persons for OSCAR/Requirements, OSCAR/Space, OSCAR Surface]

Requirements owner: In addition, observational user requirements in OSCAR/Requirements shall be owned by an identified body or expert group representing the relevant community (e.g. Technical Commission). The Point of Contacts for Application Areas are responsible for making sure that the Application Area "owner" is agreeing with the proposed requirements in OSCAR/Requirements.

3. OSCAR/REQUIREMENTS UPDATING PROCESS

3.1 EXPLANATIONS

This section applies to the updating of the contents of OSCAR/Requirements. For changes to the functionality of OSCAR, please refer to Section 5.

The variables registered in OSCAR are generally shared by several application areas. Each variable has the following attributes, which can only be updated by the administrator.

TABLE 1: Attributes of a variable in OSCAR

Attribute	Example
Name	<i>Sea surface temperature</i>
Applicable cross-cutting tags	<i>Cryosphere, Tropical Meteorology</i>
Domain or sub-domain	<i>Ocean</i>
Definition	<i>Temperature of the sea water at surface. The "bulk" temperature refers to the depth of typically 2 m, the "skin" refers to within the upper 1 mm.</i>
Comment	<i>Detailed SST definitions are available from GHRSSST: https://www.ghrsst.org/ghrsst-science/sst-definitions/</i>
Measuring unit	<i>K</i>
Uncertainty unit	<i>K</i>
Stability unit per decade	<i>K</i>
Unit for horizontal resolution	<i>km</i>
Unit for vertical resolution	
Applicable layers	<i>Sea surface, Bulk</i>

3.2 NEW VARIABLES OR CHANGES TO THE ATTRIBUTES OF A VARIABLE

The following steps shall be followed when entering a new variable or updating any attribute of an existing variable:

Step	Description	Responsibility	Frequency
1	When identifying the need to either register a new variable or amending the attributes of an existing variable, the Point of Contact or a relevant expert submits the proposed attributes (as listed in Table 1) to the administrator with a brief justification.	PoC or other expert	When needed
2	The administrator checks the formal consistency of the recommended change, seeking clarification from the initiator if necessary. If the change is minor (e.g. adding a layer, or editorial correction on the definition, etc.) the administrator jumps to step 5 6.	Administrator	When contacted by a PoC or other expert
3	If the recommended change is substantial and/or has a potential impact on the requirements of several applications, the administrator seeks confirmation from the IPET-OSDE Chair	Administrator	When appropriate
4	The IPET-OSDE Chair <u>reviews the proposed change, either confirms the proposed change, or may</u> contact the expert for further discussion, or submits the proposal to discussion by IPET-OSDE, <u>and then submits proposal to the chair of the WIGOS TT-WMD for decision</u>	IPET-OSDE Chair	When appropriate
5	<u>The TT-WMD Chair either confirms the proposed change or consults with TT-WMD and/or other experts for clarification or alternate proposal</u>	<u>TT-WMD Chair</u>	<u>When appropriate</u>
5 6	Upon confirmation by the <u>TT-WMD Chair</u> IPET-OSDE Chair, or endorsement by the IPET-OSDE group , or if the recommended change is minor, the OSCAR/Requirements administrator implements the change.	Administrator	When a proposed change is confirmed

Ref.: 13860/2018-11 OBS- WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

3.3 REQUIREMENTS APPLICABLE TO AN EXISTING VARIABLE

The provisions below are applicable when a requirement is updated, or a new requirement is entered, for a variable which is recorded in OSCAR, without changing the definition, unit, or applicable layers of this variable.

Step	Description	Responsibility	Frequency
1	The PoC reviews the requirements of his/her application area in consistency with the Statement of Guidance, taking into account the evolution occurred in the application area.	PoC	Yearly
2	If updates are necessary, the PoC logs in as Editor, and updates the requirements or enters new requirements as appropriate. If necessary he/she contacts the administrator for assistance. <u>Information about the source of the requirement ought to be added in the database in the corresponding field.</u>	PoC	Yearly
3	When the update is ready, the PoC informs the OSCAR/Requirements administrator that requirements are in draft status	PoC	When update is ready for validation
4	The administrator checks the formal consistency of the new or updated requirement. If the updates are purely editorial or a factual correction, the administrator jumps to step 7	Administrator	When requested
5	If the updates are substantial, the administrator seeks confirmation from the IPET-OSDE Chair	Administrator	When relevant
6	The IPET-OSDE Chair either confirms the updated requirement, or contacts the PoC for further discussion, or submits the proposed update to IPET-OSDE for discussion.	IPET-OSDE Chair	When relevant
7	Upon confirmation by the IPET-OSDE Chair, or endorsement by IPET-OSDE, or if the draft update is minor, the OSCAR/Requirements administrator validates the update.	Administrator	When confirmed

Ref.: 13860/2018-11 OBS- WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

4. OSCAR/SPACE Content updating Process

There are two levels of content updates:

- First level: updates based on non-controversial factual evidence,
- Second level: other updates, resulting of expert assessment.

4.1 **First level: updating of factual content**

Scope: Refers to update, insertion or deletion of factual content, based on non-controversial factual evidence (e.g. satellite launch dates, new satellite plans, start or end of operational service, orbit characteristics, instrument specifications, ground segment and programme description).

Step	Description	Responsibility	Frequency
1	SP Office keeps track of publicly available information from official satellite operator sources and updates OSCAR accordingly [If necessary, updates are confirmed with Satellite Operator focal points]	SP Office	Continuous, Delay of max 2 months
2	Satellite Operators inform SP Office of important changes or factual errors in OSCAR	Satellite operators	As necessary
3	CGMS satellite operators regularly validate factual information within their responsibility through annual reports to CGMS	Satellite operators	yearly
4	For non-CGMS members, updates are collected either via CEOS or, if relevant (e.g. non-CEOS Members), through direct call from the SP Office	SP Office in consultation with CEOS	yearly

4.2 **Second level: updating of assessments**

Scope: Refers to assessments of the suitability of certain instruments for fulfilling pre-defined capabilities or measuring specific variables. Since these assessments can be subject to discussion, effort is made to seek endorsement by representative or authoritative experts. As of OSCAR/Space Version 2, these assessments rely on expert rules based on remote sensing science principles. Expert groups will be invited to engage in the validation and update of this knowledge basis.

Step	Description	Responsibility	Frequency
1	Instruments are classified and assessed according to objective design features	SP Office	As new satellites/instruments are added
2.1	Thematic science groups and IPET-SUP are invited to review the rules determining the instrument rating per product, in their respective fields of expertise	Science groups (e.g. IPWG, IROWG, ICTSWIPT- SWeISS) and IPET-SUP	Typically 2-yearly, or when major updates are entered
2.2	ET-SAT validates the assessments and other details in their field of expertise	ET-SAT	yearly
3	SP Office implements changes requested by ET-SAT and/or science groups,	SP Office	yearly

4.3 Traceability of updates

All operations (insert, update, delete) are automatically recorded by the system. An administrator can access these logs and reverse changes if necessary.

A list of major content updates (e.g. structural changes, assessments) is maintained by the SP Office.

5. Updating of functionality and interface of the tool

Conceptual and/or technical changes to the structure, functionality and interface of the tool can be differentiated in "system maintenance", "adaptive/corrective maintenance" and "feature updates".

5.1 System maintenance

Scope: Maintenance tasks necessary to provide 24/7 accessibility and recovery services in case of failure. Includes the regular maintenance of hosted server environment.

	Description	Responsibility	Frequency
Process 1	Ensure maintenance of application backups and keep recovery versions. (Application and Content)	OSCAR Technical Administrator	Continuous
Process 2	Monitor and configure technical platform (web server, database systems etc) Inform OSCAR Developer of any significant changes in environment	OSCAR Technical Administrator	As needed, at least bi-annually, or if necessary

5.2 Adaptive/corrective maintenance

Scope: Refers to analysis and correction of discovered bugs or incompatibilities arising through the use of new devices and browsers, as well as minor changes to the presentation (wording, layout).

Step	Description	Responsibility	Frequency
1	Recording, prioritizing and validating requests	SP Office	continuous
2	Implementation and test of update, inform users (if applicable / relevant)	OSCAR Developer	as applicable, with delay of max 2 months

5.3 New features, new functionalities and presentation

Scope: This refers to adding new functionalities, or significantly changing current behaviour of the tool, including presentation and user interface.

Step	Description	Responsibility	Frequency
1	Recording of general feedback and feature requests from Expert Groups, Satellite operators, users, OSCAR development team	SP Office	Continuous

2	ET-SAT provides guidance on evolution of functionality and interface [WIR development team is consulted if requests have effects on other OSCAR modules]	ET-SAT [WIR project manager]	yearly
3	Approved features are recorded in the Software Requirements Specification for OSCAR/Space	SP Office	
4	Changes are implemented in accordance with overall OSCAR procedures and schedules	OSCAR Developer	
5	OSCAR manual(s) are updated as necessary	SP Office, OSCAR Developer	

5.4 Traceability

- A list of discovered bugs, incompatibilities and problems, along with their priority and status is maintained by the OSCAR Developer
- A list of all feature requests is maintained by the WMO SP
- Approved functionalities/ features or changes of such are recorded in the Oscar "Software Requirements Specification" (SRS) Document.

6. User feedback and evaluation

User feedback is collected through an email address indicated on the OSCAR homepage, which is checked on a regular basis by the administrator.

User emails are responded and appropriate actions are taken in accordance with the processes outlined in Section 3 and Section 4, for instance:

- an explanation is provided to the user, added in OSCAR views or in the user manual;
- a modification is brought to the interface or the functionality;
- contents are corrected, or a proposal for correction submitted to a satellite operator or a science group for validation.

Structured online surveys are used at regular intervals (every 1-2 years, as appropriate) to collect information on visitor characteristics and feedback on user satisfaction and possible areas for improvement.

Visitor statistics (number, origin, access characteristics) are collected. These statistics are reviewed on an annual basis within the SP Office.

7. Resources for Oscar updating and maintenance

The CBS Recommendation 1 (CBS-15) on Implementation and Sustainability of the Database of Observation Requirements and Observing Capabilities states:

(1) That resources be assigned with high priority within the Secretariat to complete the software development and, on a sustained basis, for technical maintenance, first-level contents updating and, through consultancy, for technical-level updating and quality control, as a key activity of the WMO Integrated Global Observing System;

(2) That Members, expert teams of the Open Programme Area Group on Integrated Observing Systems, satellite operators including the Expert Team on Satellite Systems and members of the Coordination Group for Meteorological Satellites, support the

database updating process through submitting inputs and providing reviews and feedback.

8. Evolution of the Procedure

This procedure is maintained by the SP Office, in consultation with the WIR development team, IPET-OSDE, IPET-SUP and ET-SAT.

Ref.: 13860/2018-11 OBS- WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

TEMPLATE FOR STATEMENTS OF GUIDANCE (SOGs)

(as approved by IPET-OSDE-1, April 2014)

The Statement of Guidance (SoG) for a WMO Application Area¹ is a gap analysis; it provides an assessment of the adequacy of observations to fulfill the observational user requirements and suggests areas of progress towards improved use of space-based and surface-based observing systems. Only the most significant variables in a given Application Area are analyzed in the SoGs.

The aims of the SoG are:

- to inform WMO Members on the extent to which their requirements are met by present systems, will be met by planned systems, or would be met by proposed systems. The Statement of Guidance is essentially a gap analysis with recommendations on how to address the gaps. It also provides the means whereby Members, through the Technical Commissions, can check that their requirements have been correctly interpreted.
- to provide resource materials useful to WMO Members for dialogue with observing system agencies regarding whether existing systems should be continued or modified or discontinued, whether new systems should be planned and implemented, and whether research and development is needed to meet unfulfilled aspects of the user requirements.

The Statement of Guidance for an Application Area is one element of the Rolling Review of Requirements (RRR²) process. It is used by the Commission for Basic Systems to complete the RRR process and contribute to the "Vision for the GOS"³, and hence to the Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP⁴).

The SoG is prepared by the Point of Contact (PoC) nominated for the considered Application Area. The PoC is responsible for coordinating the development of the SoG with his/her community. He/she shall submit the SoG and future updates to the Chair of the Commission for Basic Systems (CBS) Inter-Programme Expert Team on the Observing System Design and Evolution (IPET-OSDE) for his/her review and submission to the IPET-OSDE for discussion. SoGs are approved by the Chair of IPET-OSDE and/or the IPET-OSDE.

The SoG shall be structured as follows. The inclusion of annexes is discouraged.

1 <http://www.wmo.int/pages/prog/www/wigos/wir/application-areas.html>

2 <http://www.wmo.int/pages/prog/www/OSY/GOS-redesign.html>

3 <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html>

4 <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html#egos-ip>

STATEMENT OF GUIDANCE FOR [NAME OF APPLICATION AREA]

*(Point of contact: name of point of contact who prepared the SoG)
(Version number, approval status, and date)*

1. Introduction

[1/2 to 1 page]

This section shall briefly describe the Application Area and its possible sub-areas addressed in the document, and provide some information on the purpose and end users of those applications.

It also provides some general information on how the Application Area depends on observations.

2. Description of requirements

[1 to 2 pages]

As observational user requirements are not independent between Application Areas, duplication shall be avoided. This section shall therefore explain how the requirements of other Application Areas could be relevant to this Application Area; such requirements shall not be repeated in this SoG.

This section shall briefly describe the observational user requirements. They are listed by observed variable, and if needed by sub-application.

As the observational user requirements are described quantitatively and exhaustively in the User Requirements Database (i.e. OSCAR/Requirements⁵), the requirements listed in this section shall not duplicate the database, and therefore remain short and generic. It shall include a textual description of the issues that it is necessary to understand in order to interpret the numbers in the OSCAR/Requirements⁵.

3. Gap analysis

[n pages]

This section provides the results of the critical review and gap analysis for the most important variables to highlight where the main gaps exist. The critical review involves comparing the capabilities of the surface- and space-based observing systems with the quantitative observational user requirements from the OSCAR/Requirements⁵ database.

The process of preparing the gap analysis is necessarily more subjective than that of the critical review. Moreover, whilst a review attempts to provide a comprehensive summary, a Statement of Guidance is more selective, drawing out key issues. It is at this stage that judgements are required concerning, for example, the relative importance of observations of different variables. If impact studies have been conducted, the results of such studies should also be considered for the gap analysis.

As in section 2 above, duplication shall be avoided between Statements of Guidance when one Application Area depends on the requirements of another Application Area.

This section shall be organized by observed variable, and for each variable, and possibly for each sub-application, describe where there are gaps and how they might be addressed in order to have substantial impact on the Application Area.

⁵ <http://www.wmo-sat.info/oscar/observingrequirements>

The following terminology has been adopted in the SoGs.

- **"Marginal"** indicates minimum user requirements are being met,
- **"Acceptable"** indicates greater than minimum but less than maximum requirements (in the useful range) are being met, and
- **"Good"** means close to maximum requirements are being met.

4. Recommendations on how to address the gaps.

[1/2 to 1 page]

This section shall summarize the recommendations on how to address the gaps described in section 3 above. It may include a first section with some generic recommendations, followed by a second section listing the critical variables that are not adequately measured by current or planned systems are (in order of priority).

References

This section may include sources of additional relevant information concerning the Application Area and its requirements.

OUTCOME OF BREAKOUT GROUP 1

Review of Various Implementation Plans

Composition of the breakout group:

- Stefan Klink (lead)
- John Eyre
- Seiyong Park
- Rosemary Munro
- Yoshiaki Sato
- Dominique Berod
- Etienne Charpentier

Discussion

It was recalled that:

- 1) the EGOS-IP was structured on the Vision 2025.
- 2) A review of GCOS-IP was made to make sure its actions were captured in EGOS-IP. This led to CBS Decision.
- 3) Then we reached out with other groups for additional input
- 4) GCOS IP is also feeding in the new draft WIGOS Vision 2040.
- 5) Then naturally future WIGOS IP will be consistent with GCOS-IP.

The Group noted the challenge of Members to respond to WIGOS IP when other specific plans will also exist, and there is the need to simplify the work of Members when they develop national strategies for implementing all the IPs.

There is different level of maturity of various plans, e.g. for WHOS, CBS can reach out with CHY on requirements, and infrastructure implementation, data sharing, standards of data formats aspects. Note: WHYCOS will be looking at the monitoring function.

The Group agreed that the WIGOS Vision 2040 needs to capture feedback from relevant communities and visionary elements of the various existing IPs.

WIGOS IP will need to capture actions from the various IPs.

The Group agreed on the need to undertake a review of the various Implementation Plans. Benefits of the review will include:

- Future (overarching) WIGOS IP responds adequately to the plans of the WIGOS partners
- Overarching Vision and WIGOS IP will allow Members to define national response to WIGOS requirements and required evolution of observing systems in an effective and efficient way
- Synchronized IPs is of benefit to Members who won't have to put resources at national level to understand how various plans fit together

Terms of Reference of Consultant (sequence: 2(a) + 1(a), then 2(b, c) + 1(b,c), then 3):

1. Assess and review what IPs exist and are relevant to current EGOS-IP and draft WIGOS Vision 2040, and for the identified IPs:
 - a. Identify Actions/Activities from those plans, which could be linked to current EGOS-IP, and fed in materials to be used when developing the future WIGOS IP and

- b. Clarify what is going to be NMHSs contribution to the identified Actions/Activities in terms of basic infrastructure
 - c. Identify visionary elements from those plans which could be considered for the draft WIGOS Vision 2040 (immediate feedback required), and considered in future WIGOS-IP (less urgent)
2. Identify those IPs for which there is a process underway to update existing ones or to develop them within their own processes
 - a. Analyse the timelines of different IPs and maturity levels, and propose CBS workplan for interaction with relevant communities, incl. for addressing items b and c below
 - b. Recommend CBS actions to engage with relevant communities so that basic infrastructure requirements are considered in their IPs, and assure consistency between EGOS-IP and those plans
 - c. Identify those actions from the IPs which need to be captured in the future WIGOS IP
 3. Identify issues discovered through the above activities which are relevant to WIGOS which will have to be taken into account when developing the plan for the future WIGOS IP
-

OUTCOME OF BREAKOUT GROUP 2

Breakout Group 2 – Need for Application Areas, Erik Andersson

Dr Erik Andersson <erik.andersson@ecmwf.int>,
 Frank Grooters <fgrooters@gmail.com>,
 Sid Boukabara <sid.boukabara@noaa.gov>,
 Anthony Rea <anthony.rea@bom.gov.au>,
zanb_f@hotmail.com
 Dean Lockett

- To what extent is Urban Meteorology covered by existing AAs?
 - The AA for Atmospheric Composition has 3 sub-AAs defined as: Providing atmospheric composition information to support services in urban and populated areas.
 - Pollution and air quality
 - HRNWP: Mentions support for urban forecasting. There is the possibility to have the urban aspect emphasized within this SoG.
 - Question: are additional specific observations required to support forecasting or other applications for Urban Meteorology? If so, where would those (sub-) applications best fit in terms of existing AAs?
 - One likely focus is related to water management
 - Urban flooding – coastal and/or riverine and flash-flooding – relates to Hydrology and VSRF AAs.
 - A second likely focus is related to climate change and support for monitoring and prediction of impacts:
 - Heat wave – relates to seasonal forecasting and global NWP.
 - For Climate Monitoring there may be a requirement for higher density observations to support longer-term change and large variation of parameters (e.g. temperature and rainfall) over large urban cities.
 - Threats from fire
 - Atmospheric Composition – for severe events impacts.
 - Climate Monitoring? For fire risk management and prediction
 - Could possibly warrant a new AA which would include Urban but also include non-Urban applications, for example impacts on agriculture.
 - Intensity of severe weather including intense rainfall – related to VSRF

- May be a requirement for a new AA: "Land Applications" to encompass agriculture, fire, vegetation, land transport?
- GCW is being addressed and does not currently require a separate AA.
- Ocean Applications are considering a division into Open Ocean and Coastal sub-AAs and possibly others.

In summary: there are clear possibilities to incorporate the observation requirements for Urban Meteorology in several of the existing AAs. In addition, the creation of a new land AA for fire, agriculture, vegetation and land transport should be considered by the IPET-OSDE.

OUTCOME OF BREAKOUT GROUP 3

REVIEW OF VARIABLES

Composition of the group:

- John Eyre, lead
- Frank Grooters,
- Rosemary Munro,
- Sid Boukabara,
- Dominique Bérod
- Léa Freydier,
- Etienne Charpentier

Discussion:

The breakout group looked at those variables that exist in OSCAR/Requirements but do not exist in the WIGOS Metadata Standard (WMDS), and that would therefore need to be added in WMDS. It looked at the names of the variables but not at their definition at this stage. It also looked at variables that exist in both but may have to be renamed in the WMDS, OSCAR/Requirements or both.

The Breakout Group agreed with the following:

- Names of variable should not specify the dimension (e.g. 3D) nor the temporality (e.g. integration period). However, separate variables would be needed to distinguish between some 3D fields (e.g. ozone) and some 2D fields (e.g. ozone total column) for which separate requirements and observing capabilities exist.
- If a variable in OSCAR/Requirements is being made more generic (amount of precipitation), then, information should be added, either in the definition of the variable or in the comments column of OSCAR/Requirements to indicate the specifics of the existing user requirements (accumulated precipitation over 24h period).
- 31 variable names that exist in OSCAR/Requirements are proposed to be added, without change, to the WMDS. TT-WMD may wish to propose adjustments to the names of these variables in consultation with the ad hoc group on the review of variables.
- Atmospheric Composition (AC) requirements. Experts responsible for providing user requirements for the 3 new AC Application Areas should use names already present in WMDS or OSCAR/Requirements where possible. If the name is not currently in OSCAR/Requirements, then they should request the OSCAR Administrator to add it (according to agreed OSCAR procedures). If, additionally, the name is not currently in the WMDS, then they should also draw this to the attention of the OSCAR Administrator.
- For GCW and Hydrology review, John Eyre will identify who will need to be involved in the review of variables.
- Strategy for the future. The updated list of WMDS should be approved by Cg-18. A process will be needed to update the list, and OSCAR/Requirements updating procedure will have to be reviewed and updated according to WIGOS requirements. IPET-OSDE members need to review the procedure and suggest changes to the Chair. Post-meeting note from Jörg Klausen:

We need to clarify that the update frequency for the list of variables in OSCAR/Requirements and in the WMDS will be much greater than the frequency of Cgs. This should be part of the "updating procedure" mentioned above. Change requests to the WMDS, in particular addressing code lists, can be submitted at any time to TT-WMD.

TT-WMD shall review and agree on such CRs within one month. Once a CR is approved by TT-WMD, chair of IPET-OSDE shall be consulted for approval, and the CR be implemented in due course. ICG-WIGOS shall be informed by chair of TT-WMD yearly on any updates. Formal approval shall follow by EC and eventually Cg.

- Léa Freydier is preparing a template for change requests concerning the WIGOS Metadata Standard.
- Léa will be preparing a proposal of IPET-OSDE to the TT-WMD. Proposal will be reviewed by John, Luis, Etienne, Léa, Erik before submission to TT-WMD.

<i>Type</i>	<i>Ref.</i>	<i>What</i>	<i>By whom</i>	<i>Deadline</i>
Action	Annex 13	To prepare proposal of IPET-OSDE regarding the review of variables to the ICG-WIGOS TT-WMD (proposal to be reviewed by John, Luis, Etienne, Léa, Erik before submission to TT-WMD)	L. Freydier	7 Feb. 2018

OUTCOME OF BREAKOUT GROUPs 4 and 5
SUMMARY OF REVIEW STATUS
PROGRESS AGAINST THE ACTIONS OF THE
IMPLEMENTATION PLAN FOR THE
EVOLUTION OF GLOBAL OBSERVING SYSTEMS (EGOS-IP/2025)

(Version dated: 1 February 2018)

Notes:

1. Latest version of this file is available at:

<https://drive.google.com/open?id=16kj28rEo1csv9758eS7j9P5uR9wLQyHDAoF1tuZQQ3M>

2. Colour codes:

GREEN = this component of the observing system is compliant with the Vision and is likely to remain compliant until 2025.

YELLOW = some progress has been achieved, either in improving the observing system itself towards meeting the Vision, or in establishing activities through which real progress on the observing system can be expected.

RED = little or no progress.

GRAY = no progress report

No	Action	Progress/Comments (progress since 2012; or what action is needed in order to prepare a progress report)	Responsibility for monitoring progress
C1	Expand traditional obs. systems	<p>Action too broad. Are stations upgradable ? assessment could be made, as well as comparison of radio-sondes. GCOS can encourage understanding of the need. GCOS report provide information on evolution : stable for GSN, degradation for GUAN.</p> <p>Progress report</p>	GCOS Sec
C2	Transition research to operations	<p>No progress report – Baseline needs to be established and IPET-OSDE should define those candidate research observing systems that show the most promise for future operations within the life of the draft Vision for the WIGOS in 2040.</p> <p>Discussion paper on how to proceed + feedback from Chair ABO (201501). Paper to be provided to team members for their feedback (action; Secr.; asap). Cannot measure progress until candidate observing systems are identified. Plan for discussion on this issue at next IPET-OSDE meeting (action; Secr.; IPET-OSDE-4).</p>	IPET-OSDE JCOMM OCG
C3	WIS Standards	<p>Survey results (201712):</p> <ul style="list-style-type: none"> • 89% of FPs have access to Manual on WIS (some requested information in French, although manual available in all languages on WIS Wiki, but only in 4 languages in WMO Library) • 83% operate WIS NC, 37% DCPC, and 24% GISC. • 78% adhere to WIS specs listed in section 5 of Manual WIS (21% don't). Some statements about WIS metadata having not been updated at GISC. • Training needed. <p>This task also falls within the terms of reference for ET-CTS (Monitor the effectiveness of data exchange on the WIS in relation to the expected standards, and take follow-up action, including capacity-building activities, to address issues identified).</p> <p>Some progress (changed from unspecified in 2015)</p>	IPET-DRMM
C4	Users consultation	<p>Survey results (201712):</p> <ul style="list-style-type: none"> • About 50% of FPs have deployed new observing systems in past year (AWS incl. for hydrology, AWOS, Lidars incl. for volcanic ash, Lightning detection, ADCPs,), and there has been good consultation with wide 	WIGOS PO, WMO SP

		<p>range of users. Works well in space community; not so well for surface-based observing systems where some Members are not complying to standards. Change management can be improved with proper guidance and tools from WMO. Some progress (changed from red in 2015)</p>	
C5	<i>Ocean obs. sustainability</i>	<p>JCOMM-5 recognized the need for closer coordination and regular interaction between GOOS and JCOMM in the development of sustained observations, particularly in engaging new communities, networks, and technologies, and decided to recognize that OCG is jointly sponsored by GOOS. JCOMM will monitor and coordinate testing and assessments of ocean observing technologies as they mature and approach readiness for sustained operation. JCOMM-5 also advocated that emerging observing networks improve their readiness for sustained observing development (drawing on the framework for ocean observing) and identified key actions in this regard. JCOMM-5 also decided that TPOS 2020 implementation and transition into the global sustained observing system will be coordinated by the TPOS 2020/JCOMM cross-cutting Transition and Implementation Task Team, with the Terms of Reference of the task team in the annex to this Decision. WMO SP / ET-SAT to provide guidance on satellite capabilities through OSCAR.</p> <p>The "Capability review" functionality of OSCAR is available (http://www.wmo-sat.info/oscar/observingmissions) to highlight the missions related to, e.g.: Radar altimetry, sea surface wind, ocean colour. Furthermore, the "Gap analysis by variable" function is available to highlight the missions supporting a particular parameter, e.g. SST. Some progress</p>	<p>JCOMM OCG WMO SP ET-SAT</p>
C6	<i>Adaptative sampling & continuity of climate records</i>	<p>No progress report – National Focal Points to report on the level of targeting undertaken to establish a baseline. Subsequently they should report on any changes to the level of targeting and the extent to which they have investigated the impacts on climate data records. The initial focus should be on upper-air observations. Requirements are well understood by most Members and CBS. ET-SBO made survey and will provide feedback in 2018.</p>	WIGOS PO
C7	<i>"Change management" procedures</i>	<p>Survey results (201712):</p> <ul style="list-style-type: none"> • 61% of FPs changes observing systems/instruments in past year (e.g. to digital and automated instruments). • Overlapping of measurements made as far as practicable, in particular with regard to replacing mercury instruments. Life cycle management implemented in some cases. <p>Concept of change management needs to be understood. Change management is in OND Principles and related guidance. Awareness and communication plan about change management guidance</p>	<p>WIGOS PO WMO-SP/ ET-SAT JCOMM/OCG</p>

		is needed. Partial progress report from WMO SP	
C8	Data sharing principles	<p>Survey results (201712):</p> <ul style="list-style-type: none"> 62% of FPs are providing more than 50% of their data on GTS; 38% are providing less than 50% of data on GTS. Other mechanism than GTS are used (e.g. web services, ftp, XML etc.); some for commercial purposes. Some plans to increase % of data on GTS. Note: future survey needs to make the question asked to FPs clearer regarding WIS vs. GTS Members need to make efforts to better share and exchange data. Elements proposed in draft WIGOS Vision 2040. <p>More progress needed</p>	WIGOS PO
C9	Evolution of data volumes	<p>Progress report from SBO – Data volumes for BUFR TEMP have been increasing due to high resolution BUFR TEMP data (see action G14). Any change in SYNOP data volumes is much less dramatic</p> <p>ET-SBO, ET-SAT, and JCOMM OCG to advise WIS on the evolution of data exchange volumes. In particular this should focus on the exchange of next-generation geostationary satellite data, hyperspectral sounder data and radar data. IPET-OSDE should consider a recommendation to include estimates of present and future data volumes in OSCAR/space and OSCAR/surface to facilitate planning. Data rates and volumes from new-generation meteorological satellites exceed those of the previous generation by factor 10-100.</p> <p>ET-ABO showed substantial increase. OWR data expected to increase. ET-SAT to look at satellite data. Action: ETs to provide feedback. Issue and potential problem of distributing product data versus level 1 data because of the increase of data volumes (IPET-SUP).</p>	<p>ET-SBO, ET-ABO, IPET-OWR</p> <p>ET-SAT</p> <p>JCOMM/OCG</p>
C10	Data flow & feedback	<p>No progress report – National Focal Points to document existing processes as a baseline against which future progress can be assessed. Some progress report on the data quality monitoring. WDQMS under development.</p>	WIGOS PO ICT-ISS
C11	Data exchange formats	<p>No progress report – IPET-DD and IPET-CM to address Steve Forman to provide feedback. Efforts to standardize OWR data exchange formats (IPET-OWR). Note: carefully consider this action for future WIGOS IP (not always a requirement)</p>	IPET-DRMM
C12	Radio frequencies.	<p>Survey results (201712):</p> <ul style="list-style-type: none"> 65% of FPs said that observation frequency bands do not have the required level of protection. 	SG-RFC

		<ul style="list-style-type: none"> Some bands are listed: 400-406MHz for RS, 26GHz and 50GHz, 5.3 GHz, Radar C-band ... Note: Survey should clarify whether we are addressing the legal framework or actual operational interferences. <p>See report of SG-RFC to ICT-IO5-10 More progress needed</p>	
G13	Capacity Building Strategies	<p>WIGOS PO organized regional workshops. National observing systems assessments were made on basis of OSCAR. Encouraging national IPs. Regional IPs developed. Need to monitor progress against those IPs. WMO promoting mitigation of gaps and establishment of project funded with extrabudgetary funding. No progress report – comments on how to proceed</p>	WIGOS PO
G1	Traceability	<p>No progress report – CIMO looking at the issue, in particular through RICs. However, traceability remains an issue and it is hardly measurable. Efforts ought to be made to make sure information about calibration is routinely recorded in OSCAR. In future NFPs may also be asked to report annually to IPET-OSDE on which observing stations and variables they are compliant/ non-compliant with WMO standards and the requirement for SI traceability.</p>	WIGOS PO For CIMO
G2	Hourly data exchange	<p>Survey results (201712):</p> <ul style="list-style-type: none"> 60% of surface stations providing hourly data according to FPs (18 FPs have >90% of stations providing hourly data). Some partner data not shared. Plans for improvements in some cases. Manual observations not provided hourly, plans for automation exist. Note: for next survey, need to measure what percentage of hourly data are made available to GTS. <p>Some progress - efforts to be made with partner data</p>	WIGOS PO IPET-OSDE (J.Lawrimore) WDQMS should provide future information. Future survey should focus on plans for increasing
G3	Sub-hourly data exchange	<p>Some progress on AMDAR data, in particular in Europe. New IPET-OWR looking at facilitating progress for Operational Weather Radars. Some progress also for AWS. Some progress</p>	ET-ABO ET-SBO IPET-OWR Possibly add to survey with G2?
G4	WIGOS Standards	<p>Survey results (201712):</p> <ul style="list-style-type: none"> 91% of FPs provide atmospheric observations (87% for ECVs), 62% ocean observations (57% for ECVs) and 80% terrestrial observations 	WIGOS PO Survey questions

		<p>(78% for ECVs).</p> <ul style="list-style-type: none"> 81% tailor data and products to satisfy user requirements. New applications mentioned: renewable energy, fisheries, insurance, hydropower Note: questions for the survey did not obviously link to WIGOS standards and must be made clearer <p>Difficult to measure progress with the received feedback. Baseline set by WIGOS IP. Need more specific information about which observing systems are targeted for wider exchange in order to measure progress.</p>	
G5	Support to satellite validation.	<p>Progress Report</p> <p>Observations providers need to gain a better understanding of what requirements are for observations to support validation.</p>	<p>WMO SP</p> <p>Why red? Should be grey.</p>
G6	Satellite products for quality monitoring	<p>GHRSSST feedback used by JCOMM for data buoys.</p> <p>Limited progress</p>	WIGOS
G7	Radiosondes in data-sparse areas	<p>Survey results (201712):</p> <ul style="list-style-type: none"> Only 19% of FPs deployed RS stations in data sparse areas of RA-I, II or III in past year, corresponding to 16 stations in total. 7 stations closed in past year (8% of responses from FPs). 21% of FPs have plans to deploy new RS stations in these regions, corresponding to total of 17 stations planned. 30 FPs of 41 FPs have at least one station providing 25 soundings each month in the past year. 89% of stations were distributed on WIS/GTS. For those not distributed, some are distributed through other means (e.g. Canada) Cost of radio sondes remains an issues. Financial support and training needed for developing countries. <p>SBO also provided a comparison between the situation in July 2017 and Sept 2016 for RA-I, RA-II and RA-III</p> <p>Some progress</p>	<p>ET-SBO</p> <p>Survey question</p>
G8	Radiosondes in presence of AMDAR.	<p>Some progress (linking to NWP Obs. Impact workshop)</p> <p>UK shifted radiosondes from airport locations 10 years ago.</p> <p>ET-SBO effectively addressing G8-G10 under a study activity.</p>	R-SEIS
G9	Adaptative frequency of radiosondes	<p>Some progress - some impact studies carried out.</p> <p>Some countries are making targeted radiosonde soundings.</p>	R-SEIS
G10	Optimize radiosonde	<p>Some progress - Study progressing per CBS-16 Recommendations (ET-SBO</p>	ET-SBO

	network	<p>doing, started in Dec. 2017)</p> <p>Can NWP be requested to provide diagnostics to show overlap & redundancy of observations to provide support for the ET-SBO study?</p> <p>S11 question of IPET-OSDE addresses this but needs refinement by ET-SBO.</p> <p>ET-SBO has surveyed members on willingness to optimise the radiosonde network.</p> <p>Financial support is likely required to support the ET-SBO study (up to \$250K) for radiosondes or else or access of CMA additional flights.</p>	
G11	GUAN improvements	<p>Progress Reported - (some problems noted, significant in Region I and parts of other regions) GCOS is reviewing the GUAN requirements for the future and will make recommendations.</p>	GCOS Sec with IPET-OSDE (H. Segenemus)
G12	GRUAN implementation	<p>Progress Reported (28 sites out of 30-40 planned; some issues noted e.g. transition from RS92 model of Vaisala). The network is</p>	GCOS Sec with IPET-OSDE (H. Segenemus)
G13	Radiosonde data availability	<p>Survey results (201712):</p> <ul style="list-style-type: none"> 84% of FPs distributing data via GTS. <p>Some progress</p>	WIGOS PO NFP Survey
G14	HR Radiosonde data	<p>Survey results (201712):</p> <ul style="list-style-type: none"> Transition from TAC (TEMP) to BUFR possibly limiting factor (36% not using the BUFR template). 61% distributed within one hour. <p>ET-SBO: Significant increase in Dec. 2017 is mainly due to US data: >60 US stations now give HR BUFR data</p> <p>Some progress; more efforts needed for transition to BUFR</p>	WIGOS-PO ET-SBO NFP Survey
G15	Impact of radiosondes above 100hPa	<p>Still to be addressed by OSEs – C-SEIS to monitor progress</p> <p>Action: C-SEIS should be requested to review past OSEs and determine if there is a need for more studies.</p>	C-SEIS
G16	Impact of improved radiosondes above 100hPa	<p>Still to be addressed by OSEs – C-SEIS to monitor progress</p> <p>Action: C-SEIS should be requested to review past OSEs and determine if there is a need for more studies.</p>	C-SEIS

G17	Regional remote sensing profiling stations	<p>Survey results (201712):</p> <ul style="list-style-type: none"> 70% of FPs have ceilometers; 56% radar wind profilers; 11% microwave radiometers; 33% something else (e.g. lidars, lightning detection, forward scatterers, sun photometers, GNSS precipitable water vapor, AWS, etc.). Plans for expanding networks in coming year: 44% of FPs have plans for ceilometers and wind profilers; 12% for microwave radiometers, and 37% for other types of instruments. Developing countries need assistance. <p>SBO also provided progress report with regard to radar wind profilers, RASS virtual temperature profilers, and aerosol lidars. Some positive progress noted.</p> <p>Some progress, limited to developed countries.</p>	WIGOS PO, ET-SBO, Survey
G18	Processing & exchange of profiler data	<p>Survey results (201712):</p> <ul style="list-style-type: none"> 16 out of 41 FPs said they have 1 or more remote-sensing profiler stations, 12 of those are providing data on GTS, and 11 are providing hourly data on GTS. <p>SBO: RWP data is the only profiler data exchanged globally. Resourcing of res. to operations needed.</p> <p>Some efforts noted. Difficult to measure progress. Developed countries have difficulties to make progress.</p>	WIGOS PO ET-SBO NFP Survey
G19	Improve AMDAR coverage in data-sparse areas	<p>Relatively good progress - progress reported available. Development of the ABOP Strategy and Implementation Plan to 2025, and Workplan 2017-2020. Report on AMDAR Coverage and Targeting for Future Airline Recruitment. WMO and IATA signed a cooperation agreement for AMDAR support, where IATA shall endeavour to involve more widely the Air Transport Industry into the AMDAR programme</p>	ET-ABO Future IPs need to address terminology of AMDAR as a sub-system of ABO systems.
G20	Extending AMDAR	<p>Relatively good progress - progress reported available. Development of the ABOP Strategy and Implementation Plan to 2025, and Workplan 2017-2020. Report on AMDAR Coverage and Targeting for Future Airline Recruitment. WMO and IATA signed a cooperation agreement for AMDAR support, where IATA shall endeavour to involve more widely the Air Transport Industry into the AMDAR programme</p>	ET-ABO
G21	Industry support and standards for AMDAR	<p>Relatively good progress - Progress Report available</p>	ET-ABO
G22	AMDAR humidity sensor	<p>Relatively good progress - Water Vapour Measurement IP available</p>	ET-ABO
G23	AMDAR Turbulence & icing	<p>Relatively good progress - Increased implementation of ERD. EDR IP drafted.</p>	ET-ABO
G24	AMDAR for small aircrafts	<p>Progress Report - indicates some limited progress</p>	ET-ABO
G25	GAW Stations	<p>Progress Report - New GAW IP 2016-2023</p>	GAW Sec

G26	GNSS receiver stations	Monitoring by NWP centres shows that there is a relatively sparse, global and stable network of stations coordinated by the IGS (International GNSS Service) http://www.igs.org/network . In Europe there is an increasingly dense regional network, internationally exchanged. Other mature, dense networks exist nationally in other parts of the world, but the data is not available for global exchange. Progress Report	IPET-OSDE (E. Andersson)
G27	GNSS data exchange	Progress report from SBO - Number of GNSS receiver stations has been quite stable since early 2016v(since 2010, the amount has been increasing globally from 1400 to 3400 stations). Processing of data done under contract with private companies in two Countries. There are issues with regard to the sharing of GNWW data. ICT-IOS to discuss how to improve data exchange and push recommendation through CBS	ET-SBO
G28	Upper-air water vapour	No progress report - comments on how to proceed	WIGOS PO
G29	Extend BSRN globally	Progress Report received - 49 stations operating normally, 11 inactive or closed, 8 new candidates provisionally accepted, R&D activities on sensors, buoys, etc.	BSRN PM
G30	RBSN & RBCN hourly data	Progress Report received - progress better in RA-IV and RA-VI; more limited progress in RA-V and RA-I.	IPET-OSDE (J. Lawrimore)
G31	RBSN & RBCN improvements	Progress report received - Significant increase in the number of stations made available on the GTS but not included in the WMO RBSN list (from 5% in May 2016 to 14% in September 2017). There is an urgent need to update the OSCAR/Surface database accordingly which will help the quality check of the station metadata	WIGOS PO ET-SBO
G32	RBSN & RBCN metadata exchange	Relatively good progress - Implementation of OSCAR/Surface in May 2016 with 2-year transition phase from VolA. Some key metadata included in real-time reports. Ability to determine the accurate current status of these networks is not possible due to issues with metadata quality and maintenance in OSCAR.	WIGOS PO ET-SBO
G33	RBSN & RBCN design & climate	Progress Report - Some improvements noted, incl. in RA-I. Some decrease in Ra-III. Good performance in other regions.	IPET-OSDE(J. Lawrimore)
G34	Near-real-time exchange of GAW data	Progress Report	GAW Sec
G35	CryoNet	WMO Executive Council (EC-69, May 2017) approved 77 CryoNet stations and 43 contributing stations for the GCW surface observing network. (Contributing stations do not meet CryoNet requirements but are part of the GCW surface network.) There are currently 25 candidate stations, which are stations that have been proposed but not yet approved. CryoNet is currently in the pre-operational phase (2016-2019). It will become operational in	GCW (J. Key)

		2020. Good progress	
G36	<i>CryoNet real-time data exchange</i>	The GCW Portal (http://gcw.met.no) is in a pre-operational phase. It will be the GCW mechanism for distribution and exchange of CryoNet data, though much of the CryoNet data will reside elsewhere. Efforts remain to be made in particular with regard to common exchange format. Some Progress	GCW (J. Key)
G37	<i>Improve global lightning detection</i>	In situ networks (incl. some global) operated by private companies. As of 2020 there will be substantial progress with regard to space capability for lightning detection. Some progress -	ET-SBO
G38	<i>Integration of lightning detection data</i>	Progress report from SBO - At the moment, the possibilities for a global integration of lightning location data can be summarized as follows: -Purchase data from a commercial provider: easy and fast, but needs money. -Exploit the space-based geostationary observations (coming available within a few years): easy, met.services are already involved. -Establish transnational and transcontinental data feeds from the available national networks to a centralized location where a composite is generated: challenging globally because of the network ownerships and due to the lack of networks especially in Africa and Asia, and over the oceans.	ET-SBO
G39	<i>Lightning detection data exchange</i>	Limited progress - Some examples of data exchange exist but no information on amount. ET-SBO to establish agreed data protocols, working with OPAG-ISS	ET-SBO
G40	<i>Metadata & representativeness of special stations</i>	Survey results (201712): <ul style="list-style-type: none"> • 13 out of 24 FPs have stations deployed for purpose of road transportation (8 on GTS); 28 out of 35 FPs for aviation (26 on GTS); 23 out of 29 FPs for agromet (8 on GTS); 11 out of 23 FPs for urban meteorology (7 on GTS); and 7 out of 12 FPs for something else (5 on GTS). • Multi-purposes stations used. • Working with partners for operating stations. • Quality and availability problems noted with external networks. • Note: survey question must more specifically target metadata. OSCAR/Surface can potentially be used for recording the information; nut information is often missing. Difficult to measure progress with received feedback	ET-SBO Survey questions need revision.
G41	<i>Renewable energy installations</i>	Some information on progress in particular with regard to solar radiation. Action may be out of date. Access to observations of energy providers might be a new focus for action.	ET-SBO

G42	GCOS/GTOS Hydrological stations	No progress report – comments on how to proceed	GCOS Sec.
G43	Key hydrological variables for WIGOS	No progress report – comments on how to proceed Progress has been made through the ECV requirements specified in the GCOS-IP.	GCOS Sec.
G44	Ground water observations	No progress report – comments on how to proceed	WIGOS PO
G45	Dual polarization radars	Survey results (201712): <ul style="list-style-type: none"> 32 out of 37 FPs operate radars. 9 of 32 FPs have installed or upgraded radars to dual-polarization, and 19 of 32 FPs had radar data exchanged regionally or globally.. Plans exist for upgrading to dual-polarization radars. <p>Good progress</p>	ET-SBO
G46	Weather radar software comparison	IPET-OWR Working on it. There is plan for developing Best Practices guidance on data processing software for QPE The comparison of data concept has lower priority. some efforts exist in liaison with the Winter Olympics in Korea 2018 Some progress	CIMO Chairperson of the International Organizing Committee (Paul Joe)
G47	Weather radars for developing countries & DRR	Support by IPET-OWR providing technical advice. Some input from NFPs. There is project in Colombia to develop weather radar network in collaboration with other RA-III Countries, and in support of flood warning in particular. There is another project (ASEAN) under regional WIGOS IP for RA-II, in support of SouthWest Pacific Ocean Countries (with contributions of Japan and Korea, promoting bilateral and multi-lateral agreements on data exchange) Survey results (201712): <ul style="list-style-type: none"> 44% of FPs said they are from developing country (3 LDCs), out of which 12 countries have radars, 9 installed in the last year. 22% only of the developing countries which have radars have exchanged data regionally or globally. <p>Relatively good progress although efforts remain to be made, in particular with regard to exchange of radar data.</p>	WIGOS PO ET-SBO
G48	Weather radar data exchange	IPET-OWR working on it. Data model was developed based on collaboration between USA, OPERA and BOM. A data format was also developed using HDF application of CWRadial. Excellent Programme	ET-SBO

G49	ASAP	North Atlantic sampled as planned by E-ASAP. Limited coverage in other regions. Progress Report	??? JCOMM/SOT (G. Ball)
G50	Accuracy of observations over the ocean; visibility measurements	JCOMM OPA promoting state of the art technologies. No progress on visibility measurements but JCOMM-5 (2017) adopted Recommendation. Progress Report	??? JCOMM/OCG (C. Clark)
G51	Quality of ship observations	JCOMM Ship Observations Team developing metrics as part of its implementation strategy. PMOs still need to be reinforced. Key performance indicators are available at http://www.jcommops.org/board?t=SOT . Quality indicators are available for SOOP CO2, of which 90% of the 30 instruments are meeting reference quality. Quality indicators are still being developed for VOS. Good progress	??? JCOMM/SOT (G. Ball)
G52	Data buoys	1375 units in late 2017, annual trend declining with improved life span of drifters. Sustaining the array and optimizing coverage. Developing a High Resolution/Accuracy SST sub-set network as a pilot project in support of satellite validation. Good progress	??? JCOMM/DBCP (A. Wallace)
G53	Barometer on drifters	Impact of drifters on NWP has been evaluated with positive results. 1186 drifters with barometers in late 2017. The funding of the barometers on drifters by research agencies has become critical. Progress Report	??? JCOMM/DBCP (A. Wallace)
G54	RAMA Array	RAMA-2.0 proposed. Limited ship time and cost of ship time preventing regular maintenance to be undertaken. Vandalism remains problematic although it has improved in the last couple of years. New smaller, more cost-effective, easier to deploy/maintain vandalism-proof design. Limited Progress	??? JCOMM/DBCP (A. Wallace)
G55	Ice buoys in the Arctic	88 units operational during Nov 2017. 250km x 250km targeted in the Arctic (180 units); gradual decline of operational units; Arctic Eurasian sector not well sampled, collaboration essential for improved deployment and coverage. Increasing area of First-Year Ice and Open Water during summer. Survivability in seasonal ice. Real-time reporting difficult to obtain in some cases. Progress Report	??? JCOMM/IABP (C. Best)

		Should be reassessed after YOPP.	
G56	Tide gauge data availability – Ensure global availability of in situ sea level data (tide gauges, Tsunameters).	Progress Report	JCOMM/GLOSS (T. Aarup)
G57	Profiling floats	Argo has KPIs. Good progress but some issues remain, e.g. sustainability of funding, Southern Ocean, marginal seas Good progress	??? Argo ST (S. Wijffels)
G58	XBT data – For ocean and weather forecasting purposes, improve timely delivery and distribute high vertical resolution data for sub-surface temperature from Ships/XBT.	Limited funding makes it difficult to achieve the desired sampling on some transects, which are not being occupied. Progress Report	??? JCOMM/SOT (G. Ball)
G59	Aircraft atmospheric measurements	Good progress	ET-ABO
S1	User information, training, and data stewardship	Progress Report Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	IPET-SUP
S2	Documenting generation of satellite products	Progress Report Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	WMO SP / ET-SAT IPET-SUP
S3	Satellite Data preservation	Progress Report Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	WMO SP in consultation with GCOS
S4	Satellite Education and Training	Progress Report Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	IPET-SUP
S5	Regional requirements for satellite products	Progress Report RA-based satellite user groups formally established in all Regions; RA V team needs confirmation; satellite requirements established and documented for RA I, RA III-IV, RA VI (under EUMETSAT lead); emerging in RA II and RA V	IPET-SUP

S6	Calibration	Progress Report	WMO SP / ET-SAT
S7	Continuity & overlap of key satellite sensors	No progress report – comments on how to proceed	WMO SP / ET-SAT
S8	GEO satellites	Progress Report	WMO SP / ET-SAT
S9	GEO imagers	Progress Report	WMO SP / ET-SAT
S10	GEO scanning strategy	Progress Report Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	WMO SP / IPET-SUP
S11	GEO sounders	Progress Report Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	WMO SP / ET-SAT
S12	GEO lightning imager	Progress Report	WMO SP / ET-SAT
S13	LEO temporal and spatial coverage	Progress Report	WMO SP / ET-SAT
S14	LEO data timeliness	Progress Report Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	IPET-SUP in consultation with NWP centres
S15	LEO data access	Progress Report Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	WMO SP / IPET-SUP
S16	Ground segments for hyper-spectral infrared sounders	No progress report – comments on how to proceed Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	IPET-SUP
S17	MW sounders early morning gap	Progress Report	WMO SP / ET-SAT
S18	LEO imagers for AMV	Progress Report	IPET-SUP
S19	LEO water vapour for polar winds	No progress report	WMO SP / ET-SAT
S20	MW imagers for SST	Progress Report	WMO-SP/ ET-SAT
S21	RO sounders	Progress Report	WMO-SP / ET-SAT
S22	RO sounders OSSE	No progress report – comments on how to proceed	R-SEIS (E.Andersson)

S23	Altimeter constellation	Progress Report	WMO-SP / ET-SAT
S24	LEO IR dual-angle view imager for SST	Progress Report	WMO-SP / ET-SAT
S25	GPM	Progress Report	WMO-SP / ET-SAT
S26	Passive MW for GPM	Progress Report	WMO-SP / ET-SAT
S27	GPM data delivery.	Progress Report Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	WMO-SP / IPET-SUP
S28	LEO Earth Radiation Budget .	Progress Report	ET-SAT and WMO-SP
S29	Sounders for atmospheric chemistry -	Progress Report	WMO-SP / ET-SAT
S30	LEO Doppler winds	Progress Report	WMO-SP / ET-SAT
S31	Cloud/aerosol lidar data	Progress Report	WMO-SP / ET-SAT
S32	Low frequency MW	Progress Report. Status and baseline to be discussed at IPET-SUP-4 (26 Feb-1 Mar 2018)	WMO-SP / IPET-SUP
S33	GEO MW for clouds & precip..	Progress Report	WMO-SP / ET-SAT
S34	GEO for ocean colour, vegetation, clouds & aerosols	Progress Report	WMO-SP / ET-SAT
S35	HEO for polar region -	Progress Report	WMO-SP / ET-SAT
W1	Plan for continuity of space weather measurements	Progress Report	WMO SP / IPT-SWeISS
W2	Ground-based solar observations	Progress Report	WMO SP / IPT-SWeISS
W3	Spatial resolution of ground-based GNSS Ionospheric obs.	No progress report	WMO SP / IPT-SWeISS

W4	<i>Timeliness of space-based GNSS obs. from LEO</i>	No progress report	WMO SP / IPT-SWeISS
W5	<i>Sharing of ground-based GNSS RO</i>	No progress report	WMO SP / IPT-SWeISS
W6	<i>Radar altimeter obs. for Ionospheric models & TEC over ocean</i>	No progress report	WMO SP / IPT-SWeISS
W7	<i>Ground-based magnetometer data</i>	No progress report	WMO SP / IPT-SWeISS
W8	<i>Plan for obs. of plasma & energetic particles</i>	No progress report	WMO SP / IPT-SWeISS

Ref.: 13860/2018-11 OBS-WIGOS/OSD
Approved by Fernando Belda Esplugaes, Wed May 23 15:04:38 UTC 2018

PROPOSED PLAN FOR THE EVOLUTION OF OSCAR/SURFACE

The following OSCAR components are foreseen to be developed in the next two years:

- M2M: Machine to Machine Interface and API to allow national databases to update their WIGOS metadata content automatically with OSCAR/Surface.
- ABOS: Aircraft-based Observations interface as stated by the CBS Expert Team on Aircraft-Based Observations (ET-ABO). This will allow AMDAR fleet metadata and airports to be recorded in OSCAR/Surface.
- OSCAR Common Homepage: Integration of the OSCAR/Surface, OSCAR/Space and OSCAR/Requirements into one single homepage at <http://oscar.wmo.int>.
- OSCAR/Surface training and e-learning material.
- Consideration of WIGOS metadata for surface-based Space Weather observing systems.
- Interface to OSCAR/Space: IT interface between OSCAR IT infrastructure as MeteoSwiss (OSCAR/Surface, then OSCAR/Requirements) with OSCAR/Space. This should allow at some point to facilitate development of the OSCAR/Analysis component.
- Migration OSCAR/Requirements: The OSCAR/Requirements currently exists operationally at the WMO Secretariat. The purpose of this development is to migrate it to MeteoSwiss IT infrastructure and integrated it with OSCAR/Surface. This will allow in particular to facilitate development of the OSCAR/Analysis component.
- Interface to WDQMS: OSCAR/Surface will be using statistical information from the WIGOS Data Quality Monitoring System (WDQMS) to record for each observing stations specific information related to how observational data from WIGOS observing stations are effectively being received by operational centres and used.
- Interface to CPDB: Some Country specific information about the observing stations will also feed Automatically into the WMO country Profile Database (CPDB - <https://www.wmo.int/cpdb/>). This will include for example the number of observing stations in a country, the number of silent stations etc.
- Some metrics on actual use of the OSCAR/Surface (e.g. number of National Focal Points, number of them actually using the system, number of updated or new stations per country, etc.).
- OSCAR/Analysis component will provide some tools for gap analysis purposes in support of the RRR critical review by the Points of Contact of each WMO Application Area. See IPET-OSDE-3 document¹ no. 7.3 for details.

The diagram in figure 1 below summarizes foreseen developments of OSCAR/Surface and OSCAR/Requirements, in collaboration with MeteoSwiss, in the next couple of years.

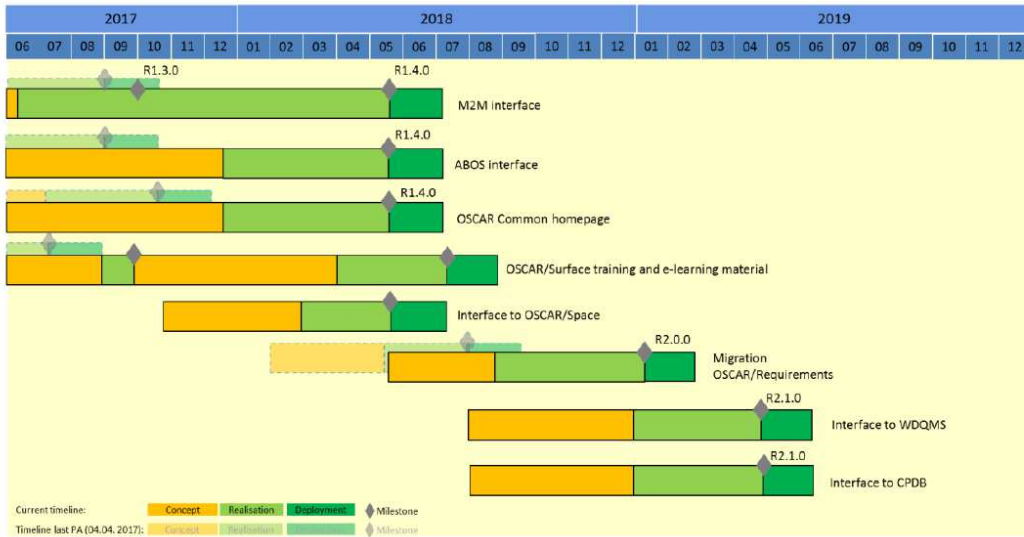


Figure 1: Plan for further development of OSCAR/Surface and OSCAR/Requirements in next two years.

OOPC COMMENTS ON STATEMENTS OF GUIDANCE

1. Comments on the Statement of Guidance for Ocean Applications

General Comments.

Recall a lively discussion at the recent JCOMM Observations Coordination Group session (May 2017 in Qingdao) on the use of the term "met-ocean" used in this document. This implies only the need for surface meteorological variable over the ocean. We had made a suggestion to change this wording to oceanographic and marine meteorological.

In general, the whole document seems unbalanced - in chapter 2.1. Wind-Wave many details are listed while other are very short and far from comprehensive.

2.6 Sea-Surface Salinity (SSS)

The following statement "*We note that the standard units for salinity have recently been changed following TEOS10 (<http://www.teos-10.org/>), which was adopted by the Intergovernmental Oceanographic Commission at its 25th assembly in June 2009. Practical Salinity Units (PSU) have been replaced by the SI unit Absolute Salinity SA, (g/kg).*" could cause confusion. The reporting unit of salinity from the observational networks and that used in all databases is still and will remain to be "psu". I'm not sure why the reference to TEOS10 is in this document, I would remove it as it may be interpreted by some to indicate a change in the unit of salinity in the observational database; this is definitely not correct.

The document then has accuracy of satellite SSS in SA units. This is incorrect, and the document should use psu consistently for salinity units.

2.7 Subsurface Temperature, Salinity and density.

Add "Subseasonal to longer predictions" to the list given in the opening paragraph.

The comment that "*Sustained funding for the Tropical Moored Buoy Arrays remained a matter of concern.*" is true for all networks that provide subsurface ocean variables. While there was a critical issue in the tropical moored array in the Pacific previously, that is being resolved through TPOS 2020; to single out one observing network is not appropriate. If they are going to make this statement, a more general statement regarding the fragility of the ocean observing network, and reliance on research funding, is more appropriate.

The requirements for and availability of subsurface ocean data should be revisited. There a number observing networks of relevance which are not mentioned. OOPC is happy to discuss.

2.8 Ocean chlorophyll, nitrate, silicate and phosphate concentrations

This section needs some attention. I suggest the authors use the GOOS EOVS documents to revise this section. www.goosoocean.org/eov

2.9 3-D Ocean Currents

There is no mention of currents products inferred from Argo.

We are concerned with the wording in 2.15 Summary of the Statement of Guidance

for Ocean Applications. Statements such as

" The ocean observing community should therefore ensure sustained funding for the key observing systems (e.g. tropical moorings, Argo, surface drifters with barometers, as well as altimeter, scatterometer, microwave SST and sea ice measurements from satellite missions)" Who is this statement intended for? Many of the observations programs were not initially designed to meet the operational ocean forecasting needs. There is a shared responsibility to develop an ocean observing system amongst the users of this system that meets requirements.

"Satellite altimetry is being used to infer the distribution of ocean currents (geostrophic velocity). Satellite altimetry provides more homogeneous space and time coverage than in situ observations, permits to derive the ageostrophic motion (e.g. centrifugal, Ekman, ageostrophic submesoscale) and the time-mean motion. Satellite altimetry also permits to detect geostrophic eddies. Global mean dynamic topography can be obtained by combining information on the geoid, altimeters, drifters, wind field, and hydrography. These products are poor in terms of timeliness required for marine services applications. HF Radars provide for good temporal and spatial resolution in coastal regions, with marginal accuracy. "

The first red-marked statement is incorrect and misleading and should be removed or eventually written into a correct expression. The second red marked statement is incorrect. Timeliness of a mean field is nonsensical. If the timeliness remark is directly at altimetry in general, it is simply false. Jason and Sentinel data are delivered within hours. Regarding the last red statement, the accuracy is useful for marine applications.

A general comment - it is unclear to me what "3-D" is referring to? is it u,v in x,y,z or u,v,w in x,y,z ? the latter would need to be explicitly mention that w is poorly observed. In any case - it is a strange heading... why not simply "Ocean Currents"? It has to be added that the third paragraph is surface currents only.

Section 2.12 and 2.13

In Section 2.12 "Surface pressure" and Section 2.13 "Surface heat flux over the ocean" ship, drifting buoys and moorings should be distinct.

The 2.15 summary section should be revised

Finally, the Ocean Application statement in section 2 uses a gap analysis assessment of data requirements. Where is the link to this gap assessment? If this classification is to be used in the document the reference should be supplied.

2. OOPC Comments on other Statements of Guidance

High Resolution NWP

Comments: Much of the text in this mirrors that for the Global NWP and OOPC's concern is that a couple of aspects are not reflected:

1). There is interest in air-sea coupling at the mesoscale and shorter and work like Li and Carbone (2012) linking where rain occurs with gradients in SST in the western tropical Pacific, so there is the opportunity to engage with oceanographers on coupling and modeling over the ocean. It is unclear from the SoG if this modelling has any interest in over the ocean or is it an over the land focus.

2) If over the ocean is included, newer ocean technologies can provide surface and upper ocean obs to feed the effort- for example SailDrone, wave glider, small Airborne AUVs flown off ships - all could map at 1 to 5 km and better scales.

3) We have many striking examples of air-sea coupling and very strong surface SST gradients already observed

So if the ocean is being considered as a boundary forcing for NWP, the summary should include: *'High-resolution NWP centers would benefit from joint research and development with oceanographers working on important air-sea coupling processes.'*

Nowcasting and Very Short Range Forecasting

Comments and clarifications:

Not so sure where the ocean side fits in with this. They say nowcasting is 0-2 hours and very short range is 2-12 hours, so not sure if they have an ocean setting in mind as well as land based settings.

Basically says requirements are the same as for Very High Res NWP. With Iridium communications on the ocean side we could give real time access to high temperature from mobile platforms like SailDrone.

The language "acceptable accuracy" is used and it would be good guidance to OOPC to know what WMO thinks this means quantitatively.

Subseasonal and Longer timescale Predictions:

Suggested edits to the text:

2.1.3 Sub-surface temperature

'Free-drifting profiling floats deployed under the Argo project (Riser et al. 2016) provide temperature and salinity profiles to ~2000 m depth, mostly with good spatial resolution globally, and acceptable frequency, except for the regions around the equator, western boundary current regions and marginal seas. While Argo has provided a breakthrough in global ocean observations, Argo floats are not capable of measuring at near boundary or shelf-shelf break regions. Here Argo combined with other technologies (gliders, surface autonomous platforms) is required.'

...

2.1.9 Deep sea

'The observation of the deep sea (below 2000 m) has relied on occasional, sparsely-distributed ship-based measurements for several decades. Basin scale moored transport arrays are also important for validating decadal predictions.'

*In recent years, the deep Argo program has been developing the free-drifting profiling floats that are capable of observing the deep ocean below 2000 m to 4000 m or 6000 m depending on the float types. **This is a pilot Argo program and deep floats are being deployed in selected deep ocean basins.***

Ref.: 13860/2018-1.1 OBS- WIGOS/OSD
Approved by Fernando Belda Esplugues, Wed May 23 15:04:38 UTC 2018

PROPOSAL FOR GAP ANALYSIS USING OSCAR

Introduction and caveat: the proposed tool would be offered as one of many other tools that can be used for gap analysis purposes (e.g. impact studies, expert knowledge) and meant to be used by experts knowing the limitations of such tool, e.g.

- (i) Results may not take into account all possible observations contributing to WMO Application Areas (e.g. satellite or remote sensing observations);
- (ii) Threshold criteria may not take into account the fact that isolated observations may still substantially impact models in particular for disaster risk reduction purposes;
- (iii) Trade-offs between different criteria, e.g. spatial vs. temporal resolution.

With the proposed tool, an OSCAR user willing to use OSCAR for gap analysis would specify the following elements:

- a) Selecting observations on the basis of the following criteria:
 - Whether the gap analysis should be made on the basis of (i) "Stated Capabilities" i.e. based solely on the WIGOS metadata in OSCAR, or (ii) "Monitored Capabilities" i.e. based on actual observations (data) received by the application area users and provided by the monitoring centres participating in the WDQMS. A specific monitoring period may be provided in case of using WDQMS input.
 - Measured variable
 - Geographical area of interest (box)
 - Inclusion or exclusion of specific sources of observations (e.g. specific networks, types or classes of platforms).
- b) Selecting observational user requirements on the basis of the following criteria¹:
 - Application Area
 - Vertical dimension (see list² in OSCAR/Requirements)
 - Horizontal dimension (see list²)
 - For what criteria the gap analysis should be made (i.e. HR, OC, U or Timeliness) – only one criteria at once for each gap analysis.

The system will compute actual HR, OC, U and timeliness on the basis of the algorithms described in Table 1 below.

Criteria	Stated capabilities	Monitored capabilities
HR	$HR = \sqrt{\frac{\text{Area of box}}{\text{Number of observations}}}$	For each selected observing platform time series, the WDQMS returns a number of observations. $HR = \sqrt{\frac{\text{Area of box}}{\text{number of observations}}}$
VR	Not computed	Not computed

¹ The user may then wish to overwrite the obtained HR, OC, U or Timeliness values for consideration of specific user requirements, e.g. national

² <https://www.wmo-sat.info/oscar/layers>

OC	Average of stated observing cycles of selected observations in the considered box	<p>For each selected observing platform time series, the WDQMS returns a number of observations for which an observing cycle is computed as follows:</p> $OC_i = \frac{\text{Total period}}{\text{Number of observations}}$ <p>We then average all OC_i values of all selected observing platforms</p>
U	Average of the stated uncertainties of selected observations in the considered box	<p>For each selected observing platform time series, the WDQMS returns RMS_i of (Obs-FG).</p> <p>Then average uncertainty is computed as follows:</p> $U = \sqrt{\frac{\sum RMS_i^2}{\text{number of platforms}}}$
Timeliness	Average of the stated timeliness of selected observations in the considered box	<p>For each selected observing platform time series, the WDQMS returns the average Timeliness_i.</p> <p>We then compute the average timeliness of all Timeliness_i values.</p>
Stability	Not computed	Not computed

Table 1: Calculation of capabilities for each of the OSCAR/Requirements criteria

Once criteria values are computed according to the algorithms described in the above table, the results can be presented for the selected Application Area, Vertical Domain, Horizontal Domain, and Criteria (i.e. HR, OC, U or Timeliness) using colour codes as follows:

Value range	Color	Comment
Value > Threshold	White	No impact
Optimum < Value ≤ Threshold	Blue	Significant impact
Goal < Value ≤ Optimum :	Green	Optimal
Value ≤ Goal :	Red	Oversampled
No requirements value	Gray	n/a

Notes:

- 1) Results are displayed for the selected geographic box. Small sub-boxes of the selected box may be considered, whereby the capabilities would be computed for the sub-boxes and displayed on a map accordingly.
- 2) When developing the solution corresponding to the above specifications, priority will be given to assessing observations capabilities on the basis of some selection criteria, i.e. visualizing the observations. Gap analysis has two types of users: PoCs and network managers.



IMPACT OF SURFACE-BASED GNSS OBSERVATIONS ON NWP

The Series of WMO Workshops on the Impact of Various Observing Systems on Numerical Weather Prediction has collected information on the impact of surface-based GNSS observations as follows:

- Final report of 5th impact workshop (2012)
 - The results of recent impact studies provide strong support for exchange of more observations between regions, and between countries within regions: e.g. ground-based GPS data, radar data, hourly surface observations and MODE-S data at airports.
 - UKMO: GPS-ZTD assimilation shows the significant impact on forecasts of surface variables.
 - DWD: The regional impact study show positive impact of radar rain rates in forecasts up to 6 hours and a positive impact of GPS ZTD.
 - ESRL: The results from the Rapid Refresh experiments also show the contribution of ground-based GPS and surface observation.
 - JMA: positive impact from the humidity data over land area such as MHS and ground-based GPS assimilation.
 - KNMI: KNMI also showed the positive impact from GPS ZTD and radar radial winds.
- Final report of 6th impact workshop
 - Studies regarding temporally correlated errors of ground-based GNSS data found negligible correlations beyond 1.5 hours.
 - Several presenters demonstrated that assimilating observations at increased temporal resolution improved short to medium range forecast skill. This was assumed to be at least in part caused by a significant increase in the number of assimilated observations that are synoptic in nature, e.g. satellite radiances, ground-based GPS, wind profiler data.
 - a. Maturing data types; Ground-based GNSS slant total delay, zenith total delay;

and the following are the relating reports from JMA.

- Nakamura et al (2004)
 - Data Assimilation of GPS Precipitable Water Vapor into the JMA Mesoscale Numerical Weather Prediction Model and its Impact on Rainfall Forecasts
 - https://www.jstage.jst.go.jp/article/jmsj/82/1B/82_1B_441/pdf
- Koizumi and Sato (2004)
 - Impact of GPS and TMI Precipitable Water Data on Mesoscale Numerical Weather Prediction Model Forecasts
 - https://www.jstage.jst.go.jp/article/jmsj/82/1B/82_1B_453/pdf
- Seko et al (2010)
 - Improvement of Rainfall Forecast by Assimilations of Ground-Based GPS Data and Radio Occultation Data
 - https://www.jstage.jst.go.jp/article/sola/6/0/6_0_81/article/-char/ja
- Seko et al (2011)
 - Data assimilation experiments of precipitable water vapour using the LETKF system: intense rainfall event over Japan 28 July 2008
 - <http://onlinelibrary.wiley.com/doi/10.1111/j.1600-0870.2010.00508.x/pdf>
- Yoshimoto (2011)
 - The Impacts of GPS Precipitable Water Assimilation in the JMA Global 4D-VAR Data Assimilation System
 - http://www.wcrp-climate.org/WGNE/BlueBook/2011/individual-articles/01_Yoshimoto_Koichi_GPSdata.pdf

ACRONYMS

AA	Application Area
ABOS	Aircraft-Based Observing System
AMDAR	Aircraft Meteorological Data Relay
AntON	Antarctic Observing Network
AOPC	GCOS Atmospheric Observation Panel for Climate
asap	As soon as possible
ASAP	Automated Shipboard Aerological Programme
AWS	Automatic Weather Station
CAeM	Commission for Aeronautical Meteorology
CAGM	Commission for Agricultural Meteorology
CAS	Commission for Atmospheric Sciences
CBS	Commission for Basic Systems
CCI	Commission for Climatology
CD	Capacity Development
CEOS	Committee on Earth Observation Satellites
Cg	Congress
CGMS	Coordination Group for Meteorological Satellites
Chy	Commission for Hydrology
CIMO	Commission for Instruments and Methods of Observation
CM	Climate Monitoring
CMA	China Meteorological Administration
CryoNet	Core network of GCW surface measurement sites/stations
DAOS	Data Assimilation and Observing Systems working group
DPFS	Data Processing and Forecasting System
DRR	Disaster Risk Reduction
E-AMDAR	EIG EUMETNET AMDAR programme
E-ASAP	EIG EUMETNET Automated Shipboard Aerological Programme
EC	Executive Council
ECMWF	European Centre for Medium-Range Weather Forecast
EC-PORS	Executive Council Panel of Experts on Polar Observations, Research and Services
ECV	Essential Climate Variable
EGOS-IP	Implementation Plan for the Evolution of Global Observing Systems
E-GVAP	EIG EUMETNET GNSS water vapour programme
EIG	Economical Interest Group
E-PROFILE	EIG EUMETNET Radar Wind Profilers and Backscatter Lidars programme
E-SURFMAR	EIG EUMETNET Surface Marine observation programme
ET-ABO	OPAG-IOS Expert Team on Aircraft Based Observing Systems
ET-AO	CIMO Expert Team on Aircraft Based Observations
ET-EGOS	Former OPAG-IOS Expert Team on the Evolution of Global Observing Systems
ET-ODRRGOS	Former OPAG-IOS Expert Team on Observational Data Requirements and Redesign of the Global Observing System
ET-OPSL	CBS/CCI Expert Team on Operational Predictions from Sub-Seasonal to Longer-Time Scales
ET-SAT	OPAG-IOS Expert-Team on Satellite Systems
ET-SBO	OPAG-IOS Expert Team on Surface-Based Observing Systems
EUMETNET	EIG Grouping of European Meteorological Services
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
E-WINPROF	EIG EUMETNET Operational Networking of Wind Profilers in Europe
FAO	Food and Agriculture Organization of the United Nations
FSO	Forecast Sensitivity to Observation
GAW	Global Atmosphere Watch
GAWSIS	GAW Station Information System
GCOS	WMO-IOC-UNEP-ICSU Global Climate Observing System
GCOS-IP	GCOS Implementation Plan
GCW	Global Cryosphere Watch

Ref.: 13860/2018_1.1_OBS-WIGOS/OSD
Approved by Fernando Belda Esplugaes, Wed May 23 15:04:38 UTC 2018

GCW-IP	GCW Implementation Plan
GEO	Group on Earth Observations
GEO	Operational geostationary satellites
GFCS	Global Framework for Climate Services
GHGs	Greenhouse gases
GLAS	GEWEX Global Land/Atmosphere System Study
GNSS	Global Navigation Satellite System
GNSSRO	GNSS for Radio Occultation
GNWP	Global NWP
GOOS	IOC-WMO-UNEP-ICSU Global Ocean Observing System
GOS	Global Observing System
GPCs	Global Producing Centres of Long-Range Forecasts
GPS	Global Positioning System
GPSRO	GPS Radio Occultation
GRUAN	GCOS Reference Upper Air Network
GSG	GCW Steering Group
GSICS	Global Space-Based Inter-Calibration System
GSN	GCOS Surface Network
GSNMC	GSN Monitoring Centre
GTN-P	Global Terrestrial Network for Permafrost
GTS	Global Telecommunications System
HR	Horizontal Resolution
HRNWP	High Resolution NWP
IBCS	Intergovernmental Board on Climate Services
ICAO	International Civil Aviation Organization
ICG-WIGOS	Inter-Commission Coordination Group on WIGOS
ICSU	International Council for Science
ICT-IOS	CBS Implementation Coordination Team on Integrated Observing Systems
ICT-SW	WMO Inter-Programme Coordination Team on Space Weather
ID	Identification Number
IGOS	Integrated Global Observing Strategy
IMOP	Instrument and Methods of Observation Programme
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IPET	Inter-Programme Expert Team
IPET-OSDE	OPAG-IOS IPET on the Observing System Design and Evolution
IPET-SUP	OPAG-IOS IPET on Satellite Utilization and Products
IPET-WIFI	OPAG-IOS IPET on WIGOS Framework Implementation Matters
IPT-SWISS	Inter-Programme Team on Space Weather Information, Systems and Services
IPWG	International Precipitation Working Group
ITU	International Telecommunication Union
IWWG	International Winds Working Group
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JMA	Japan Meteorological Agency
KAA	Key Activity Area
KNMI	Royal Netherlands Meteorological Institute
LAM	Limited Area Model
LEO	Operational low-Earth orbit satellites
LT	Lower-Troposphere
MHEWS	Multi-Hazard Early Warning Systems
MoU	Memorandum of Understanding
NASA	National Aeronautics and Space Administration
NCEP	NOAA National Centers for Environmental Prediction
NFP	National Focal Point
NMHSs	National Meteorological and Hydrological Services
NOAA	US National Oceanic and Atmospheric Administration
NVSRF	Nowcasting and Very Short Range Forecasting
NWP	Numerical Weather Prediction

OC	Observing Cycle
OCG	JCOMM Observations Coordination Group
OND	Observing Network Design
OOPC	Ocean Observations Panel for Climate (GCOS/GOOS/WCRP) (also known as GOOS Physics and Climate panel)
OPA	JCOMM Observations Programme Area
OPACE	Open Panel of CCI Experts
OPAG	Open Programme Area Group
OPAG-DPFS	CBS OPAG on DPFS
OPAG-IOS	CBS OPAG on Integrated Observing Systems
OPERA	EIG EUMETNET Operational Programme for the Exchange of Weather Radar Information
OSCAR	Observing System Capability Analysis and Review tool
OSCAR/Requirements	Observational user requirements component of OSCAR
OSCAR/Space	Space-based observing systems capabilities component of OSCAR
OSCAR/Surface	Surface-based observing systems capabilities component of OSCAR
OSDW	IPET-OSDE Observing System Design Workshop
OSE	Observing System Experiment
OSND	Observing system network design
OSSE	Observing System Simulation Experiment
PoC	Point of Contact
QM	Quality Management
R&D	Research and Development
RA	Regional Association
RBCN	Regional Basic Climatological Network
RBON	Regional Basic Observing Network
RBSN	Regional Basic Synoptic Network
R-MAR	OPAG-IOS Rapporteur on Marine Observing Systems
RRR	Rolling Review of Requirements
R-SEIS	OPAG-IOS Co-Rapporteur on Scientific Evaluation of Impact Studies undertaken by NWP centres
RTH	Regional Telecommunication Hub
R-WIP	Regional WIGOS Implementation Plan
SAG	Scientific Advisory Groups
SAON	Sustained Arctic Observing Network
SG-OD	IPET-WIFI Sub-Group on OSCAR Development
SG-RFC	OPAG-IOS Steering Group on Radio-Frequency Coordination
SIAF	Seasonal to Inter-Annual Forecasting
SLWC	Super Cooled Liquid Water Content
SOC	Science Organizing Committee
SoG	Statement of Guidance
TAMDAR	Tropospheric Airborne Meteorological Data Reporting
TAO	Tropical Atmosphere Ocean
TBD	To be defined
TC	Technical Commission
TDCF	Table Driven Code Form
TECO	Technical Conference
TOPC	GCOS Terrestrial Observation Panel for Climate
ToR	Terms of Reference
TPOS	Tropical Pacific Observing System project
TRITON	Triangle Trans-Ocean Buoy Network
TT-ACV	GAW Task Team on Atmospheric Composition Vocabulary
TT-SOGON	CCI Task Team on the Statement of Guidance on Observational Needs
TT-WDP	Task Team on WIGOS Data and Partnerships
U	Uncertainty
UK	United Kingdom of Great Britain and Northern Ireland
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change

UR	User Requirement
USA	United States of America
VCP	Voluntary Cooperation Programme
VOC	Volatile Organic Compound
VoIA	WMO No. 9, Weather Reporting, Volume A, Observing Stations and WMO Catalogue of Radio-sondes
VR	Vertical Resolution
WAM	West African monsoon
WCRP	WMO-IOC-ICSU World Climate Research Programme
WDQMS	WIGOS Data Quality Monitoring System
WG-GRUAN	Working Group on GRUAN
WHOS	WMO Hydrological Observing System
WIGOS	WMO Integrated Global Observing System
WIP	WIGOS Framework Implementation Plan
WIR	WIGOS Information Resource
WIS	WMO Information System
WMO	World Meteorological Organization
WPP	WIGOS Pre-operational Phase
WRF	Weather Research and Forecasting
WWW	World Weather Watch

[page left intentionally blank]