



CARIBBEAN METEOROLOGICAL ORGANIZATION

ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES
GEORGE TOWN, GRAND CAYMAN, CAYMAN ISLANDS, 23 NOVEMBER 2022

Doc. 4

OPERATIONAL MATTERS (Submitted by the Coordinating Director)

INTRODUCTION

1. This report addresses matters that are particularly related to the operations of National Meteorological and Hydrometeorological Services (NHMSs).

A. AERONAUTICAL METEOROLOGY, EARLY WARNING SERVICES, CLIMATE SERVICES AND MATTERS OF IMPORTANCE TO MEMBERS OPERATIONS

The recently-held Second Sessions of the WMO *Commission for Weather, Climate, Water and Related Environmental Services and Applications* (SERCOM-2) and of the *Commission for Observation, Infrastructure and Information Systems* (INFCOM-2) made several recommendations and took decisions relevant to operational meteorology, linked to improved and modernized service delivery. Particular recommendations and decisions that will directly affect the provision of aeronautical meteorological services, early warning services, climate monitoring and services are provided in this report.

SERCOM Recommendation 01: Amendment to the Technical Regulations (WMO-No. 49), Volume I, General Meteorological Standards and Recommended Practices and updates to the Compendium of WMO Competency Frameworks (WMO-No. 1209)

2. SERCOM-2 recommended an amendment to the *Technical Regulations (WMO-No. 49), Volume I, General Meteorological Standards and Recommended Practices* and updates to the *Compendium of WMO Competency Frameworks (WMO-No. 1209)*, on the qualification and competency requirements of aeronautical meteorological personnel (observers and forecasters). Included are changes to performance criteria related to meteorological forecasters being able to perform tasks linked to other relevant environmental situations, phenomena, parameters and information, comprising but not limited to the presence of volcanic ash, the release of radioactive material or toxic chemicals into the atmosphere and space weather. Some of the major proposed amendments to the Technical Regulations are provided with recommended amendments in light blue and deletions in red (below).

Personnel Providing Aeronautical Meteorological Services

Qualifications

3. Members shall ensure, taking into consideration the area and airspace of responsibility, aviation user requirements, international regulations, local procedures and priorities, that **the level of qualification(s) necessary to underpin the required competencies of operational aeronautical meteorological forecasters and observers is consistent with the relevant educational frameworks, background skills and knowledge requirements described in the Basic Instruction Package for Meteorologists and the Basic Instruction Package for Meteorological Technicians, respectively**, as defined in Appendix A.

This recommendation has the following notes:

- a) **Aeronautical meteorological forecasters and observers in this context include personnel with responsibility for providing an aeronautical meteorological service at the national, regional or global level.**
- b) **National and/or regional bodies may require additional and/or higher levels of qualification(s) for operational aeronautical meteorological personnel.**
- c) **Aeronautical meteorological service delivery specialisms such as (but not limited to) volcanic hazards and space weather may require the successful completion of additional and/or alternative qualification frameworks to underpin the required competencies of the personnel delivering operational services in such specialist areas.**

Competencies: Aeronautical meteorological forecaster

4. Members shall ensure that for the area and airspace of responsibility, given the impact of meteorological **and other relevant environmental** phenomena and parameters on aviation operations, and in compliance with aviation user requirements, international regulations and local procedures and priorities, an aeronautical meteorological forecaster is able to:

- a) Analyze and monitor continually the weather **and other relevant environmental** situations;
- b) Forecast ~~aeronautical~~ meteorological **and other relevant environmental** phenomena and parameters;
- c) Warn of hazardous ~~weather~~ **meteorological and other relevant environmental** phenomena;
- d) Ensure the quality of meteorological **and other relevant environmental** information and services **supplied to users**;
- e) Communicate meteorological **and other relevant environmental** information to internal and external users.

Note: Other relevant environmental situations, phenomena, parameters and information in this context may include (but not be limited to) the presence of volcanic ash, the release of radioactive material or toxic chemicals into the atmosphere and space weather.

Competencies: Aeronautical meteorological observer

5. Members shall ensure that for the area and airspace of responsibility, given the impact of meteorological **or other relevant environmental** phenomena and parameters on aviation operations, and in compliance with aviation user requirements, international regulations and local procedures and priorities, an aeronautical meteorological observer is able to:

Monitor continually the weather **or other relevant environmental** situation;

- a) Observe and record ~~aeronautical~~ meteorological **or other relevant environmental** phenomena and parameters;
- b) Ensure the quality of **the observing** system performance and of meteorological **or other relevant environmental** information **supplied to users**; and
- c) Communicate meteorological or **other relevant environmental** information to internal and external users.

Note: Other relevant environmental situations, phenomena, parameters and information in this context may include (but not be limited to) the presence of volcanic ash and space weather.

SERCOM Recommendation 02: Discontinuation of Technical Regulations (WMO-No. 49), Volume II, Meteorological Service for International Air Navigation

6. SERCOM-2 also recommended a plan of action on the discontinuation of Technical Regulations (WMO-No. 49), Volume II, Meteorological Service for International Air Navigation. It has been proposed that WMO-No. 49, Volume II should be discontinued in two stages as follows:

- (1) Discontinue Part I, International Standards and Recommended Practices: Core Standards and Recommended Practices and Part II, International Standards and Recommended Practices: Appendices and Attachments of WMO-No. 49, Volume II, with effect **31 December 2023**;
- (2) Discontinue Part III, Aeronautical Climatology and Part IV, Format and Preparation of Flight Documentation of WMO-No. 49, Volume II upon the incorporation of material of continuing relevance into the ICAO Procedures for Air Navigation Services — Meteorology (PANS-MET) (Doc 10157), preferably as part of Amendment 1 to PANS-MET (**provisionally 2026**).

7. WMO Members and others desiring to further their understanding of the discontinuation of WMO-No. 49, Volume II, are directed to a [Communication Package](#). These two recommendations will be submitted to the Nineteenth World Meteorological Congress (Cg-19, May-June 2023) for consideration and adoption.

SERCOM Recommendation 03: Updates to WMO Guidance Material Addressing Aeronautical Meteorological Service Delivery (WMO-No. 732) and the Cost Recovery of Aeronautical Meteorological Services (WMO-No. 904).

8. In addition, SERCOM-2 formulated recommendations on proposed updates to WMO guidance material addressing aeronautical meteorological service delivery (WMO-No. 732) and the cost recovery of aeronautical meteorological services (WMO-No. 904). The proposed 2023 update of WMO-No. 732 provides guidance to WMO Members and their service providers in the provision of aeronautical meteorological services across a range of topics such as governance and the production and delivery of observations, forecasts and other information.

9. The proposed 2023 update of WMO-No. 904 accounts for the fact that aeronautical meteorological services have evolved and the methods and practices of determining, allocating and recovering costs have advanced over the past 15 years. Consequently, a major update to (but not a wholesale replacement of) WMO-No. 904 is proposed. The proposed 2023 update of WMO-No. 904 provides guidance to WMO Members and their service providers in the cost recovery of aeronautical meteorological services across a range of topics such as governance, general principles and procedures for appropriately allocating costs for various meteorological facilities and services, and examples of cost recovery arrangements (national case studies).

10. These recommendations will be submitted to the 76th session of the WMO Executive Council (EC-76, February-March 2023) for consideration and adoption through EC-76 resolutions.

SERCOM Recommendation 04: Amendments to the Basic Instruction Package for Meteorologists (BIP-M) and Basic Instruction Package for Meteorological Technicians (BIP-MT).

11. These amendments are wide-ranging and significant. Members can view the full recommended amendments at [REVIEW OF BIP-M AND BIP-MT](#). The following are snapshots of the proposed amendments, with proposed amendments in blue and deletions in red:

The Basic Instruction Package for Meteorologists

12. The Basic Instruction Package for Meteorologists **(BIP-M) establishes a common understanding of the abilities required for individuals to be recognized as Meteorologists**, as defined in Appendix A. **BIP-M is presented in its entirety in the Guide to the Implementation of Education and Training Standards in Meteorology and Hydrology (WMO-No. 1083), Volume I, which contains guidance on how to implement the learning outcomes presented in Appendix A. BIP-M** shall be used by Members to ensure that the meteorological personnel in the category Meteorologist are provided with ~~a robust and broad range of knowledge of atmospheric phenomena and processes, together with skills related to the application of this knowledge.~~ **the underlying knowledge to acquire skills common to all professionals in this category, that they can use as a platform to develop the necessary competencies for specific roles and continue to learn throughout their careers.**

The Basic Instruction Package for Meteorological Technicians

13. The Basic Instruction Package for Meteorological Technicians **(BIP-MT) establishes a common understanding of the abilities required for individuals to be recognized as Meteorological Technicians**, as defined in Appendix A. **BIP-MT is presented in its entirety in the Guide to the Implementation of Education and Training Standards in Meteorology and Hydrology (WMO-No. 1083), Volume I, which contains guidance on how to implement the learning outcomes presented in Appendix A. BIP-MT**, shall be used by Members to ensure that the meteorological personnel in the category Meteorological Technician are provided with ~~basic knowledge of atmospheric phenomena and processes, together with skills related to the application of this knowledge.~~ **the underlying knowledge to acquire skills common to all professionals in this category, that they can use as a platform to develop the necessary competencies for specific roles and continue to learn throughout their careers.**

B. TECHNICAL GUIDE ON TROPICAL CYCLONES

14. At the request of the 18th WMO Congress (**Resolution 16 (Cg-18)**) - *Guide(s) on the Support of NMHSs to their National Multi-hazard Early Warning procedures, Coordination Mechanisms, Systems and Service-* **Guide No. 1 Tropical Cyclones** have been developed by the Expert team on Multi-Hazard Early Warning Technical Guidance (ET-MTG) that included RA IV Experts **Mr. John Tibbetts**, of the Cayman Islands (British Caribbean Territories) and **Dr. José Maria Rubiera Torres**, of Cuba.

15. SERCOM-2 adopted and recommended to the Executive Council, [draft Recommendation 5.6\(7\)/1: WMO Guide for NMHS in Support of National Multi-Hazard Early Warning Systems, Procedures, Coordination Mechanisms, and Services: Guide No.1 — Tropical Cyclone](#). The purpose of the guide is to bridge the gap between early warnings and early actions and to enable outreach to the last mile to support early actions, and to support Resolution 3 (EC-75) – UN Global Early Warning/Adaptation Initiative.

16. This guide is designed to provide a practical guide for Multi-Hazard Early Warning Systems (MHEWS) operations to help NMHSs to provide effective and institutional support to their national disaster risk management mandates. It aims to support WMO Members prone to tropical cyclones. Its use is encouraged for developing or updating national MHEWS procedures, coordination mechanisms and synergy, systems and services. Members are urged to take the desired actions to implement the recommendations provided in Guide No.1 — Tropical Cyclone to establish their national MHEWS procedures, mechanisms and systems to enable information on warnings and response actions to reach everyone.

C. BUFR MIGRATION

17. WMO recommends that global exchange of observations be done in BUFR. According to the Guide to the WMO Integrated Global Observing System (WMO-No 1165), WIGOS Station Identifiers cannot be represented in the Traditional Alphanumeric Code (TAC) forms, such as FM-12 SYNOP or FM-35 TEMP. Table Driven Code Form equivalents have to be used (FM-94 BUFR or FM-95 CREX, or, in the future, model-driven code forms).

18. A migration from Traditional Alphanumeric Codes (TAC) to Table-Driven Code Forms (TDCF) has been in progress for more than a decade. The CMO has been advising Directors and Managers of National Meteorological and Hydro-meteorological Services at the annual meetings of the need to migrate the dissemination of synoptic observations from TAC forms to TDCF – Binary Universal Form for the Representation of meteorological data (BUFR) for several years.

19. There has been only minor progress in the migration among CMO Members over the last five (5) years. Most CMO Member countries' station observations reporting are done in TAC but not in BUFR. As of October 31, 2022, **only two (2) CMO Member States are reporting their surface observations in BUFR**. One Member completed the migration to TDCF and stopped TAC formats, while the other Member continues reporting with both BUFR and TAC. Daily monitoring of coverage of migration from TAC to BUFR reports (updated automatically) is performed by the NWP centers. For example, surface and upper BUFR reports are available from the [BUFR Monitoring Maps](#).

20. CMO Members' commitment is still required to complete the migration to BUFR to meet various new requirements from WMO's projects and initiatives, including the WIGOS. An additional complication is that "WIGOS Station Identifiers" have been introduced by WMO and necessitate widespread software changes.

21. The challenges that affect BUFR migration, are not only among CMO Members, and can be traced to capacity and training issues as prime factors, as BUFR is viewed as more complex than TAC. BUFR represents a substantial paradigm shift over TAC, which is deeply ingrained throughout the worldwide meteorological enterprise. A very large amount of training was invested in TAC over the

years, and they are well understood to the point of being second nature to staff, all the way up to the most senior. As a result, there remains a strong need for national and regional coordination and capacity-building, including refreshed training on BUFR implementation to tackle the regional BUFR issue. Apart from training, an actual culture change is needed with significant efforts devoted to BUFR understanding and implementation.

22. Recommended actions for all CMO Members

- Establish a migration strategy, including installation of available BUFR software with the goal that BUFR reports are generated directly from measured data where possible, instead of by converting/reformatting TAC reports;
- Strengthen and establish working relationships with Members who have already implemented BUFR capability with a view towards getting assistance for implementing BUFR;
- Make sure all surface observation reporting is made available in BUFR format, in full compliance with WMO Manual on Codes;
- Establish parallel dissemination of TAC and BUFR as soon as possible, but only after providing all NWP centers with advanced warning;
- Undertake BUFR training for staff to facilitate the completion of migration activities.

D. ICAO METEOROLOGICAL INFORMATION EXCHANGE MODEL (IWXXM)

23. WMO created the ICAO Meteorological Information Exchange Model (IWXXM) data format, which is to be used for operational exchanges of aviation meteorological information in eXtensible Markup Language (XML). The meeting will recall the discussions on IWXXM at the Directors of Meteorological Services Meetings 2018, 2019, and 2020 ([DMS2020 Doc4](#)).

IWXXM Implementation Status

24. WMO President through the fast-track procedure amended the WMO Manual on Codes Vol 1.3, WMO-NO. 306 and announced in the [2022 WMO Operational Newsletter World Weather Watch](#), that IWXXM became a Standard in ICAO Annex 3, Meteorological Services for International Air Navigation (WMO No. 49, Vol II Meteorological Service for International Air Navigation) on November 15, 2021.

25. The amendment informs that all Members **shall** now use IWXXM for the provision of information regarding observations and forecasts, and reports thereof, for international civil aviation, including provisions of the following types of reports and advisories: METAR, SPECI, TAF, SIGMET, AIRMET, Tropical Cyclone Advisory, Volcanic Ash, Space Weather Advisory, SIGWX Forecast.

Future Plans: Transition from TAC to IWXXM

26. ICAO plans to remove TAC as a Standard in ICAO Annex 3 by 2026, establishing IWXXM as the sole primary format for MET information exchange. Therefore, Members need to prepare for ingesting IWXXM long-term (rather than relying on TAC translation). This means that future systems and services will provide output in IWXXM only. IWXXM 2021-2 is published online at [IWXXM Schemas](#).

27. Mr. Glendell De Souza, Chair, Services Committee, Regional Association IV, and former Science and Technology Officer of the CMO Headquarters developed [IWXXM-Car](#) for the Caribbean

from software provided by the United States National Weather Service's Meteorological Development Laboratory. The software can transition TAC messages to IWXXM and in its present format encodes METAR and TAF messages. The software output has been validated against the WMO XML schema and has been tested successfully on computers with the following operating systems:

- a. Windows 7
- b. Windows 10

The software requires an input file in text format such as:

SACA32 XXCB 191309

METAR TBPB 191300Z 10013KT 999 FEW018 SCT036 28/22 Q1018 NOSIG=

METAR TFFF 191300Z AUTO 1014KT 9999 SCT0025 27/22 Q1018=

METAR TFFR 191300Z AUTO 09009KTKT 9999 FEW028 /// /// TCU 28/22 Q1019=

28. The Graphical User Interface (GUI) has three (3) sections, an input file section, which shows the path to the input file, an activity that shows any error message, and what observation/forecast has successfully converted to XML. The software was designed for the Member States of the Caribbean Meteorological Organization and will only encode observations and forecasts into IWXXM from the stations listed in the software documentation.

Information about the software and its implementation are contained in Annex I.

29. Recommendations

- Members are urged to download and implement the software for the exchange of aviation meteorological information in IWXXM format and to identify a Focal Point with responsibility for IWXXM transition within their NMHS. The software, installation guide and documentation are available at [IWXXM-Car Software](#).
- Members are also encouraged to strengthen working relationships with Members who have already implemented IWXXM capability.

E. COMMON ALERT PROTOCOL (CAP)

30. The meeting will recall the discussion on the Common Alert Protocol (CAP) at the 2021 and 2019 Meetings of Directors of Meteorological Services ([DMS2021 Doc4](#); [DMS2019, Doc4](#)). The WMO continues to maintain an international Register of Alerting Authorities at the [WMO Alerting Authority](#) to record the Authoritative Sources of warnings, as identified by WMO Members' Permanent Representatives. To date, only six (6) CMO Members have registered Alerting Authorities in the WMO register. The WMO has requested that CAP messages from Members should be routed through the Register of WMO Members Alerting Authorities. However, CAP is still not used as the format for issuing warnings in up to half of WMO Members in all WMO regions, except Regions II and VI.

31. Late last year, WMO implemented a fast-track initiative to implement the CAP. Since the launch of the fast-track CAP initiative in 2021, eighteen (18) countries in Region I (Africa) have operationalized CAP. WMO is looking to expand the initiative to other regions. The initiative provides capacity building; assists in selecting a CAP editing facility; nominating an Editor to the WMO Register; guiding the editor in inserting the CAP source URL in the Register; and establishes Standard Operating Procedures for mainstreaming CAP in the warning process of the NMHS. In view of the progress made

in Region I, assessments of CAP implementation in the other WMO Regions have been undertaken and many Members have outstanding action points for CAP readiness.

32. SERCOM-2 recommended the adoption of amendments to the *Technical Regulations, Volume 1, General Meteorological Standards and Recommended Practices* (WMO-No. 49) that “**Members should apply the Common Alerting Protocol (CAP) of the International Telecommunication Union (ITU) for the dissemination of warning information.**”

33. The WMO Severe Weather Information Centre (SWIC) 2.0 [website](#) provides official weather warnings in CAP format issued by WMO Members, as a Geographical Information Systems (GIS)-based map display, ensuring the attribution of NMHSs and WMO as authoritative sources of warnings and alerts. The website displays all CAP alerts in [SWIC 2.0 CAP Display Maps](#) as a single and centralized source for the media and the general public to access official warnings and information issued by National Meteorological and Hydrological Services (NMHSs) efficiently and effectively. SWIC 2.0 also provides [CAP Alert-Hub Feeds](#), which provide simplified access to aggregated CAP alerts and publishes CAP feeds URLs for accessibility. The SWIC is a core component of the Global Multi-Hazard Alert System (GMAS). GMAS is a WMO framework mechanism, which aims to enable NMHSs to disseminate authoritative warnings and advice to all WMO Members and a global audience.

34. Recommended Actions

- a) WMO Permanent Representative (PR) of CMO Members should register their NMHSs as alerting authorities in the WMO Register;
- b) CMO Members are encouraged to implement CAP, in line with the WMO CAP initiative, by seeking assistance through the WMO CAP fast-track initiative;
- c) CMO Members PRs with existing CAP messaging or other warning formats should ensure these messages are routed through the Register of WMO Members Alerting Authorities; and
- d) CMO members should register their CAP or warning messages URL Feeds with SWIC 2.0.

F. TRANSITION TO REGIONAL BASIC OBSERVING NETWORK (RBON)

35. The meeting will recall the discussion of RBON at the 2021 Meeting of Directors of Meteorological Services ([DMS2021 Doc 4](#)). On 4 July 2022, WMO informed Members that the Infrastructure Commission (INFCOM) decided on a transition plan to RBON, involving the following phases:

- Phase 1 (2022) — Transition of existing RBSN, and RBCN stations to RBON. The task consists of transferring to RBON affiliation, all selected and relevant RBSN and RBCN stations.
- Phase 2 (2023) — Design and evolution of RBON at the regional level.

36. For Phase 1, the Secretariat has now automatically transferred, on 7 June 2022, the affiliation of all regions RBSN, and RBCN stations to RBON in the OSCAR/Surface database.

WMO invited Members to:

- I. Check compliance of their RBON stations with the RBON technical regulations as stated in section 3.2.3 of the [Manual on the WMO Integrated Global Observing System](#) (WMO-No.

1160), and take the following actions for RBON stations, which may not be in compliance with the RBON provisions:

- Upgrade stations or take steps in order for these stations to become compliant with RBON provisions; and
 - Remove the remaining non-compliant stations from the RBON composition if it is not practical to have them upgraded.
- II. Commit additional observing stations during phase 2 of the RBON transition plan in 2023 to address the high-priority regional challenges.
- III. Promote or contribute to possible pilot activities on regional data exchange of certain types of observations, with an initial focus on radar observations and hydrological observations.

37. A check with the OSCAR/Surface database shows that the following CMO Members stations are on the Global Observing System (GOS) but not RBON stations: Anguilla, British Virgin Islands, Montserrat, St Kitts and Nevis, St Vincent and the Grenadines, and Turks and Caicos. The GOS is a component of the WMO Integrated Global Observing System (WIGOS).

38. A key requirement for an RBON station in phase 1 of the RBON transition plan is the international exchange of the data in real-time or near-real-time (**WMO-No. 1160, section 3.2.3.4**). This means the stations must be reported in real-time or near-real-time on the GTS/WIS to allow their data assimilation on the Global NWP before the model cut-off time. Another key RBON requirement is a 4-year operations commitment with a 10-year commitment recommended (**WMO-No. 1160, section 3.2.3.5**). This means the observing station is kept operational in compliance with RBON requirements for at least 4 more years. Member stations that are not on RBON but are already exchanging data internationally in real or near-real-time are readily set to become RBON stations.

39. **Recommended Actions**

- Members are urged to examine their RBON stations in OSCAR/Surface to make sure that all RBON stations are properly registered in OSCAR/Surface according to the Manual on the WMO Integrated Global Observing System (WMO-No. 1160).
- Members are urged to monitor the performance of RBON stations to maintain their conformance with RBON requirements.
- Members that are not on RBON are encouraged to commit their observing stations during phase 2 of the RBON transition plan in 2023 and designate their stations as RBON stations, as a high priority.

G. WIGOS, OSCAR/Surface, WDQMS STATUS

WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS) OPERATIONAL PLAN 2020-2023

40. CMO Member States are required, to implement and operate their observing systems in accordance with WMO standards and recommendations. The Meeting is reminded that during 2016-2019 WIGOS was in the pre-operational phase. Based on Resolution 37 (Cg-18), WIGOS transitioned to operational status in January 2020; with the initial part of the WIGOS Operational Phase spanning the period 2020-2023.

Expected Key Deliverables for Members by 2023

41. According to the [Annex to Resolution 37 \(Cg-18\)](#) , by the end of 2020-2023, the expected deliverables of the WIGOS framework at the global, regional, and national levels include, but are not limited, to the following:

- Nomination of national focal points for OSCAR/Surface, WIGOS and WDQMS completed;
- Members are actively updating and maintaining their station(s) metadata in the OSCAR/Surface database, for which observations are exchanged internationally;
- RBON network implemented in all Member States;
- GBON network fully implemented in Member States who accepted GBON network membership;
- National WIGOS Implementation Plans adopted and approved;
- National WIGOS governance mechanism will have been established;
- New National WIGOS Station Identifiers system and policy for issuing IDs defined, adopted and implemented by Members;
- WIGOS Data Quality Monitoring System (WDQMS) is fully operational;
- National processes for acting on issues and incidents received from the WDQMS are in place;
- WIGOS metadata compliance achieved;
- Regional WIGOS Centre will have been established and functional; and
- All Members will have affiliated themselves with the RWC.

Monitoring & Evaluation

42. In order to foster the general culture of compliance with WMO Regulations and ensure optimal performance of the system, the Annex stipulates that all aspects of WIGOS implementation will be monitored and evaluated.

WIGOS Data Quality Management System (WDQMS)

43. The Meeting is reminded of the discussion during the 2018 Meeting of Directors of Meteorological Services ([DMS2018 Doc 5](#), St. Kitts and Nevis) on the *WIGOS Data Quality Management System (WDQMS)* web tool, which is hosted at ECMWF. CMO Members' surface land stations that are exchanging observations via the Global Telecommunication System (GTS)/WMO Information System (WIS) are among the stations providing the input to the WDQMS webtool monitoring function.

The WDQMS webtool generates routine daily performance reports based on at least two performance indicators:

- Data quality.
- Data availability.

Data Availability

44. For the near-real-time NWP monitoring module of WDQMS, the **data availability** is computed based on the quality monitoring information received from all the NWP Centres. The data availability is determined by the total number of meteorological observations (TAC/BUFR) received by a particular NWP Centre during a certain period (for example, 6 hours) compared to the required number of observations for international exchange expected during this period. It is worth noting that in the

WDQMS context “observations received” means the observations that were made available to the assimilation system of each NWP centre.

45. The expected number of 6-hourly and daily observation totals (i.e., the number of observations the station should exchange internationally via GTS/WIS during the defined period) are extracted from the reporting schedule recorded in OSCAR/surface and used as a reference on a daily basis. This means that if the metadata of the Members' station reporting interval in OSCAR/Surface is listed as hourly then the expected number of land-surface observations used to compute the 6-hourly availability performance is 6, and 24-hourly availability is 24. For upper-air observations, the daily availability performance maps are based on a total of 2 expected observations per day.

Data Quality

46. The **data quality**, which can affect data availability performance, is obtained by comparing the surface pressure “Observation minus Background (O-B)” departures, provided by the WIGOS Monitoring Centre, against the up-to-date observational requirements of global NWP defined in OSCAR/Requirements. The observational requirement of surface pressure departures that is acceptable, as defined in the [OSCAR/Requirement](#) is 0.5 hPa. Any departure that is higher than 0.5 hPa is considered as poor quality. Although the O-B statistics are used to ascertain the quality of the observations, a mismatch between observations and model short-range forecast is not always due to poor quality observations.

47. There can be other reasons for this mismatch, such as inaccurate metadata or model errors. For example, it might be the case that a station measures air pressure hourly but is committed in WIS to ingest SYNOP message to GTS every 3 h. If the information on GTS commitment is not captured in OSCAR/Surface, the data availability monitoring would not show appropriate results.

CMO Members WDQMS Data Availability & Quality Performance

48. Most of the CMO Members' surface pressure observations ‘availability’ on the WDQMS performance maps currently show orange dots being the dominant feature. One of the reasons is that the quality monitoring information provided by the four NWP Centres (DWD, ECMWF, JMA, and NCEP) is based on the feedback from their data assimilation (DA) system. For example, DWD DA does not have the model background available for the observations they do not intend to assimilate, whereas ECMWF calculates the model background for all the observations made available to DA, even for the ones that the model is not supposed to use in the assimilation (e.g., observations from stations that are in the blacklist due to known poor quality). The frequency at which the observations are used within each assimilation window (i.e., 3-hourly at DWD and hourly at ECMWF) explain some of the discrepancy seen in the number of received by DWD (2 in 6-hour interval) and ECMWF (6 in a 6-hour interval).

49. Recommended Actions

- Members should evaluate the performance of stations under their responsibility on a daily basis by reviewing the automated quality monitoring reports received from the WIGOS Monitoring Centres (global NWP centres) which are displayed in the available WDQMS web tool outputs.

- To identify whether their station(s) is (are) showing non-compliance, Members should check the performance concerning the three main categories: data availability, timeliness, and accuracy regarding the WDQMS performance targets.
- The frequency at which the observations are used within each assimilation window (for example 3-hourly at DWD and hourly at ECMWF) can explain the discrepancy seen in the number of observations received by DWD (2 in 6-hour intervals) and ECMWF (6 in a 6-hour interval).
- Members are encouraged to check their station metadata in OSCAR/Surface for the reporting schedule and make sure it matches their operational practice.

H. WMO CLIMATOLOGICAL STANDARD NORMALS (CLINO) 1991–2020

50. The publication of a consolidated global **Climatological Standard Normals (CLINO)** data set, assembled from Members' submissions, represents a fundamental flagship product of WMO and its predecessor International Meteorological Organization (IMO) for almost 100 years. Graded as WMO mandatory publication, CLINO underpins many national, regional and global climate and weather applications as well as national and international norms and statistics.

51. **In August 2021**, WMO issued a call for submission of CLINO 1991–2020, including detailed format specifications and collection process. The deadline for submissions was 31 March 2022. A second WMO call for submission was issued in May 2022, thereby extending the deadline to 31 December 2022, the definite deadline for Members' CLINO submissions.

52. The publication of CLINO 1991–2020 as a WMO mandatory publication is planned for the second half of 2023, following final global quality control and data set consolidation throughout January to June 2023. A final CLINO collection assessment report will be delivered to the World Meteorological Congress at its nineteenth session (Cg-19).

53. A check on the status of CMO Members' submissions of their CLINO 1991-2020 as of 31 October 2022 shows, eight (8) members have already submitted their CLINO 1991-2020.

54. **Recommended Actions**

- Members who have not done so are urged to complete and provide their CLINO 1991-2020 to the WMO by December 31, 2022, the deadline for completing the CLINO collection in 2022.

I. WMO Annual State of the Climate Report

55. Since 1993, the WMO, in cooperation with its Members, has issued its flagship annual statements on the status of the global climate to provide credible scientific information on climate and its variability. The WMO State of the Climate report is a collection of summaries (monthly to annual) on the state of the climate indicators from national, regional, and global temperatures trends, precipitation distribution over land, extreme events including those related to tropical cyclones and wind storms, flooding, drought, and extreme heat and cold events.

56. On 5 August 2022 WMO announced the launch of the content preparation process for the Annual State of the Global Climate report for 2022. At the same time, WMO requested Members to

provide a year-to-date climate summary for inclusion in a provisional statement, which was to be released during COP27 (November 2022), with the final statement scheduled to be published in March/April 2023.

57. CMO Members who are listed as contributors to the provisional statement of the Annual State of the Global Climate thus far, are Barbados, British Caribbean Territories, Cayman Islands, Grenada, and Trinidad and Tobago. Members are urged to continue to populate their year-to-date statements, leading to an annual statement, and develop a concise but informative overview of the temperatures, rainfall, and significant weather events for submission to the WMO Annual State of the Global Climate Report, 2022.

J. Modernization of the WMO State of the Climate Monitoring

58. SERCOM-2 by Decision 5.5(2)/1 (SERCOM-2) approved the “Guidance On The Use of Climatological Standard Normals and Other Baselines in Monitoring the State Of the Climate”, as a means of modernization of the WMO State of the Climate monitoring; and requested the Secretary-General to facilitate the publication of this guidance. Members are urged to pay attention and adhere to the recommendations contained in the guidance, including:

1. Use Climate Normals (CLINO), updated every 10 years for all climate applications. This would provide a single approach for all climate information and allow a much wider range of data to be used consistently.
 2. Climate indicators should be calculated, to the extent possible, using the most recent CLINO period to compute anomalies. These anomalies should be accompanied by a more in-depth analysis of trends and extremes to properly reflect the long-term changes.
-

Annex I

Readme IWXXM-Car

NOTE: Changes to the software.

Due to a recent upgrade in the software at <https://github.com/NOAA-MDL/GIFTS>, modifications have been to IWXXM-Car. The modifications have fixed the time zone to UTC and added NNNN to the end of the “txt file”.

To use the software, double-click on the “launcher” file.

IWXXM-Car Use

1. IWWXM-Car was developed for the Caribbean from software provided by the United States National Weather Service's Meteorological Development Laboratory and the repository is available at <https://github.com/NOAA-MDL/GIFTS>.
2. In its present format the software can encode METARs and TAFs and its output has been validated against the WMO xml schema and has been tested successfully on computers with the following operating systems:
 - a. Windows 7
 - b. Windows 10
3. The software requires an input file which is text format such as the example in Figure 1;

```
SACA32 XXCB 191309
METAR TBPB 191300Z 10013KT 9999 FEW018 SCT036 28/22 Q1018 NOSIG=
METAR TFFF 191300Z AUTO 10014KT 9999 SCT025 27/22 Q1018=
METAR TFFR 191300Z AUTO 09009KT 9999 FEW028/// ///TCU 28/22 Q1019=
METAR TGPY 191300Z 05015KT 9999 FEW018 28/22 Q1017 NOSIG=
METAR TLPL 191300Z 07016KT 9999 FEW027 27/21 Q1018 NOSIG=
METAR TNCM 191300Z 08009KT 050V120 9999 SCT018 27/21 Q1021=
METAR TTPP 191300Z 13005KT 9999 VCSH FEW020 27/24 Q1017 NOSIG RMK JP..NE=
METAR TUPJ 191300Z 09009G20KT 10SM SCT020 28/22 A3011 RMK Q1019 VIS 16KM=
```

Figure 1: Example of a METAR file

4. The Graphical User Interface (GUI) has three (3) sections, an input file section, which shows the path to the input file, an activity which shows any error message and what observation/forecast have successfully converted to xml, as shown in Figure 2. The output file is place in the same folder as the executable file.

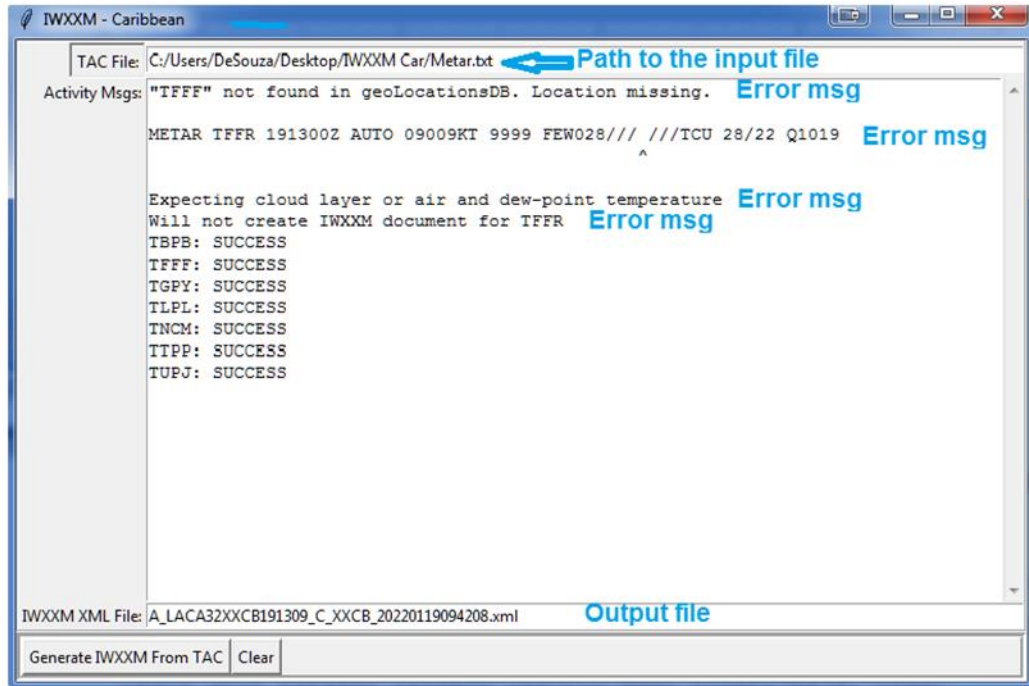


Figure 2: The GUI showing example of file input, activity messages and the path and name of the output file.

Note: The software checks the encoding of the observations and forecasts against the WMO's METAR and TAF code form which is available online and will generate an error message if the encoded METAR or TAF does not conform.

5. The software was designed for the Member States of the Caribbean Meteorological Organization and will only encode into IWXXM observations and forecast from the stations listed in Figure 3.

AAAD		ADELAIDE AIRPORT		-34.92		138.52		4
KDCA DCA		RONALD REAGAN/WASHINGTON NATIONAL AIRPORT		38.84833	-77.03417	4		
TQPF AXA		WALLBLAKE/CLAYTON J. LLOYD INTERNATIONAL AIRPORT		18.20		-63.05		38
TAPA ANU		VC BIRD INTERNATIONAL AIRPORT		17.12		-61.78		8
MZBZ BZE		PHILLIP GOLDSTON INTERNATIONAL AIRPORT		17.53		-88.30		5
TBPB BGI		GRANTLEY ADAMS INTERNATIONAL AIRPORT		13.0666		-59.4833		50
TUPJ EIS		TERRANCE B. LETTSOME INTERNATIONAL AIRPORT		18.45		-64.53		4
MWCR GCM		OWEN ROBERTS INTERNATIONAL AIRPORT		19.29		-81.36		3
MWCB CYB		SIR CHARLES KIRKCONNELL INTERNATIONAL AIRPORT		19.58		-79.88		2
TDCF DCF		CANEFIELD AIRPORT		15.33		-61.39		5
TDPD DOM		MELVILLE HALL AIRPORT		15.53		-61.30		14
TGPY GND		MAURICE BISHOP INTERNATIONAL AIRPORT		12.00		-61.78		6
SYCJ GEO		CHEDDI JAGAN INTERNATIONAL AIRPORT		-6.5		58.25		29
SYEC OGL		EUGENE F. CORREIA INTERNATIONAL AIRPORT		-6.8080		58.104		0
MKJP KIN		NORMAN MANLEY INTERNATIONAL AIRPORT		17.93		-76.78		3
MKJS MBJ		SANGSTER INTERNATIONAL AIRPORT		18.50		-77.92		1
TRPG MNI		JOHN A. OSBORNE AIRPORT/GERALDS AIRPORT		16.7911		-62.1933		167
TKPK SKB		ROBERT L. BRADSHAW INTERNATIONAL AIRPORT		17.30		-62.72		67
TKPN NEV		VANCE W. AMORY INTERNATIONAL AIRPORT		17.21		-62.59		17
TNCM SXM		PRINCESS JULIANA INTERNATIONAL AIRPORT		18.03		-63.12		3
TLPC SLU		GEORGE F. L. CHARLES AIRPORT		14.02		-61.00		2
TLPL UVF		HEWANORRA INTERNATIONAL AIRPORT		13.75		-60.95		3
TVSA SVD		ARGYLE INTERNATIONAL AIRPORT		13.15		-61.02		41
TTCP TAB		ARTHUR NAPOLEON RAYMOND ROBINSON INTERNATIONAL AIRPORT		11.15		-60.833		3
TTPP POS		PIARCO INTERNATIONAL AIRPORT		10.617		-61.35		12
MBGT GDT		JAGS MCCARTNEY INTERNATIONAL AIRPORT		21.45		-71.15		10
MBPV PLS		PROVIDENCIALES INTERNATIONAL AIRPORT		21.7666		-72.266		4
TNCA AUA		QUEEN BEATRIX AIRPORT ARUBA		12.50		-70.0166		3
TNCC CUR		HATO INTERNATIONAL AIRPORT		12.200		-68.9666		8
SMJP PBM		JOHAN ADOLF PENGEL INTERNATIONAL AIRPORT/ZANDERIJ		-5.400		55.2000		16
SOCA CAY		CAYENNE-ROCHAMBEAU AIRPORT		-4.8222		52.3652		8

Figure 3: Stations which are in the database used by IWXXM-Car

Note: The latitude and longitude and height of the last three columns are taken from the station metadata which is available on [OSCAR/Surface](#). If there is more recent information which is published please update the metadata on OSCAR/Surface and inform CMO.

- The xml file which is produced by the software **cannot be sent to the WAF server**, it does not contain the WMO header. The software was modified to produce two output files with the same name, but with different file extension, which are ".xml" and ".txt". It is the **text file which is to be transmitted to the WAFS server**. Figures 4 and 5 provide a snapshot of the beginning of
A_LTBZ06SBBR110000RRA_C_SBBR_20220215180938.xml and
A_LTBZ06SBBR110000RRA_C_SBBR_20220215180938.txt, respectively.

```

<MeteorologicalBulletin gml:id="uid.f30338e4-e9ae-4c59-8478-3b543be8a01b" xmlns="http://def.wmo.int/collect/2014" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://def.wmo.int/collect/2014 http://www.wmo.int/collect/2014/collect.xsd" xmlns:airm="http://www.aimx.aero/schema/5.1.1" xmlns:aimx="http://www.aimx.aero/schema/5.1.1" xmlns:ivwxm="http://www.aimx.aero/schema/5.1.1" xmlns:ivwxm="http://www.aimx.aero/schema/5.1.1">
  <ivwxm:TAF gml:id="uid.c7aac2a4-471c-4cdf-b60d-e06c2da78386" permissibleUsage="OPERATIONAL" reportStatus="NORMAL" xmlns:airm="http://www.aimx.aero/schema/5.1.1" xmlns:aimx="http://www.aimx.aero/schema/5.1.1" xmlns:ivwxm="http://www.aimx.aero/schema/5.1.1" xmlns:ivwxm="http://www.aimx.aero/schema/5.1.1">
    <ivwxm:issueTime>
      <gml:TimeInstant gml:id="uid.6a451779-5638-47bd-9423-38e899914b90">
        <gml:timePosition>2022-02-10T21:00:00Z</gml:timePosition>
      </gml:TimeInstant>
    </ivwxm:issueTime>
    <ivwxm:aerodrome>
      <airm:AirportHeliport gml:id="uid.e8db3alc-52a7-4074-8579-4433e46f213a">
        <airm:timeSlice>
          <airm:AirportHeliportTimeSlice gml:id="uid.fdc5636-7627-4aaa-a54a-ac47c1bb8287">
            <gml:validTime/>
            <airm:interpretation>SNAPSHOT</airm:interpretation>
            <airm:name>ALTA FLORESTA</airm:name>
            <airm:locationIndicatorICAO>SBAT</airm:locationIndicatorICAO>
            <airm:ARP>
              <airm:ElevatedPoint axisLabels="Lat Long" gml:id="uid.9123ac48-4c64-4dd1-baaf-7e560d76ce5a" srsDimension="2" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
                <gml:pos>-9.86000 -56.10000</gml:pos>
              </airm:ElevatedPoint>
            </airm:ARP>
          </airm:AirportHeliportTimeSlice>
        </airm:timeSlice>
      </airm:AirportHeliport>
    </ivwxm:aerodrome>
  </ivwxm:TAF>
</MeteorologicalBulletin>

```

Figure 4: Example of the start of the file A_LTBZ06SBBR110000RRA_C_SBBR_20220215180938.xml

```

LTBZ06 SBBR 110000 RRA
<MeteorologicalBulletin gml:id="uid.f30338e4-e9ae-4c59-8478-3b543be8a01b" xmlns="http://def.wmo.int/collect/2014" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://def.wmo.int/collect/2014 http://www.wmo.int/collect/2014/collect.xsd" xmlns:airm="http://www.aimx.aero/schema/5.1.1" xmlns:aimx="http://www.aimx.aero/schema/5.1.1" xmlns:ivwxm="http://www.aimx.aero/schema/5.1.1" xmlns:ivwxm="http://www.aimx.aero/schema/5.1.1">
  <ivwxm:TAF gml:id="uid.c7aac2a4-471c-4cdf-b60d-e06c2da78386" permissibleUsage="OPERATIONAL" reportStatus="NORMAL" xmlns:airm="http://www.aimx.aero/schema/5.1.1" xmlns:aimx="http://www.aimx.aero/schema/5.1.1" xmlns:ivwxm="http://www.aimx.aero/schema/5.1.1" xmlns:ivwxm="http://www.aimx.aero/schema/5.1.1">
    <ivwxm:issueTime>
      <gml:TimeInstant gml:id="uid.6a451779-5638-47bd-9423-38e899914b90">
        <gml:timePosition>2022-02-10T21:00:00Z</gml:timePosition>
      </gml:TimeInstant>
    </ivwxm:issueTime>
    <ivwxm:aerodrome>
      <airm:AirportHeliport gml:id="uid.e8db3alc-52a7-4074-8579-4433e46f213a">
        <airm:timeSlice>
          <airm:AirportHeliportTimeSlice gml:id="uid.fdc5636-7627-4aaa-a54a-ac47c1bb8287">
            <gml:validTime/>
            <airm:interpretation>SNAPSHOT</airm:interpretation>
            <airm:name>ALTA FLORESTA</airm:name>
            <airm:locationIndicatorICAO>SBAT</airm:locationIndicatorICAO>
            <airm:ARP>
              <airm:ElevatedPoint axisLabels="Lat Long" gml:id="uid.9123ac48-4c64-4dd1-baaf-7e560d76ce5a" srsDimension="2" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
                <gml:pos>-9.86000 -56.10000</gml:pos>
              </airm:ElevatedPoint>
            </airm:ARP>
          </airm:AirportHeliportTimeSlice>
        </airm:timeSlice>
      </airm:AirportHeliport>
    </ivwxm:aerodrome>
  </ivwxm:TAF>
</MeteorologicalBulletin>

```

Figure 5: Example of the start of the file A_LTBZ06SBBR110000RRA_C_SBBR_20220215180938.txt

Note: The software used for displaying the ".xml" and ".txt" files is Notepad++, with and xml plug-in. The software recognizes that the A_LTBZ06SBBR110000RRA_C_SBBR_20220215180938.xml, is a true xml file but the second file is not a true xml file.

7. The file is named using the file naming convention developed by WMO, which can be found on page 142 of the [Manual on the Global Telecommunication System](#).
8. IWXXM-Car and the Launcher file can remain open and used as needed, since it does not use system resources unless you are creating a new IWXXM file.