# SUMMARY REPORT

## JMA/WMO Workshop on Quality Management of Surface Observations – RA II WIGOS Project

Japan Meteorological Agency, Tokyo, Japan
19 – 23 March 2018

## 1 Introduction

1.1 The *JMA/WMO Workshop on Quality Management of Surface Observations – RA II WIGOS Project* was held at the Japan Meteorological Agency (JMA) headquarters in Tokyo, Japan, from 19 to 23 March 2018.

1.2 The workshop was a major activity of the Regional WIGOS Project titled *Enhance the Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations* as approved at the 16th session of Regional Association II (RA II) (Abu Dhabi, UAE, February 2017), and was planned in response to the Questionnaire on Quality Management for Surface Meteorological Observations in RA II conducted in April 2016 under the previous Regional WIGOS Project.

1.3 In line with the aims of the regional WIGOS project, the workshop's objectives were to:

a) facilitate WIGOS implementation in RA II and improvement of data quality at RBCN/RBSN (to be developed into RBON) stations under the WDQMS (WIGOS Data Quality Monitoring System) framework;

b) improve data quality in surface observation in RA II via research into and sharing of best practices regarding QA/QC procedures in relation to rainfall and other matters; and

c) enhance in-situ checking and calibration of instruments at observation stations as well as instrument maintenance management and field environments in RA II.

1.4 Koichiro Kakihara (International Strategy Officer for Meteorological Observations in JMA's Observation Department) served as moderator.

1.5 The workshop agenda is provided in Annex I of this report.

1.6 Documents and information on the workshop are available at https://www.jma.go.jp/jma/en/Activities/qmws_2018/qmws_2018.html

## 2. Attendance

2.1 The workshop was attended by 28 experts from 10 NHMSs in WMO RA II (Bangladesh, Cambodia, Lao People's Democratic Republic, the Maldives, Myanmar, Pakistan, Sri Lanka, Thailand, the United Arab Emirates and Viet Nam), RIC Beijing (China), RIC Manila (the Philippines), the WMO/CIMO Lead Centre on Precipitation Intensity (University of Genoa, Italy), the World Meteorological Organization (WMO) and the Japan Meteorological Agency (JMA).

2.2 A list of attendees is provided in Annex II of this report.

## 3. Workshop Opening

3.1 The workshop was opened by Naoyuki Hasegawa (Director-General of JMA's Observation Department), who welcomed the attendees to Tokyo and highlighted the dependence of meteorological services on the international/inter-organizational exchange of observation data (including quality information) and the role to be played by improvement of quality management in enhancing such services worldwide. Mr. Hasegawa also encouraged those present to closely and cordially interact for the success of the workshop.

3.2 Dr. Lars Peter Riishojgaard, WIGOS Project Manager in the WMO Secretariat welcomed the participants to the Workshop on behalf of Professor Taalas, Secretary General of WMO and Dr. Belda, Director of the Observing and Information Systems Department.
He reminded the participants of the importance of making observations, international exchange of observations and quality management of observations and expressed his hope that the Workshop could help Region II make progress in all three areas.

Dr. Riishojgaard closed his remarks by expressing his sincere appreciation to JMA for taking the initiative to hosting this Workshop in support of one of WMO's strategic priorities and for taking it upon themselves to handle all the logistics and the vast majority of the funding of the event.

## 4. Session 1: WMO Integrated Global Observing System (WIGOS)

4.1 Dr. Riishojgaard gave a keynote presentation containing an overall introduction to WIGOS and its current status, with the main focus on the two of the main technical tools developed to help the WMO Members manage their observing systems under WIGOS.

The first, OSCAR/Surface, is the new online WMO station catalog that has replaced WMO Publication 9, Volume A, but with much more information about many more observing stations and advanced search and filtering procedures in place. This is a very valuable resource and it will provide instantaneous overviews of everything that WIGOS or any of its sub-components includes in terms of observing stations and platforms.

The second, the WIGOS Data Quality Monitoring System (WDQMS) is the tool that allows WMO and its Members to measure how well WIGOS is working both in terms of data delivery and data quality. This tool is still under development, but WMO is already able to show the status of the delivery of surface pressure and upper air (radiosonde) observations to four NWP centers around the globe in near-real time, updated every six hours. This is a very powerful tool that will allow WMO to better monitor the compliance of its Members with WIGOS regulatory material and help Members further improve their observing systems.

Finally, Dr. Riishojgaard introduced the concept of Regional WIGOS Centers as an important regional structure to help support Members in their implementation of WIGOS. He noted that this was very well aligned with one of the two main themes of the Workshop, namely Regional WIGOS Project number IV from the Region II WIGOS Implementation Plan: "Enhance the Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations", of which Japan is one of the two coordinators. He closed his presentation by expressing the hope that progress would be made during the Workshop toward implementing an RWC for at least part of RA-II with strong involvement of JMA.

4.2 Dr. Isabelle Ruedi, Head, Instruments and Methods of Observation

Unit, WMO, also delivered a keynote address on CIMO in support of fit-for-purpose measurements. She recalled the mission of the WMO Commission for Instruments and Methods of Observation (CIMO), its main activities and how they are evolving. She presented the concept of traceability and its importance for data quality. She then presented a number of recent CIMO activities that have a strong link with the quality of surface measurements.

These included the traceability strategy that acknowledges different paths to ensure the traceability of measurements, the siting classification, the sustained performance classification. She informed that competencies for the staff in the area of observations and instrumentation had been developed. Neutral tender specifications for the procurement of AWSs are being developed in collaboration with HMEI and that a preliminary version can be made available.

The role of Regional Instrument Centers in supporting WMO Members was explained, and available resources developed for the strengthening of RICs and other NMHS calibration laboratories were mentioned. Finally, she presented a list of resources available on-line for the capacity development of technical staff.

4.3 Yukinari Ota (Senior Scientific Officer in JMA's Forecast Department) highlighted JMA's responsibility for monitoring the quality of land-surface observations in RA II in its role as a CBS Lead Centre and publishing the results online every six months. Mr. Ota detailed the actions of some Members to remedy surface observation issues in response to such reporting, but pointed out that it usually takes at least three months to produce reports and even longer for Members to take related action.

Mr. Ota also spoke about the WIGOS Data Quality Monitoring System (WDMQS), which is intended to support near-real-time monitoring and incident management for all WIGOS components. The system includes monitoring, evaluation and incident management as its basic functional components, and JMA is involved in the NWP Quality Monitoring Pilot Project on WDQMS with ECMWF, NCEP and DWD. Mr. Ota showed an interesting data availability map for WDMQS monitoring.

4.4 Yoshiaki Hirano (Senior Coordinator for Observation Planning in JMA's Observation Department) gave an overview of the Regional WIGOS Project in RA II and highlighted the aims of the workshop in his capacity as coordinator of the WIGOS project on Enhancing Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations in RA II. Mr. Hirano explained the

three-pronged approach taken by the coordinating group to implement activities relating to the project (i.e., surveying, workshopping and reporting) and covered the achievements of the project so far. He emphasized hopes that the workshop − the third round of the project − would help to enhance the integrity and management of data quality in the region.

4.5 On behalf of the WIGOS project coordinator, JMA's Seiichiro Kigawa, Toshihiro Hayashi and Keiko Makiyama reported on the outcomes of the 2016 Questionnaire on Quality Management of Surface Meteorological Observations in RA II. The results indicated that many NMHSs faced difficulty both in quality checking of observation data and in environment checking for precipitation observation. It was also found that NMHSs needed to encourage the application of precipitation observation data in Disaster Risk Reduction (DRR) and other areas. Mr. Kigawa also gave an overview of practical WIGOS implementation in Japan to help attending Members accelerate its adoption nationwide.

4.6 Reports from ten countries (Bangladesh, Cambodia, Lao PDR, the Maldives, Myanmar, Pakistan, Sri Lanka, Thailand, the United Arab Emirates and Viet Nam) were presented in poster form with focus on current status and challenges in the area of rainfall observation and related quality management, as well as expectations for the workshop. The poster session generated active discussions among presenters and attendees.

4.7 Following the country reports, a summary of the poster session was shared with all attendees and the aims of the workshop were reinforced.

## 5. Session 2: Regional Instrument Centre

5.1 Session 2 was held at the Regional Instrument Centre (RIC) Tsukuba in Japan's Ibaraki Prefecture.

5.2 Xuejing Nan gave a presentation on the Meteorological Observation Center of the China Meteorological Administration (CMA), with information on the meteorological observation system, surface observation stations and instruments in operational use. Ms. Nan also reported on the services of RIC Beijing, including information on reference equipment, calibration capabilities, the traceability system

and training activities/calibration services for members.

5.3 Ferdinand Barcenas of RIC Manila gave a presentation on the Philippine Atmospheric, Geophysical and Astronomical Services (PAGASA) organization, with information on the meteorological observation system, surface observation stations and instruments in operational use. Mr. Barcenas also reported on the services of RIC Manila, including information on calibration equipment, the traceability system and the center's activities.
Mr. Barcenas also noted the planned establishment of Local Instrument Centres at the Mindanao, Visayas and Northern Luzon PAGASA Regional Services Divisions in the Philippines where Manila will be the Main Instrument Centre which is the RIC Philippines to enable it to deliver more quality service.

5.4 Kouichi Nakashima of RIC Tsukuba gave a presentation on JMA's Meteorological Instrument Center. He also reported on the services of RIC Tsukuba, with information on calibration equipment, training activities/calibration services for members and future plans. Mr. Nakashima emphasized the successful implementation of the RIC-Tsukuba Package (a set of cooperative activities incorporated into Japan International Cooperation Agency (JICA) technical projects) at some NMHSs.

5.5 Satoshi Hagiya (Assistant Scientific Officer at JMA's Meteorological Instrument Center) gave a presentation on the practical use of standard meteorological instruments in domestic meteorological observation networks. His delivery covered the traceability of meteorological instruments in Japan and maintenance of instruments in domestic meteorological observation networks using portable standard equipment.

5.6 Workshop attendees visited RIC Tsukuba facilities, viewing JMA standard instruments, calibration equipment and a test field. Those present asked a variety of questions and learned about JMA's traceability and calibration methods.

## 6. Session 3: Quality Management in Surface Observations

6.1 Yasushi Izumikawa (JMA) gave a presentation on quality management in rainfall observation, highlighting the system and procedure for quality management in rainfall observation at JMA and effective tools for HQC (human quality

control). Attendees then discussed ways to improve quality control in rainfall observations using both AQC (automatic quality control) and HQC. Mr. Izumikawa also covered and demonstrated double mass analysis as an HQC approach.

6.2 During the morning break on the fourth day (22 March 2018), an ad-hoc poster session was held. Kigawa et al. (JMA) presented a practical case of WIGOS implementation and its application to Disaster Risk Reduction (DRR) in Japan.

6.3 Prof. Luca Giovanni Lanza and Dr. Mattia Stagnaro (WMO/CIMO Lead Centre on Precipitation Intensity), with the support of Dr. Arianna Cauteruccio (University of Genova), gave a lecture on the accuracy, calibration and quality management of precipitation gauges. In the lecture, the instrumental and environmental errors, dynamic calibration, bias correction, sampling errors and the wind-induced undercatch of precipitation gauges were presented, as well as the consequences of inaccurate measurements on flood management. The use of a portable calibration device was described, which enhanced a clear understanding of rain gauge verification as fieldwork. Furthermore, their interactive lecture on the accuracy and traceability of precipitation measurements provided many hints for discussions in Session 4.

## 7. Session 4: Workshop Conclusion

7.1 Attendees discussed responses to challenges in rainfall observation in individual countries and future activities/actions for improvement of quality management in RA II observation data. The following matters were discussed in four groups:

a) Future visions for surface observation networks
b) Short- and long-term goals in observation data quality
c) Improvement of on-site quality management, control and checking activities, including instrument calibration and maintenance
d) Approaches to staff training

7.2 In response to the results of the above consideration, all attendees discussed solutions proposed by each group.

7.3 As a summary of the discussions, the Tokyo Action Plan 2018

(TAP2018) was formulated (see Annex III).

7.4 On behalf of the WIGOS project coordinator, Koichiro Kakihara summarized the workshop. Attendees:

a) learned about the significance and perspective of WIGOS and the framework for support of related implementation in individual countries;

b) shared information on challenges regarding their own issues with quality management of observation data;

c) understood the importance of ensuring the traceability of instruments in the observation networks of individual countries and were encouraged to utilize RIC services;

d) learned about concepts and practical methods for quality management of rainfall observation data; and

e) discussed plans for improvement of meteorological observation in individual countries and in the region as a whole.

## 8. Workshop Wrap-up

8.1 Yoshiaki Hirano of JMA and Dr. Lars Peter Riishojgaard of WMO provided closing remarks, and the successful workshop was wrapped up at 2:45 p.m. on Friday 23 March 2018.

—END—

ANNEX I

JMA/WMO Workshop on Quality Management of Surface Observations
– RA II WIGOS Project

AGENDA

Opening

Session 1: WMO Integrated Observing System (WIGOS)

1.1) *Keynote addresses:* (1) The WMO Integrated Global Observing Systems; Current Status and Planned Regional Activities, (2) CIMO in support of fit-for-purpose measurement

1.2) Quality monitoring of observation data in NWP Centre and overview of the WDQMS

1.3) Regional WIGOS Project in RA II

1.4) Review of the results of the questionnaire on Quality Management of Surface Meteorological Observations in RA II

1.5) *Poster session*: Country report from participating Members: Status of quality management in rainfall observation

Session 2: Regional Instrument Centre (RIC)

2.1) Introduction of RICs (RICs Tsukuba, Beijing and Manila)

2.2) Practical use of standard meteorological instruments in domestic meteorological observation networks

2.3) Site visit to RIC Tsukuba

Session 3: Quality management of surface observations

3.1) Quality management in rainfall observation

3.2) Accuracy of precipitation measurements, instrument calibration and techniques for data correction and interpretation

Session 4: Conclusion of the workshop

4.1) Discussion on future activities/actions for improvement of quality management of observation data in RA II

4.2) Outcome from the workshop

4.3) Adoption of a draft summary

Closure

# ANNEX I I

## LIST OF PARTICIPANTS

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ANNEX III

Tokyo Action Plan 2018 *(proposal)*

*As presented by attendees at the JMA/WMO Workshop on Quality Management of Surface Observations − RA II WIGOS Project*
*Japan Meteorological Agency, Tokyo, Japan, 19 − 23 March 2018*

THE REGIONAL WIGOS PROJECT "ENHANCE THE AVAILABILITY AND QUALITY MANAGEMENT SUPPORT FOR NMHSS IN SURFACE, CLIMATE AND UPPER-AIR OBSERVATIONS",

Noting:

(1) the WMO Integrated Global Observing System (WIGOS) is a framework for WMO observing systems providing assistance in improving the integrated operations of Member countries and in building productive partnerships that will help to improve weather, climate, water and relevant environmental services;

(2) the Regional WIGOS Project titled *Enhancing Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations* was approved at the 16th session of Regional Association II (RA II) (Abu Dhabi, UAE, February 2017); and

(3) the aims of the Project are to improve data quality at RBCN/RBSN (RBON) stations and enhance the services of RICs in RA II;

Noting further:

(1) the Questionnaire on Quality Management for Surface Meteorological Observations in Regional Association II (Asia) issued in April 2016 as an activity of the Project generated responses from 20 NMHSs among RA II Members;

(2) based on the results of the questionnaire, the *JMA/WMO Workshop on Quality Management of Surface Observations − RA II WIGOS Project* was held at the Japan Meteorological Agency (JMA) headquarters in Tokyo, Japan, from 19 to 23 March 2018; and

(3) the workshop's objectives were to:

i) facilitate WIGOS implementation in RA II and improvement of data

quality at RBCN/RBSN (to be developed into RBON) stations under the WDQMS (WIGOS Data Quality Monitoring System) framework;

ii) improve data quality in surface observation in RA II via research into and sharing of best practices regarding QA/QC procedures in relation to rainfall and other matters; and

iii) enhance in-situ checking and calibration of instruments at observation stations, as well as instrument maintenance management and field environments in RA II;

Recognizing:

(1) this region (Asia) is disaster-prone, and Disaster Risk Reduction (DRR) here is a common challenge;

(2) natural disaster conditions caused by heavy rain, such as flooding and landslides, have a particularly significant impact on society in the region; and

(3) an effective way of mitigating risks associated with such disaster conditions involves widespread and precise monitoring of rainfall in real time using appropriately calibrated instruments and applying well-conducted quality control; the use of rainfall observation data subjected to stringent quality checking in DRR is also effective;

Recognizing further via the workshop:

(1) many observation stations in the region face difficulties in both quality checking of observation data and environment checking; and

(2) NMHSs in the region recognize a lack of skilled staff for quality control of meteorological observation data;

Summarizes solutions to challenges in the region as discussed at the workshop in the form of the Tokyo Action Plan provided in Appendix A,

Proposes the following needs:

(1) for enhancement of surface observation networks:

(a) to guarantee the traceability of measurements to international standards within individual NMHSs and to have Members utilize the services of Regional Instrument Centres (RICs) to address this issue;

(b) to use meteorological observation data both from NMHS and from other organizations in DRR-related services/activities;

(2) for improvement of observation data quality:

(a) to facilitate human resource development for quality control in meteorological observation and provide quantitative quality information to other NMHSs and related organizations;

(b) to utilize remote-sensing meteorological observation data, such as information from weather radars and meteorological satellites, in DRR-related services/activities as a supplement to surface observation data;

(3) for improvement of on-site maintenance:

(a) to deploy standard instruments for meteorological observations and facilitate inter-comparison of standard instruments with Regional Instrument Centres (RICs);

(b) to make use of traveling standard instruments for the maintenance of meteorological observation networks; and

(4) for capacity building in QC techniques and maintenance:

(a) to translate technical documents on QC techniques into relevant languages;

Requests the Coordinating Group of the Regional WIGOS Project to:

(1) establish a website for the Regional WIGOS Project on Enhancing Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations;

(2) develop, using this website, an environment for capacity building in quality management for surface observations, in addition to efforts made via the RIC Tsukuba website to provide training materials on traceability and meteorological instrument calibration; and

(3) develop an environment to support communications among parties in charge of meteorological observation and/or instruments in the region.

# Appendix A

## Proposal of Tokyo Action Plan 2018

| Topics of discussion | Needs identified from discussions | Tokyo Action Plan 2018 *Proposal* | | |
|---|---|---|---|---|
| | | Short term -2020 | Middle term -2023 | Long term -2028 |
| Future visions for surface observation networks<br>Short- and long-term goals in observation data quality<br>Improvement of on-site quality management activities<br>Approaches to staff training | • Encouragement for use of precipitation observation station data in DRR<br>• Integration of surface/remote sensing to maximize observation data application<br>• Encouragement for deployment of AWS in sparsely covered regions<br>• Encouragement for AWS calibration activities toward the provision of quality data to users<br>• Encouragement for enhancement of integrated quality management to support user assessment of observation data<br>• Encouragement for development of training methods to support skilled observation and technical expertise | • Increase the number of reporting stations and observation resolution (every three hours or hourly).<br>• Conduct research to determine optimal observation network configuration.<br>• Encourage all countries to implement WDQMS and other tools.<br>• Improve QC techniques in instrument calibration, field inspection and other areas.<br>• Implement standard operating procedures (SOPs) for AWS maintenance, including methods for instrument inspection after extreme events.<br>• Engage in post-workshop activities, including newsletter issuance and provision of e-mail-based support.<br>• Encourage OSCAR surface training in all countries.<br>Workshop #1 | • Enhance integrated quality management.<br>• Establish special environments/appropriate exposure around observing stations.<br>• Develop guidance on integrated observing systems for surface observation with remote sensing.<br>• Provide further training on instrument maintenance and calibration.<br>Workshop #2 | • Improve observation resolution.<br>• Increase station observation network density.<br>• Develop computerized QC methods for correction of historical data.<br>• Establish collaboration among international agencies/academics/engineers for improved observation capability. |