WORLD METEOROLOGICAL ORGANIZATION

INTER-COMMISSION COORDINATION GROUP

ON THE WMO INTEGRATED GLOBAL OBSERVING SYSTEM

***WIGOS Data Quality Monitoring System***

***Workshop for WIGOS Component and Co-sponsored Observing Systems***

Geneva, Switzerland, 26-29 June 2017

**FINAL REPORT**



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**Executive Summary**

The workshop of the WMO Integrated Global Observing System Data Quality Monitoring Ssystem (WDQMS) for the WIGOS component and co-sponsored observing systems, was held at Geneva, Switzerland, from 26 to 29 June 2017. The session was chaired by Mr Stuart Goldstraw (United Kingdom of Great Britain and Northern Ireland), chair of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) Task Team on WIGOS Data Quality Monitoring System (TT-WDQMS). The Workshop was attended by representatives from each of the the following communities: the Global Atmosphere Watch (GAW) Programme, the Global Climate Observing System (GCOS), the WMO Hydrological Observing System (WHOS), the Operations Centre of the Joint Commission for Oceanography and Marine Meteorology (JCOMM-OPS) and the Global Cryosphere Watch (GCW) Programme.

The objectives of the Workshop were to present the WDQMS framework as it stands, to identify the existing monitoring and incident management activities under each WIGOS component and co-sponsored observing systems, and assess how they relate to the generic concept of the WDQMS, to identify what, if any, modification is required to make the WDQMS framework applicable to other observational systems, also to identify the next steps in terms of its potential implementation across all WIGOS systems and finally to agree the next steps to be undertaken during the WIGOS pre-operational phase (2016-2019).

As main outcomes the fact that most of the observing components have their own specific procedures: in the case of GAW networks they are not very well aligned with the current concept of the WDQMS, in the case of GCOS networks and JCOMM-OPS networks they seem to be more aligned, the latter having an operational incident management system in place, and the Hydrological and GCW networks are still developing/improving their procedures. From each of the dedicated discussions with the abovementioned representatives, a set of conclusions and actions were agreed to be taken into account and further discussed by TT-WDQMS.

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**General summary**

1. **GENERAL**
	1. **Opening**
		1. The Workshop of the WIGOS Data Quality Monitoring System (WDQMS) for the “WMO Integrated Global Observing System” (WIGOS) Component and Co-sponsored Observing Systems, was held at Geneva, Switzerland, from 26 to 29 June 2017.
		2. The session was chaired by Mr Stuart Goldstraw (United Kingdom of Great Britain and Northern Ireland), Chair of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) Task Team on WIGOS Data Quality Monitoring System (TT-WDQMS), who opened the session at 09:30 hours on Monday, 26 June 2017. He welcomed the participants to Geneva, Switzerland and mentioned that this would be a four days Workshop for five component and co-sponsored observing components, to discuss with representatives from the following communities: The observing component of the Global Atmosphere Watch (GAW), the Global Climate Observing System (GCOS), the WMO Hydrological Observing Systems (WHOS), the Operations Centre of the Joint Commission for Oceanography and Marine Meteorology (JCOMM-OPS) and the observing component of the Global Cryosphere Watch (GCW).
		3. Mr Lars Peter Riishojgaard, WIGOS Project Manager, WMO Secretariat, also welcomed the participants, on behalf of WMO Secretary-General and on behalf of the Director of the Observing and Information Systems Department. He mentioned that the WDQMS is one of the five priorities of Pre-operational Phase of WIGOS and that the current WDQMS project started with the Global Observing System (GOS) components but WDQMS is looking for a common access point to the monitoring results for all WIGOS component and co-sponsored observing components. He also mentioned that an Incident Management System (IMS) has been missing in the current WMO monitoring systems.
	2. **Objectives of the Workshop**
		1. The following objectives had been proposed for this Worksop:
		* To present the WDQMS framework as it stands:
			+ in detail as implemented in the GOS pilot and demonstration projects,
			+ in generic terms that could be applied to other observing systems;
		* To identify the existing monitoring and incident management activities under each WIGOS component and co-sponsored observing systems, and assess how they relate to the generic concept of the WDQMS;
		* To identify what, if any, modification is required to make the generic WDQMS framework applicable to other WIGOS observational systems;
		* To identify the next steps in terms of potential implementation of the WDQMS framework across all WIGOS component and co-sponsored observing systems;
		* To agree the next steps to be undertaken during the WIGOS 2016 to 2019 pre-operational phase period.
		1. The conclusions from this Workshop will be further discussed by the TT-WDQMS before submission to ICG-WIGOS for endorsement.
	3. **The current concept and the current status of the WDQMS projects and actions**
		1. Presentations were delivered to each of the representatives of the various component and co-sponsored systems on the current concept of the WDQMS (by the Chair TT-WDQMS) and on the current status of the WDQMS projects and actions (by the Secretariat).
		2. The pilot project with Global Numerical Weather Prediction (NWP) Centres has shown that different monitoring results may be found from different NWP centres. If two different NWP centres see different data, then an assessment of the Global Telecommunications System (GTS) should be done before sending an incident ticket to the data provider; On the other hand, the differences may be due to different procedures at each NWP Centre, particularly in their data assimilation systems, but could also be due to special agreements, e.g. bilateral data sharing.
		3. The developments achieved so far by the WDQMS are not enough to cover the whole WIGOS, so there is a need to discuss before expanding the current concept to other component and co-sponsored observing systems; The Workshop should learn from the representatives of the various component and co-sponsored systems what activities and procedures are there already. What we are trying to do is to apply the WDQMS framework to all WIGOS observing components
		4. The incident tickets need to be sent to the specific/thematic points of contact, e.g. aircraft, marine, etc. The IMS needs to have responses adjusted to the current situation in each country, e.g. if a country is suffering a humanitarian crisis this situation has to be taken into account before issuing any tickets to that country.
		5. The current prototype of a web-based IMS with the “subscriptions” functionality allows all involved parties to receive automatic notifications each time there is something new/changed, e.g. an incident ticket being edited.
		6. The WDQMS procedures, particularly the IMS procedures, should be part of higher-level Quality Management Systems (QMF), e.g. to deal with poor data quality, coming from observing stations.
	4. The list of participants in this Workshop is given in [Appendix I](#Appendix_I).
2. **MAJOR CONCLUSIONS AND ACTIONS RELATED TO OBSERVING COMPONENT OF THE GLOBAL ATMOSPHERE WATCH PROGRAMME (GAW)**
	1. **The following conclusions/highlights were drawn from the discussions on the GAW:**
		1. The GAW has a Quality Monitoring (QM) framework and a series of data centres; There are different application areas, each of them has different data quality and monitoring requirements.
		2. The scope of the quality monitoring for GAW is much broader than NWP. There are no automatic procedures/checking, there is always someone analysing the data and sending notifications to the data producers. The existing 6 GAW World Data Centres (WDCs) receive observational data from the data submitters and check the consistency of the submission. They do not send it anywhere else. If the data looks OK, it is made available to the public.
		3. Most of the WMO PRs are Directors of the NMHSs, which is an issue for GAW activities, because they are not involved and don’t see themselves as representatives of other research, academic organizations that are involved, e.g. in the GAW measurements.
		4. A major issue to maintain/resume the GAW stations operations is the need for funding, which in many cases means external/international funding.
		5. The GAW regional calibration centres play a technical role in ensuring quality of the observations, but data collection is done globally by the World Data Centres.
		6. The WDQMS functions should be flexible in terms of where they take place, e.g. monitoring and evaluation can run together in the same centre.
		7. It is suggested that approval of a new Regional WIGOS Centre (RWC) should take into account whether/how the organization(s) proposing to establish a RWC, make use of the data they propose to monitor.
		8. The monitoring of data availability could have a more integrated WIGOS approach, as compared to the monitoring of data quality which should be delegated to the communities.
	2. **The following actions were agreed with the GAW representatives:**
		1. The GAW collection of Measurement Guidelines (for each parameter) to be made available to TT-WDQMS for analysis. The GAW Quality Assurance Principles are available from the [GAW Implementation Plan for 2016-2023](https://library.wmo.int/opac/doc_num.php?explnum_id=3395).
		2. The GAWSIS-OSCAR/Surface managers to consider restoring the broken automatic link with the GAW data centres regarding the inclusion of real operating status in its database.
		3. The GAW community to confirm ozone as a test case variable for integrating monitoring results into the WDQMS webtool and/or identify other variables for this purpose.
3. **MAJOR CONCLUSIONS AND ACTIONS RELATED TO CO-SPONSORED GLOBAL CLIMATE OBSERVING SYSTEM (GCOS)**
	1. **The following conclusions/highlights were drawn from the discussions on GCOS:**
		1. As GCOS Surface Network Monitoring Centre (GSNMC) the NMHSs of Germany (DWD) and Japan (JMA) monitor the GCOS Surface Network (GSN) stations and publishes the results for stations reporting in TAC format (FM71-CLIMAT). DWD also monitors the Regional Basic Climatological Network (RBCN) stations without making the results yet available and works on the extention of the monitoring activities to include CLIMAT reports in BUFR format. There are 9 CBS lead centres for GCOS who follow-up on the performance of GSN stations in various regions/sub-regions. There are 10 GCOS data centres, which have different levels of governance.
		2. It was agreed that WDQMS is intended to monitor “what” exists, it is not intended to build networks nor to fix all the problems.
		3. In terms of implementation of various networks into WDQMS, the GSN and GUAN stations would have a higher priority for solving issues, as compared to the larger network.
		4. The GCOS centres essentially take care of GSN, but there are also contacts for GUAN; Usually, the global centres contact the Members directly, there will be no added value in going through the regional centres, except when assistance is needed with respect to language.
		5. The WDQMS monitoring centres should be independent; In the future the WDQMS may provide trends of the evolution of the observing systems.
		6. For the affiliation of GUAN stations in OSCAR/Surface the procedure to be followed, could be similar to the existing one for GAW stations. Currently, there is no global operational responsibility for OSCAR.
		7. The inclusion of the Global Terrestrial Observing Networks (GTN which is related to the Terrestrial Observations Panel for Climate) in WDQMS is more likely to happen at a later stage.
		8. The IMS procedure (cycle) should be a standard for all WIGOS observing components.
	2. **The following open issues have been identified:**
		1. How and who will monitor the WDQMS monitoring centres?
		2. To include the snow depth from the Synop reports in the monitoring files?
		3. Are there other institutions that could help to solve the issues?
		4. Which WIGOS component observing systems should be covered by a RWC?
	3. **The following actions were agreed with the GCOS representatives:**
		1. The TT-WDQMS to go through the Terms of Reference (ToRs) of the Commission for Basic Systems (CBS) lead centres for GCOS.
		2. The Guidance document on WDQMS for Regional WIGOS Centres (RWCs) (by Tanja Kleinert) to be circulated.
		3. The GSN monitoring centre (Christiana Lefebvre) to work with EUMETNET (Tanja Kleinert) towards the monitoring of CLIMAT reports.
4. **MAJOR CONCLUSIONS AND ACTIONS RELATED TO WMO HYDROLOGICAL OBSERVING SYSTEM (WHOS)**
	1. **The following conclusions/highlights were drawn from the discussions on WHOS:**
		1. The IMS should be smart enough to cluster large number of issues into a few incidents.
		2. There is no global systematic exchange of hydrological data. The Hydrological Global Centres rely on a voluntary basis to share their data.
		3. Requirements to store hydrological capabilities (metadata) in OSCAR/Surface are needed.
		4. WDQMS is meant to identify issues that were not identified at national level
		5. The inclusion of hydrological information into WDQMS should start small and simple, with the most relevant variables - “Discharge” and “stage” are the two major hydrological variables.
		6. The WDQMS could be implemented at basin level, where agreements exist, e.g. South American (SAS) and African projects could be used as a WDQMS regional pilots for hydrology, as part of WHOS-2.
		7. In principle the publishing of the monitoring results should follow the sharing principles of the data itself (Res. 40 and 25).
	2. **The following actions were agreed with the WHOS representatives:**
		1. To review the OSCAR/Surface to check if it captures the needs for hydrology. An ICG-WIGOS Task Team on OSCAR Development will start next year, which should have representative from hydrology – Mr Silvano Pecora (Italy) is the contact.
		2. To define what a WIGOS Global centre should do in the WDQMS context.
		3. To analyse the ToRs of the three Hydrological Global Centres
5. **MAJOR CONCLUSIONS AND ACTIONS RELATED TO THE JOINT COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY OPERATIONS CENTRE (JCOMM-OPS)**
	1. **The following conclusions/highlights were drawn from the discussions on JCOMM-OPS:**
		1. JCOMMOPS issues incident tickets and they would benefit if being under a WDQMS context; Also an additional level of monitoring could be beneficial.
		2. There is an issue of “bad data” being exchanged, when there is no action from the national contact. There are around 30 countries involved.
		3. JCOMM Data Centres are responsible for collecting and ensuring data quality; The WDQMS should focus on "information quality" instead of "data quality".
		4. Some of the JCOMM networks are regional focused.
		5. JCOMMOPS has a IMS which can provide results to the WDQMS; It runs three operational levels of incident tickets, a first one in near-real time for instruments, a second one also in near-real time for platforms, and a third one in non-real time for the trends of networks - the first two levels (on a daily basis) are the most relevant ones for WDQMS - and they are critically dependent on the “Machine-to-Machine” link to OSCAR/Surface.
		6. There is a need of a protocol for the exchange of monitoring results from JCOMMOPs; The metadata related to the status of a station/platform may be adjusted to conform with WDQMS.
		7. JCOMMOPS procedures include the following functionalities: a procedure for data users to provide feedback; Network planning tools, including metadata for performance monitoring; Monitoring results presented in online geographic maps – these could be exported to the "WIGOS" servers, using the floats network as a first example.
		8. JCOMMOPS lacks funding for hiring an expert to work with the regional observing systems, which means shallow waters, coastal, etc.
		9. JCOMMOPS is expected to be allowed to allocate the WIGOS IDs - JCOMM V Session.
		10. Meteo-France runs near real time monitoring on a daily basis and also a delayed mode monitoring with monthly statistics and trends; Automatically blacklists stations (buoys and VOS). In the end all the monitoring results are available on the JCOMMOPS server.
	2. **The following actions were agreed with the JCOMMOPS representatives:**
		1. JCOMMOPS to prepare a short description of their QM and IMS related procedures.
		2. TT-WMD to check if/how the incidents from the JCOMMOPS can be captured.
		3. TT-WDQMS to define how an incident should be communicated
		4. TT-WDQMS to review the data files produced by JCOMMOPS and to mapped them against the pilot project files from NWP centres.
		5. To ensure consistency between the NWP variables list with the OSCAR/WMDS list, including consistency of language/ontology, based on a standard, e.g. “blacklist”, “basin”.
		6. TT-WDQMS to discuss the monitoring of the data volume, i.e. from a whole network
		7. To re-think the membership of TT-WDQMS to have JCOMM represented
		8. To involve Antonine? in the WIGOS Metadata Standard (WMDS)/OSCAR-Surface initiatives, particularly in the code tables.
6. **MAJOR CONCLUSIONS AND ACTIONS RELATED TO THE GLOBAL CRYOSPHERE WATCH (GCW)**
	1. **The following conclusions/highlights were drawn from the discussions on GCW:**
		1. Polar and High Mountain Regions are the priority focus for GCW; GCW intersects with many other Programmes, such as GAW, Hydrology, JCOMM.
		2. GCW includes observations from both space-based and surface-based observing systems. The Cryonet is the surface-based operational component, which is being developed by a Working-Group on Observations, who is also in charge of developing the best practices. From the Cryonet stations there is an expectation to receive data according to some requirements.
		3. In most cases the ownership of national contributions to GCW activities is by a research organization or other type of institution, non-NMHS.
		4. A central piece is the GCW Data Portal, which is a WMO Information System (WIS) "node" and collects all data through a range of timeliness from real time to several months, however this data portal is not a data archive. For correcting data sets after an incident has been solved, e.g. after a calibration procedure, the availability of metadata via OSCAR/Surface is critical. One of the requirements is that all metadata for OSCAR/Surface should go through the GCW data portal. The Cryonet stations not complying with all requirements are called "Contributing stations".
		5. The priorities for the IMS are dependent on the WMO/co-sponsored Programme/System.
	2. **The following actions were agreed with the GCW representatives:**
		1. TT-WDQMS to review the current document that describes the GCW concept and activities.
		2. TT-WDQMS to consider the exchange of quality information together with the data.
		3. TT-WDQMS to check the (evolving) guidance document for Cryonet (still a draft).
		4. TT-WMD to consider reviewing the latest discussion on the grouping of stations.
		5. Cryonet to join the test effort of the WIGOS Metadata XML schema – Secretariat to add Joel Fiddes and Øystein Godøy to the list of interested parties.
		6. TT-WDQMS to consider the sensitiveness of incident tickets to be sent to data providers if they are not NMHS – there should be no problem with stations that send data through the NMHSs.
		7. Common action – all to discuss how to collect snow depth data that could be used as a test variable for the WDQMS "global display" webtool.
		8. TT-WDQMS to discuss if the monitoring should be by variable or by station.

1. **GENERAL ACTION:**
	1. Describe in the next edition of the WIGOS Newsletter what the WDQMS means for each of the five communities represented in the Workshop.
2. **CLOSURE OF THE SESSION**
	1. Mr Goldstraw thanked the participants and the Secretariat and closed the session at 5:00 pm on Thursday 29 June 2017.

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**Appendix I**

**LIST OF PARTICIPANTS**

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**Appendix II**

**WIGOS Data Quality Monitoring System (WDQMS)**

**Workshop for WIGOS Component and Co-sponsored Observing Systems**

“Integration Workshop”: 26-29 June 2017, Geneva, Switzerland

PROVISIONAL PROGRAMME (draft version 1.1, 26 June)

[Meeting room = “7 Jura”]

Monday 26 May

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| 09:30 – 09:40 | Opening remarks | WMO Secretariat |
| 09:40 – 09:50 | Objectives and organization of the Workshop  | Chair TT-WDQMS |
| 09:50 – 10:20 | The current concept of the WDQMS | Chair TT-WDQMS |
| 10:20 – 10:40 | The current status of the WDQMS projects and actions | Luis Nunes |
| 10:40 – 11:00 | *Coffee/Tea Break* |
| 11:00 – 12:30 | Discussion on how to apply/adjust the WDQMS concept to GAW | All |
| 12:30 – 14:00 | *Lunch Break* |
| 14:00 – 15:30 | Discussion on how to apply/adjust the WDQMS concept to GAW (Cont.) | All |
| 15:30 – 15:50 | *Coffee/Tea Break* |
| 15:50 – 17:00 | Summary of results and actions with GAW | Chair TT-WDQMS & Secretariat |

Tuesday 27 May

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| 09:00 – 09:10 | Objectives and organization of the Workshop | Chair TT-WDQMS |
| 09:10 – 09:40 | The current concept of the WDQMS | Chair TT-WDQMS |
| 09:40 – 10:00 | The current status of the WDQMS projects and actions | Luis Nunes |
| 10:00 – 10:40 | Discussion on how to apply/adjust the WDQMS concept to GCOS | All |
| 10:40 – 11:00 | *Coffee/Tea Break* |
| 11:00 – 12:30 | Discussion on how to apply/adjust the WDQMS concept to GCOS (Cont.) | All |
| 12:30 – 14:00 | *Lunch Break* |
| 14:00 – 14:40 | Discussion on how to apply/adjust the WDQMS concept to GCOS (Cont.) | All |
| 14:40 – 15:45 | Summary of results and actions with GCOS | Chair TT-WDQMS & Secretariat |
| 15:45 – 16:00 | *Coffee/Tea Break* |
| 16:00 – 17:00 | Initial discussion with Hydrology representatives (TBC)(Objectives and organization of the Workshop;The current concept status of the WDQMS projects and actions) | Chair TT-WDQMS & Secretariat |

Wednesday 28 June

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| 09:00 – 10:30 | Discussion on how to apply/adjust the WDQMS concept to WHOS | All |
| 10:30 – 10:45 | *Coffee/Tea Break* |
| 10:45 – 12:00 | Discussion on how to apply/adjust the WDQMS concept to WHOS (Cont.) | All |
| 12:00 – 13:00 | Summary of results and actions with WHOS | Chair TT-WDQMS & Secretariat |
| 13:00 – 14:20 | *Lunch Break* |
| 14:20 – 14:30 | Objectives and organization of the Workshop | Chair TT-WDQMS |
| 14:30 – 15:00 | The current concept of the WDQMS | Chair TT-WDQMS |
| 15:00 – 15:20 | The current status of the WDQMS projects and actions | Luis Nunes |
| 15:20 – 15:50 | Discussion on how to apply/adjust the WDQMS concept to JCOMM | All |
| 15:50 – 16:10 | *Coffee/Tea Break* |
| 16:10 – 17:00 | Discussion on how to apply/adjust the WDQMS concept to JCOMM (Cont) | All |

Thursday 29 June

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| 09:00 – 10:40 | Discussion on how to apply/adjust the WDQMS concept to JCOMM (Cont) | All |
| 10:40 – 11:00 | *Coffee/Tea Break* |
| 11:00 – 12:00 | Summary of results and actions with JCOMM | Chair TT-WDQMS & Secretariat |
| 12:00 – 13:00 | *Lunch Break* |
| 13:00 – 13:10 | Objectives and organization of the Workshop | Chair TT-WDQMS |
| 13:10 – 13:30 | The current concept of the WDQMS | Chair TT-WDQMS |
| 13:30 – 13:45 | The current status of the WDQMS projects and actions | Luis Nunes |
| 13:45 – 15:15 | Discussion on how to apply/adjust the WDQMS concept to GCW | All |
| 15:15 – 15:30 | *Coffee/Tea Break* |
| 15:30 – 16:45 | Discussion on how to apply/adjust the WDQMS concept to GCW (Cont) | All |
| 16:45 – 17:30 | Summary of results and actions with GCW | Chair TT-WDQMS & Secretariat |