C A R I B B E A N

M E T E O R O L O G I C A L

O R G A N I Z A T I O N

**ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES Doc. 4**

Belize City, BELIZE, 11NOVEMBER 2015

**OPERATIONAL MATTERS**

(Submitted by the Coordinating Director)

## INTRODUCTION

1. Several matters that are particularly related to the operations at National Meteorological Services (NMSs) are raised or addressed in this document. Some of the matters may be of immediate concern or require immediate action on the part of the NMSs, while others are raised to create awareness of issues upcoming in the near future.

## A. WMO Annual Global Monitoring

2. The WMO Manual on the Global Telecommunication System (GTS), in its Attachment 1‑5, refers to a plan for monitoring the operation of the World Weather Watch (WWW). This plan includes provisions for the internationally coordinated monitoring of the operation of the WWW on a non-real-time basis.

3. The Annual Global Monitoring (AGM) is carried out in October each year. The WWW centres are invited to monitor SYNOP, TEMP, PILOT, and CLIMAT reports from the *Regional Basic Synoptic Network* (RBSN) stations, in accordance with the responsibility taken for the exchange of data on the GTS:

* The **National Meteorological Centres** (NMCs) should monitor data from their own territory:
* **Regional Telecommunication Hubs** (RTHs) should at least monitor data from their associated NMCs, and possibly from their own Region:
* **World Meteorological Centres**(WMCs) and RTHs located on the Main Trunk Network (MTN) should monitor the complete global data set.

4. The results of the AGM make it possible to compare the availability of the reports received from RBSN stations at the NMC responsible for inserting the data in the Regional Meteorological Telecommunicat mjhuion Network (RMTN), at the associated RTH and at MTN centres. The differences in the availability of data between centres are generally due to the following main reasons: (i) differences of requirements in the reception of data, (ii) shortcomings in the relay of the data on the GTS, (iii) data not monitored due to differences in the implementation of the monitoring procedures at centres.

5. There are ten (10) Members States of the Caribbean Meteorological Organization whose National Meteorological Service (NMS) are RBSN stations. These are Antigua and Barbuda, Barbados, Belize, Cayman Islands, Dominica, Grenada, Guyana, Jamaica, Saint Lucia and Trinidad and Tobago.

6. WMO's data archive at **ftp://ftp.wmo.int/GTS\_monitoring/AGM/To\_WMO/201410/** shows that Barbados, Belize, Cayman Islands, Dominica and Trinidad and Tobago submitted results of their monitoring for the AGM in 2014. Hence, the results presented in **Table 1** below for the monitoring of SYNOP, TEMP and CLIMAT reflects, for the most part, the reports from the RTH and MTN centres.

|  |  |  |  |
| --- | --- | --- | --- |
| **Country** | **SYNOP****(%)** | **TEMP****(%)** | **CLIMAT****(%)** |
| Antigua and Barbuda | **90-100** | **N/A** | **N/A** |
| Barbados | **90-100** | **90-100** | **90-100** |
| Belize | **90-100** | **90-100** | **90-100** |
| Cayman Islands | **45-90** | **90-100** | **Silent** |
| Dominica (Canefield) | **45-90** | **N/A** | **N/A** |
| Dominica (Melville Hall) | **45-90** | **N/A** | **N/A** |
| Grenada | **90-100** | **N/A** | **N/A** |
| Guyana (Cheddi Jagan) | **90-100** | **N/A** | **Silent** |
| Jamaica (Kingston) | **90-100** | **Silent** | **90-100** |
| Jamaica (Montego Bay | **90-100** | **N/A** | **90-100** |
| Saint Lucia (Hewanorra) | **90-100** | **N/A** | **N/A** |
| Saint Lucia (Vigie) | **45-90** | **N/A** | **N/A** |
| Trinidad and Tobago (Crown Point) | **90-100** | **N/A** | **N/A** |
| Trinidad and Tobago (Piarco) | **90-100** | **90-100** | **90-100** |

 Table 1: Results of the 2014 Annual Global Monitoring:

 N/A - Not Applicable

7. The results also show that the stations at Kamarang (81005), Ebini (81010) in Guyana, were silent during the reporting period. The RTH and MTN centres results also indicated that between 45-90% of the expected synoptic reports were received from the stations at Lethem (81006), but only 1-45% of the synoptic reports were received from Kaieteur Falls (81080).

**B. Satellite Matters**

8. Operational satellite data distribution and dissemination for meteorological applications in RA IV (North America, Central America and the Caribbean) are currently provided through NOAA direct broadcast channels (GVAR, HRIT/EMWIN), through the DVB‑S dissemination service GEONETCast-Americas (GNC-A), by EUMETSAT through EUMETCast-Americas, as well as through the internet. The situation is currently quite complex since:

* There is a wide range of capabilities by countries in the Region to receive, process and interpret satellite data (ranging from state-of-the-art to basic users);
* GEONETCast-Americas is maintained by NOAA as a service that supplements other operational NOAA data distribution systems and is not supported as a primary dissemination channel. It is, however, an attractive alternative to receive data due to the low cost of purchasing and maintaining a receiving station;
* Product dissemination through the EUMETCast-Americas service will be discontinued by the end of 2016. EUMETSAT and NOAA are in the process of organizing a transition of products to GNC-A;
* Internet connectivity is low in some parts of the region, especially during severe events.

9. The situation is further compounded by:

* The introduction of the new-generation GOES-R satellite series over the region from October 2016 onwards;
* The new GOES Re-broadcast (GRB) service requires entirely new receiving equipment;
* Regional users of GOES need to prepare in advance for the exploitation of next-generation satellites, in particular the GOES-R series (in terms of reception equipment, processing facilities, training of staff etc);
* The final orbit longitude location of the GOES-R satellite currently being unknown. This will be determined by NOAA on the basis of the health of the GOES constellation (both current operational GOES-13 (East) and GOES-15 (West) satellites are ageing; GOES-14 is in-orbit storage).

***GOES R - Satellite Series***

10. The Geostationary Operational Environmental Satellite - R Series (GOES-R) is the next generation of geosynchronous environmental satellites which will provide atmospheric and surface measurements of the Earth’s Western Hemisphere for weather forecasting, severe storm tracking, space weather monitoring, and meteorological research.

11. GOES-R will mark a technological advance in geostationary observations. Compared to the current GOES system, the advanced instruments and data processing will provide:

* Three times more spectral information
* Four times greater spatial resolution
* Five times faster coverage
* Real-time mapping of total lightning activity
* Increased thunderstorm and tornado warning lead time
* Improved hurricane track and intensity forecasts
* Improved monitoring of solar x-ray flux
* Improved monitoring of solar flares and coronal mass ejections
* Improved geomagnetic storm forecasting.

12. GOES-R will make available thirty-four (34) meteorological, solar and space weather products, as shown in Figure 1. An additional thirty-one (31) products may be made available as future capabilities for the GOES-R Series. These products are:



**Figure 1**: Product available from GOES-R Series of satellites:

Source: http://www.goes-r.gov/products/overview.html

13. GOES-R is now due to be launched in October 2016, about six months later than planned. This means that the aging GOES-13 will remain in service as GOES East a bit longer. Data from the GOES-R satellite will be available via GOES Rebroadcast (GRB). Testing and calibration of the satellite will take approximately one year before the satellite is activated. During the testing and calibration phase the satellite will be located at 89.5°W longitude. However, whether GOES-R is to become GOES East or GOES West is still to be decided.

***Pathways to Receiving Satellite Imagery post 2016***

14. The following roadmap is intended to provide guidance to Members, and recommends action in order to:

* Assist Members in achieving user readiness to the next-generation satellites (GOES-R in particular);
* Minimize cost and risks for Members in the steps towards this end.

15. In the following sections, a distinction is made between users that are planning to purchase a GRB station, and those that are not. For the former, GEONETCast Americas should be a data receiving mechanism that minimizes the risk of service interruption during the transition to the new GOES-R system; it could also serve as a back-up system to GRB. For the latter user group, GEONETCast-Americas could be a primary data reception system, although the needs of users of satellite data on this channel are not yet being fully met. Further, the Internet can be a further source of satellite imagery but not necessarily in near-real time.

**1. Internet Access**

16. NOAA provides access to satellite imagery through the NOAA's Satellite and Information Services (NESDIS) Office of Satellite and Product Operations (OSPO), either through dedicated websites, which generally have latency on one hour between the time stamp of the imagery, or access via the website. Users can also get dedicated access to imagery through the following:

* NPP Data Exploitation (NDE) provides National Polar-orbiting Partnership (NPP) data and derived products;
* GEODIST provides McIDAS products via AbstractData DistributionEnvironment (ADDE);
	+ McIDAS products are satellite imagery and primarily GOES derived products;
* DDS (Data Distribution Server) provides all other non-McIDAS operational products.

17. At present, users need to complete a standard data access request form to get dedicated satellite imagery access, which is available at [**http://www.ospo.noaa.gov/Organization/About/access.html**](http://www.ospo.noaa.gov/Organization/About/access.html)**.**

**2. GEONETCast Americas**

18. GEONETCast Americas is the western hemisphere component of GEONETCast, a near real time, global network of satellite-based data dissemination systems designed to distribute space-based, airborne and in situ data, metadata and products to a diverse community of users.

19. GEONETCast Americas (GNC-A) has a data rate of 2.0Mbps and at present it broadcasts satellite imagery in GeoTIFF format with a frequency of thirty (30) minutes and the maximum number of water vapour, infrared and visible imagery in sectors is forty-eight (48) images per sector. Full disk imagery in the three wavelengths (visible, infrared, water vapour) is transmitted every three hours and there are other environmental products which are transmitted once per day.

20. The Coordination Group on Satellite Data Requirements for RA III and RA IV has created a comprehensive list of satellite products it believes should be transmitted via GEONETCast Americas. However, due to the limited data rate, the list of satellite products is being prioritized. Directors of Meteorological Services of CMO Member States were asked to assist in the prioritizing of the list. However, to date, no responses have been received.

**3. Members planning to install GOES-R GRB system (GOES-R becomes GOES East)**

21. A Meteorological Service will have to deploy a two-pronged plan of action in order to minimize the time between the decision is taken by the USA to have the GOES-R (or –S) satellite become GOES East, with the concomitant loss of direct-readout satellite data (GVAR), and the re-acquisition of satellite data (GRB). Documents and arguments have to be prepared to be used in discussions with the funding bodies (national and/or international) for bolstering the case of why the funds should be expended on the purchase and maintenance of a GRB direct-readout system or systems (if multiple nations are to be involved, then a client/server or Internet distributed systems needs to be considered.). Simultaneously, the technical specification for the GRB system has to be developed (this implies that there has been a discussion of the needs of the service(s)). Based on discussions, the period for the presentations of arguments to the funding agency or agencies can take at least one year for an agreement to be reached on the intent to purchase the GRB system. It should take at least a further six (6) months for the launch and evaluation of the tender for the purchase of the GRB system(s). Purchase and the delivery and installation after signing of contract will take at least nine (9) months. Hence, the entire process will take at least two (2) years, and possibly 2.5 years.

22. The cost of a GRB system ranges from US$300,000 to $700,000 depending on configuration. Further, the standard warranty period is one (1) year and Meteorological Services will also have to factor the cost of a yearly maintenance contact after the warranty period and training for both maintenance staff and users.

23. In addition, for back-up purposes and during the transition from the current GOES to GOES-R, Meteorological Services should migrate all of their existing EUMETCast-A receivers (if in use at present) to GNC-A; to ensure provision of minimum GOES and Meteosat imagery. Furthermore, Internet-based options using NOAA CLASS and other sources should be explored for additional back-up.

4. **Members not planning to install a GOES-R GRB receiving system**

24. There are two (2) options available for this option, with option (1) being preferable under current Internet connectivity conditions:

1. ***GEONETCast-Americas***: In RA IV, GNC-A is used as a secondary system. Hence, while there are datasets available via GNC-A, bandwidth, latency and completeness of the satellite data for operational purposes are issues to be addressed. NOAA is committed to support GEONETCast Americas, and Meteorological Services should invest in one or more stations as a measure to reduce the risk of service interruption during the transition to GOES-R, or as back-up.
2. ***Internet***: Through the Internet meteorological service have the following options:
	1. Directly from public websites: The problem with this method is the latency of the imagery available and reliability;
	2. Extranet/password protected websites: The advantage is that this requires an agreement between services, but is more reliable and with a predictable latency and the service will receive what they need;
	3. FTP access: Not necessarily public, hence, more reliable but specific software may be needed for viewing the imagery. Usually the software is open sourced.

25. For all systems above, the bandwidth available will limit data availability. For the Internet users’ bandwidth on both ends are crucial. However, the bandwidth available for downloading will in most cases determine how quickly data including satellite imagery is received.

26. The cost of a GEONETCast-Americas receiving system is between US$5,000 to $30,000 for a simple or turn-key system.

**C. The Observing System Capability Analysis and Review (OSCAR) Tool**

27. In a major contribution to the ***WMO Integrated Global Observing System*** (WIGOS), as part of the Rolling Review of Requirements (RRR) process of the *WIGOS Operational Information Resource* (WIR), the Meteorological Service of Switzerland (MeteoSwiss) has created and is maintaining a data inventory and tool (referred to as the *Observing Systems Capabilities Analysis and Review* tool - **OSCAR**) on user requirements and observing system capabilities. Its primary aim is to determine the extent to which the global observing systems relevant to WIGOS, comprised of the surface- and space-based observing systems, meet user requirements for observations.

28. OSCAR is designed to address two fundamental requirements which allow for the maintenance and accessibility of information on: (i) technology-free user requirements for observation of geophysical variables, for all application areas; and, (ii) Observing systems capabilities for global observing systems relevant to WIGOS (both surface-based and space-based).

29. The observations user requirements component of OSCAR (OSCAR/Requirements) allows for records of technology-free observations user requirements formulated by WMO and co-sponsored programmes: GCOS, GOOS, WCRP, etc.

30. The requirements are expressed for geophysical variables in terms of 5 criteria: (i) horizontal resolution, (ii) vertical resolution, (iii) observing cycle, (iv) timeliness and (v) uncertainty. For each of these criteria, the table indicates three (3) values:

* the “threshold” is the minimum requirement to be met to ensure that data are useful;
* the “goal” is the ideal beyond which further improvements would exceed requirements; and,
* the “breakthrough” is an intermediate level between “threshold” and “goal“ which, if achieved, would result in a significant improvement for the targeted application. The breakthrough level may be considered as an optimum, from a cost-benefit point of view, when planning or designing observing systems.

31. The observing capabilities of OSCAR are comprised of the following two components:

* The Satellite component of OSCAR (OSCAR/Space), which includes the space-based observing system capabilities database is maintained by the WMO Space Programme; and,
* The Surface-Based observing systems component of OSCAR (OSCAR/Surface), which will be maintained by the WMO World Weather Watch Programme.

32. While the development of the Satellite component of OSCAR (OSCAR/Space) of the OSCAR is well advanced and now operational, the OSCAR/Surface component was only recently beta tested and it should be operationalized by the end of 2015.

33. There are two fundamental requirements of OSCAR/Surface:

1. To provide for the entry, storage, maintenance and retrieval of all historical, current and future metadata associated with *WMO Publication No. 9, Volume A, Observing Stations* and *WMO Catalogue of Radiosondes*.
2. To contribute to the process of carrying out the Rolling Review of Requirements for the surface-based systems relevant to WIGOS, this shall include both land-based and ocean-based observing systems capabilities.

34. OSCAR/Surface has the following primary functions:

* Provide facilities for entry, storage, maintenance and retrieval of:
	+ required reference material and metadata on WIGOS historical, current and future surface-based observing systems;
	+ required reference material and metadata on WIGOS surface-based observing systems actual performance capabilities;
* Using appropriate data and information exchange mechanisms, interface to third party databases that contain information on the status and performances of observing stations managed by Members and partner organizations contributing to WIGOS;
* Using appropriate data and information exchange mechanisms, it provides or provides access to all necessary data and information to the processes and applications that support the RRR process, including the critical review of capabilities of surface-based observing systems;
* Using information from both OSCAR/Requirements and OSCAR/Surface, critical review by comparing the performance of the instruments with the user requirements, and identify gaps in conjunction with the use of other tools such as Observing System Experiments (OSE) and Observing System Simulation Experiments (OSSEs). The critical review is particularly useful for producing the Statements of Guidance (SoGs) for each of the application area which provide for a gap analysis and specific recommendations to address those gaps. SoGs are used in turn to produce and update the Implementation Plan for the Evolution of the global observing system (EGOS-IP).

35. As stated in paragraph 32 above, OSCAR/Surface will be operational be the end of 2015. It is intended that the transition from *WMO Publication No. 9, Volume A, Observing Stations* to OSCAR/Surface will be completed by 2017 and it will be the source of all capabilities and mandatory metadata by 2018. At Congress-17, it was indicated that the transition period from *WMO Publication No. 9, Volume A, Observing Stations* to OSCAR/Surface will start between September to October 2015 and the WIGOS National Focal Points will be given the opportunity to decide between providing their WIGOS metadata directly via OSCAR or continuing to provide their metadata through existing WMO procedures. Editing of the metadata would either through the web interface at **https://oscar.meteoswiss.ch/OSCAR/index.html#/** or via machine to machine via the web interface.

36. It is intended that by September 2017, the transition to OSCAR would be completed and *WMO Publication No. 9, Volume A, Observing Stations*, will officially cease to exist and related procedures used to maintain station information will be discontinued.

**D. WIS Registration and the Provision of Metadata**

37. WMO dispatched correspondence dated 10 February 2012 to the Permanent Representatives with WMO on the subject "*Making the WMO Information System Operational"* which requested the Permanent Representatives *inter alia*, to take action on the following matters:

1. Nomination of Principal Global Information System Centre (GISC);
2. Identification of a WIS Focal Points;
3. Registration with a GISC for management of WIS discovery metadata.

The Permanent Representatives were required to provide a written response to WMO with respect to the actions taken to the matters itemized above.

38. The RA IV Task Team on Regional WIS/WIGOS Implementation used the nominations provided by the Permanent Representatives to invite Meteorological Services to nominate a participant to attend a workshop of the creation of WIS Metadata and the updating of metadata records held at GISC Washington. The workshop, which was limited in participants due to funding, was held at the Caribbean Institute for Meteorology and Hydrology from 11‑13 August 2015.

39. The participants of the workshop were introduced to the GISC Washington portal, which enables the user to perform discovery, access and recovery of meteorological information. The portal is located at: **http://giscportal.washington.weather.gov/openwis-user-portal/srv/en/main.home**

40. The metadata records, which were available to the workshop, were generated by GISC Washington using metadata generation software with the input being the country records available in *WMO NO. 9, Volume C1 - Weather Reporting*. The metadata records, which were generated, were incomplete since crucial information pertaining to ownership of the information and how it can be access is not available in the publication.

41. Further, investigation of the metadata generated indicated other errors. A list of all WMO headers used by WMO Members in RA IV, as maintained by RTH Washington, was generated and circulated for Members to review and revise where necessary. A subset of the list for CMO Members is provided in **Appendix I**. The list includes WMO headers for meteorological data which are no longer transmitted by Meteorological Services on the GTS or in some case there are no WMO headers for data which is transmitted.

42. To assist Washington in removing the errors which may be contained in the WMO headers associated with a country, all National Meteorological Services in RA IV were provided with a form to register with the Telecommunications Operations Center of RTH Washington. Once registered, National Meteorological Services will be able to review and revise where necessary the WMO headers associated with their country directly on the RTH's database.

43. It will be recalled that WIS implementation was to be developed in two parallel parts;

**Part A:**

The continued consolidation and further improvements of the Global Telecommunication System for time-critical and operation-critical data, including its extension to meet operational requirements of WMO Programmes in addition to the World Weather Watch (including improved management of services);

**PART B:**

An extension of the information services through flexible data discovery, access and retrieval services to authorized users, as well as flexible timely delivery services.

44. However, without the metadata residing on a GISC, there will be no data discovery, access and retrieval. WIS has been designed for users to first access a GISC to ascertain data availability, data frequency, ownership and limit on its use, before data is retrieved and used. Meteorological Services are urged to ensure that the metadata associated with the products which they create is accurate and up-to-date.

\_\_\_\_\_\_\_\_

October 2015

**ANGUILLA**

There is no data from RTH Washington on Anguilla.

**ANTIGUA AND BARBUDA**

|  |
| --- |
| BMAA01TAPA |
| BMBB01TAPA |
| BMDA01TAPA |
| BMRR01TAPA |
| FAAT31TAPA |
| FACA31TAPA |
| FTAT31TAPA |
| FTCA31TAPA |
| SAAT00TAPA |
| SAAT31TAPA |
| SDAT20TAPA |
| SIAT01TAPA |
| SIAT31TAPA |
| SMAT00TAPA |
| SMAT01TAPA |
| SPAT31TAPA |
| USAT00TAPA |
| WHCA31TAPA |
| WOCA31TAPA |
| WSAT31TAPA |
| WSCA31TAPA |
| WVCA31TAPA |

**BARBADOS**

|  |
| --- |
| SARS10TBAC |
| BMAA01TBPB |
| BMBB01TBPB |
| BMDA01TBPB |
| BMRR01TBPB |
| CSBR01TBPB |
| CUBR01TBPB |
| FACA31TBPB |
| FADO31TBPB |
| FAVG31TBPB |
| FTBR31TBPB |

**BARBADOS Cont'd**

|  |
| --- |
| PAHM44TBPB |
| QAEA00TBPB |
| SABR01TBPB |
| SABR31TBPB |
| SIBR01TBPB |
| SIBR20TBPB |
| SMBR01TBPB |
| SMBR20TBPB |
| SMBR31TBPB |
| SMVX99TBPB |
| SNBR01TBPB |
| SPBR31TBPB |
| TFBR31TBPB |
| UAVX99TBPB |
| UEBR01TBPB |
| UFBR01TBPB |
| UGBR01TBPB |
| UKBR01TBPB |
| ULBR01TBPB |
| UQBR01TBPB |
| USBR01TBPB |
| WHCA31TBPB |
| WOCA31TBPB |
| WSOD31TBPB |
| WSVG31TBPB |
| WVCA31TBPB |
| BMAA01TBPO |
| BMBB01TBPO |
| BMBB99TBPO |
| BMDA01TBPO |
| BMRR01TBPO |
| WSCA31TBPO |
| WVCA31TBPO |

**BELIZE**

|  |
| --- |
| BMAA01MZBZ |
| BMBB01MZBZ |
| BMBB99MZBZ |
| BMDA01MZBZ |
| BMRR01MZBZ |
| CSBH01MZBZ |

**BELIZE Cont'd**

|  |
| --- |
| CUBH01MZBZ |
| FLBH01MZBZ |
| FTBH01MZBZ |
| FTBH21MZBZ |
| FTBH31MZBZ |
| NTXX99MZBZ |
| PAHM44MZBZ |
| SABH01MZBZ |
| SABH21MZBZ |
| SABH31MZBZ |
| SACA31MZBZ |
| SIBH01MZBZ |
| SIBH21MZBZ |
| SMBH01MZBZ |
| SPBH21MZBZ |
| SPBH31MZBZ |
| UEBH01MZBZ |
| UFBH01MZBZ |
| UGBH01MZBZ |
| UKBH01MZBZ |
| ULBH01MZBZ |
| UQBH01MZBZ |
| USBH01MZBZ |
| WHCA31MZBZ |
| WOCA31MZBZ |
| WSCA31MZBZ |
| WVCA31MZBZ |
| SABH31MZXB |
| SIBH21MZXB |

**BRITISH VIRGIN ISLANDS**

There is no data from RTH Washington on British Virgin Islands.

**CAYMAN ISLANDS**

|  |
| --- |
| SAGC31MWCB |
| SMGC01MWCB |
| SPGC31MWCB |
| UFGC01MWCG |
| UGGC01MWCG |
| UKGC01MWCG |
| UMGC01MWCG |

**DOMINICA**

|  |
| --- |
| SAMR20TDFF |
| BMAA01TDPD |
| BMBB01TDPD |
| BMDA01TDPD |
| BMRR01TDPD |
| NTXX99TDPD |
| SADO01TDPD |
| SADO31TDPD |
| SIDO01TDPD |
| SIDO20TDPD |
| SMDO01TDPD |
| WSCA31TDPD |
| WVCA31TDPD |

**GRENADA**

There is no data from RTH Washington on Grenada.

**GUYANA**

There is no data from RTH Washington on Guyana.

**JAMAICA**

|  |
| --- |
| BMAA01MKJP |
| BMBB01MKJP |
| BMBB99MKJP |
| BMDA01MKJP |
| BMRR01MKJP |
| CSJM01MKJP |
| CSJM01MKJS |
| CSJM31MKJP |
| CUJM01MKJP |
| FJJM31MKJP |
| FTJM01MKJK |
| FTJM01MKJP |
| FTJM31MKJP |
| FTJM31MKJS |
| FTJM31MKKP |
| NTXX99MKJP |
| PAHM44MKJP |
| SACA31MKJP |
| SAJM01MKJP |
| SAJM20MKJP |
| SAJM21MKJP |
| SAJM31MKJP |
| SAJM31MKJS |
| SAJM31MKKJ |
| SAJM31MKPS |
| SIJM01MKJP |
| SIJM20MKJP |
| SIJM20MKJS |
| SIJM20MKKS |
| SIJM21MKJP |
| SIJM21MKJS |
| SIJM31MKJP |
| SIJM31MKJS |
| SMJM01MKJP |
| SMJM01MKJS |
| SMJM20MKJP |
| SMJM20MKJS |
| SMJM31MKJP |
| SMVX99MKJP |
| SNJM01MKJS |
| SPJM31MKJP |
| SPJM31MKJS |
| **JAMAICA Cont'd**UACA31MKJP |
| UAJM01MKJP |
| UEJM01MKJP |
| UGJM01MKJP |
| UKJM01MKJP |
| ULJM01MKJP |
| UQJM01MKJP |
| USJM01MKJP |
| WACA31MKJP |
| WAJM31MKJP |
| WCCA31MKJP |
| WCJM31MKJP |
| WCJM32MKJP |
| WCJM33MKJP |
| WCJM34MKJP |
| WCJM35MKJP |
| WHCA31MKJP |
| WOCA31MKJP |
| WSCA31MKJP |
| WSJM31MKJP |
| WSJM32MKJP |
| WSJM33MKJP |
| WSJM34MKJP |
| WSJM35MKJP |
| WVCA31MKJP |
| WVJM31MKJP |
| WVJM32MKJP |
| WVJM33MKJP |
| WVJM34MKJP |
| WVJM35MKJP |

**MONTSERRAT**

There is no data from RTH Washington on Montserrat.

**ST. KITTS/NEVIS**

|  |
| --- |
| BMAA01TKPK |
| BMBB01TKPK |
| BMDA01TKPK |
| BMRR01TKPK |
| NTXX99TKPK |
| SAAT13TKPK |
| SAAT31TKPK |
| SAAT31TKPN |
| SAMR20TKFF |
| SARA10TKUR |
| SIAT01TKPK |
| SIAT20TKPK |
| SIAT20TKPN |
| SIAT21TKPK |
| SMAT01TKPK |
| SMAT01TKPN |
| SMAT20TKPK |
| SMTA01TKPK |
| SPAT31TKPK |
| SPAT31TKPN |
| WSCA31TKPK |
| WSEE31TKAC |
| WSRA31TKAC |
| WVCA31TKPK |

**SAINT LUCIA**

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| BMAA01TLPC |
| BMBB01TLPC |
| BMBB99TLPC |
| BMDA01TLPC |
| BMRR01TLPC |
| FTLC01TLPL |
| FTLC31TLPL |
| NTXX99TLPL |
| SACA31TLPL |
| SACA33TLPL |
| SALC01TLPL |
| SALC31TLPC |
| SALC31TLPL |
| SICL01TLPL |
| SILC01TLPC |
| SILC01TLPL |
| SILC20TLPL |
| **SAINT LUCIA Cont'd**SILC31TLPC |
| SILC31TLPL |
| SLAC31TLPL |
| SMLC01TLPC |
| SMLC01TLPL |
| SMLC31TLPL |
| SPLC31TLPC |
| SPLC31TLPL |
| WSCA31TLPC |
| WVCA31TLPC |

**ST. VINCENT and the GRENADINES**

There is no data from RTH Washington on St. Vincent and the Grenadines.

**TRINIDAD AND TOBAGO**

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| ATSA31TTPP |
| BMAA01TTPP |
| BMBB01TTPP |
| BMBB99TTPP |
| BMDA01TTPP |
| BMRR01TTPP |
| CSTD01TTPP |
| CUTD01TTPP |
| FACA31TTPP |
| FASA20TTPP |
| FASA30TTPP |
| FASA31TTOO |
| FASA31TTPP |
| FASS31TTPP |
| FSCA31TTPP |
| FTAC31TTPP |
| FTCA20TTPP |
| FTCA31TTCP |
| FTCA31TTPP |
| FTSA03TTPP |
| FTSA31TTCP |
| FTSA31TTPP |
| **TRINIDAD AND TOBAGO****Cont'd**FTTD31TTPP |
| NTXX99TTPP |
| NWCA31TTPP |
| NWTD31TTPP |
| PAHM44TTPP |
| SATD01TTPP |
| SATD13TTPP |
| SATD20TTPP |
| SATD31TTCP |
| SATD31TTPP |
| SATF31TTPP |
| SATS31TTPP |
| SDCA31TTPP |
| SDTD20TTCP |
| SDTD20TTPP |
| SITD01TTPP |
| SITD20TTCP |
| SITD20TTPP |
| SITD21TTPP |
| SITD31TTPP |
| SMTD01TTCP |
| SMTD01TTPP |
| SMTD01TTTP |
| SMTD10TTPP |
| SMTD20TTPP |
| SMTD31TTCP |
| SMTD31TTPP |
| SPTD01TTPP |
| SPTD20TTPP |
| SPTD31TTCP |
| SPTD31TTPP |
| STAD31TTPP |
| UANT01TTPP |
| UDTD01TTPP |
| UEDT01TTPP |
| UETD01TTPP |
| UGTD01TTPP |
| UKTD01TTPP |
| UKYD01TTPP |
| ULTD01TTPP |
| UQTD01TTPP |
| USTD01TTPP |
| UXTD01TTBB |
| UXTD01TTPP |
| UXTD31TTPP |

**TRINIDAD AND TOBAGO Cont'd**

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| UXTS01TTPP |
| WCCA31TTPP |
| WCCA32TTPP |
| WCCA33TTPP |
| WCCA34TTPP |
| WCCA35TTPP |
| WHCA31TTPP |
| WHMR31TTPP |
| WOCA31TTPP |
| WOMR31TTPP |
| WSCA31TTPP |
| WSCA32TTPP |
| WSCA33TTPP |
| WSCA34TTPP |
| WSCA35TTPP |
| WSTD31TTPP |
| WVCA31TTPP |
| WVCA31TTRP |
| WVCA31TTZP |
| WVCA32TTPP |
| WVCA33TTPP |
| WVCA34TTPP |
| WVCA35TTPP |

**TURKS AND CAICOS ISLANDS**

WMO Headers for the Turks and Caicos Islands are merged with the Bahamas.