CARIBBEAN METEOROLOGICAL ORGANIZATION

CARIBBEAN METEOROLOGICAL COUNCIL **Doc.10**
SIXTY-SEVENTH SESSION
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CMO WEATHER RADAR NETWORK

(Submitted by the Coordinating Director)

Introduction

1. The weather radar network across the Caribbean Meteorological Organization (CMO) Member States consists of a mix of 8 weather radars (operational and non-operational) at varying stages of their life cycle and are located in Barbados, Belize, Cayman Islands, Guyana, Jamaica, Saint Lucia and Trinidad and Tobago (2). The Caribbean radar coverage is boosted by other radars located in Martinique, Guadeloupe, Sint Maarten, Dominican Republic and Cuba. These radars provide national and regional detection of hydrometeorological hazards such as thunderstorms, **intense and damaging rainfall, strong winds, tropical storms, hurricanes and their evolution**, and the threat posed to life and property. Figure 1 shows the location of weather radars across the Caribbean, except for Saint Lucia and Tobago.

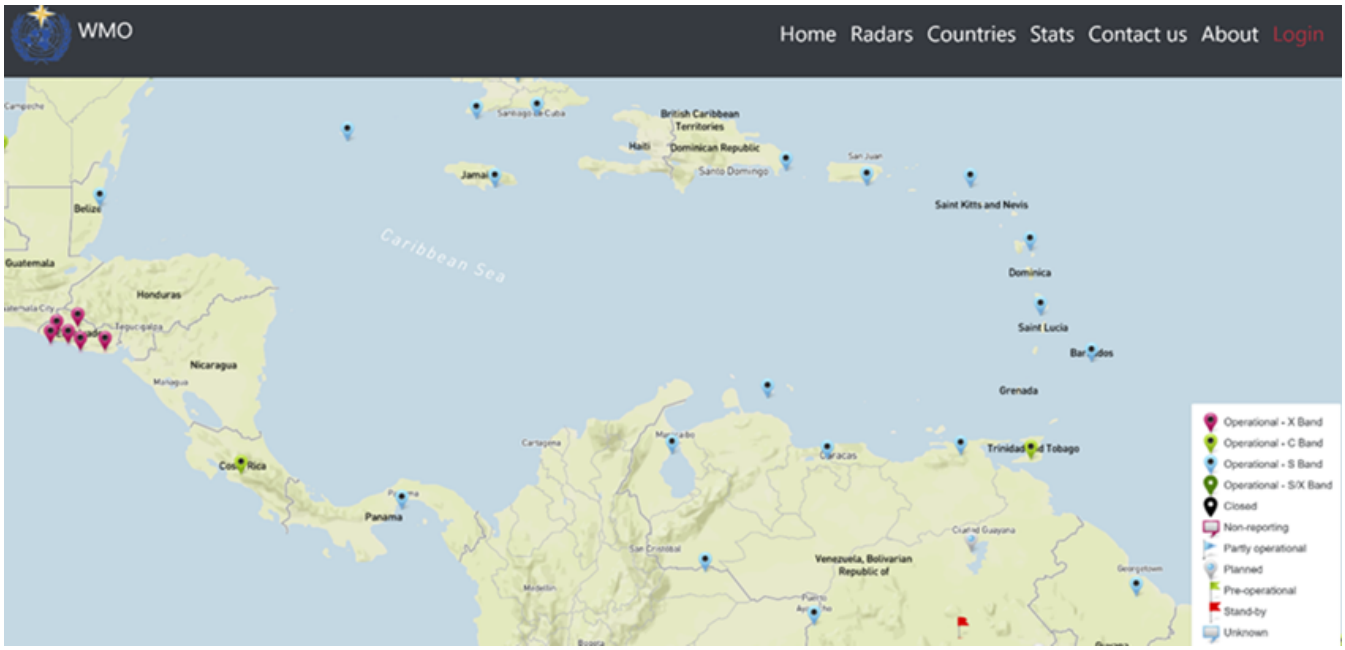

Figure 1. Locations of weather radars across the Caribbean, 2024 (courtesy, World Meteorological Organization, WMO).

2. This document examines the operational status of the CMO Weather Radar Network and provides updates on other activities regarding the radars since CMC65 (Trinidad and Tobago, November 2023). The document also raises awareness on emerging radar issues, provides recommendations for the Council to consider and informs on the CMO Operational Radar Group

(CORG) activities during the intersessional period. It will seek, among others, endorsement of the activities contained herein by the Council.

Economic Sensitivity, Operational Fragility of Aged Radars and Benefit of Radar Modernization

3. Economic sectors that are sensitive to weather events benefit from higher data quality, availability and consistency in early warning data for severe-weather events as weather information is an important part of their day to day, activity, contingency and strategic planning. The weather radars on the Caribbean radar network are essential remote observation assets in forecasting short-term, severe weather such as thunderstorms, tornadoes, hail, extreme rain, and microbursts. These radars improve decision-making when the countries and the region face weather and climate extreme events and assist with mitigating damage. Therefore, these weather radars are vital components of Member countries and regional early warning systems.

4. CMO-implemented weather radar systems consist of five (5) radars, one which was recently upgraded (Barbados 2022), and four (Cayman Islands, Belize, Guyana, Trinidad and Tobago (10+ years) that are aged and needs upgrading with modern technology. Replacing the aged radar technology will assist with ensuring access to higher quality, more reliable, and easier to maintain radar systems. The improved weather data quality from upgraded systems is vital to several applications and will contribute to increased usage of radar information and benefit a number of weather-sensitive economic sectors such as disaster preparedness, agriculture, water, media, marine services and fisheries, construction, aviation, tourism, transportation, and retail.

5. The Council is reminded that the weather radars are an important component of modern weather forecasting and warning that must **operate 24 hours a day, 7 days a week, 365 days per year and are not set-and-forget operations**. Rather, they require regular check-up, and calibration and radar experts available to provide planned preventative maintenance and unplanned maintenance at a moment's notice due to issues such as voltage fluctuations that may cause radar outages. To do this effectively and efficiently, the radar operators require adequate, dedicated and sustainable annual budgetary allocations to procure spare parts, and for engaging external radar expertise when necessary. Further, maintenance costs are adding up with parts becoming more and more difficult to procure for the older radars.

6. The Council is asked to note that, operating and maintaining a weather radar is a complex and costly endeavor and fraught with challenges that can be overwhelming for the Member countries that own and operate them. Therefore, it is important that there is a shared regional vision aimed at working together to maintain and sustain the radars on the network collectively to improve the ability to detect and track severe weather within the region.

(a) Previous Radar Status Report

7. At the 65th Council, it was reported that Trinidad and Tobago's radar outage, which started in February 2020, continued into 2023; the Cayman Island started radar outage in 2023; while Jamaica's new radar, installed under the *Pilot Program for Climate Resilience* (PPCR) project in 2021, experienced major mechanical defects in March 2022 and the radar outage continued in 2023. The Council was also apprised that the regional radar network expanded with operational radars in Saint Lucia, Sint Maarten and Martinique.

(b) Current Status of the CMO Weather Radar Network and other Caribbean Radars

Trinidad Radar

8. Council will recall that at CMC65 it was reported that Trinidad and Tobago was making progress to have its radar repaired in time for the 2024 hurricane season. After approximately four years of radar outage, the Trinidad and Tobago's weather radar was successfully repaired and

returned to operations in July 2024, with a recommissioning of the radar on 6 July 2024. To date the radar remains in a functional and operational state. The radar repair process for Trinidad and Tobago was a surmountable challenge with unique learning experiences for all involved.

9. Due to the prolonged radar outage, repair works were required for all the major components of the radar, including the antenna control unit, transmitter unit, waveguide, dish motors, gearboxes and receiver unit including installation of a new signal processor, as shown in Figure 2. During the repair process Trinidad and Tobago experienced many challenges in accessing spare parts, including having to order custom-made parts due to the age of the radar, while some of the ordered new parts were incompatible and had to be adapted. In some instances, custom made spare parts took up to nine months to be provided; in other instances, radar parts had to be purchased from Barbados, and at times the company had to source parts from other countries that had already upgraded their radars.

Heavy corrosion on wave guide. New waveguide rotary joint installed. Feed horn changed.

New gearboxes installed. New signal process installed, D-link switch changed. New dehydrator repaired installed

Figure 2. Components repaired or changed during the radar repair process in Trinidad and Tobago.

10. Additionally, due to the remote location of the radar site, poor internet services prolonged repairs. The process involved the Government of Trinidad and Tobago utilizing its radar fund held by the CMO Headquarters to procure spare parts and engage Leonardo GmbH of Germany to repair the radar. During the process, the CMO Headquarters advocated on Trinidad and Tobago's behalf by engaging Leonard directly and facilitated meetings between the Government of Trinidad and Tobago and the company to ensure that the radar return to an operational state, after significant funds had been expended.

11. Trinidad and Tobago also utilized the radar outage period to fully refurbished and strengthened the structure and compound housing the radar. This included replacing the standby generator, air conditioner units, dehumidifier, uninterruptible power supply (UPS), diesel fuel storage tanks, water storage, security booth, sealing of the radome, structural metal and street work, and re-fencing the radar compound, among others.

<u>Best practices to employ to have the radar functioning until upgrade</u>

12. On completion of the repairs, Leonardo GmbH has committed to assist and ensure that the weather radar remains operational until the radar is upgraded. To achieve this, it has requested that the Trinidad and Tobago Meteorological Service has a maintenance contract in place, which includes:

- Helpdesk support
- Preventive maintenance, conducted 1 to 2 times per year
- Procurement of spare parts and consumables.

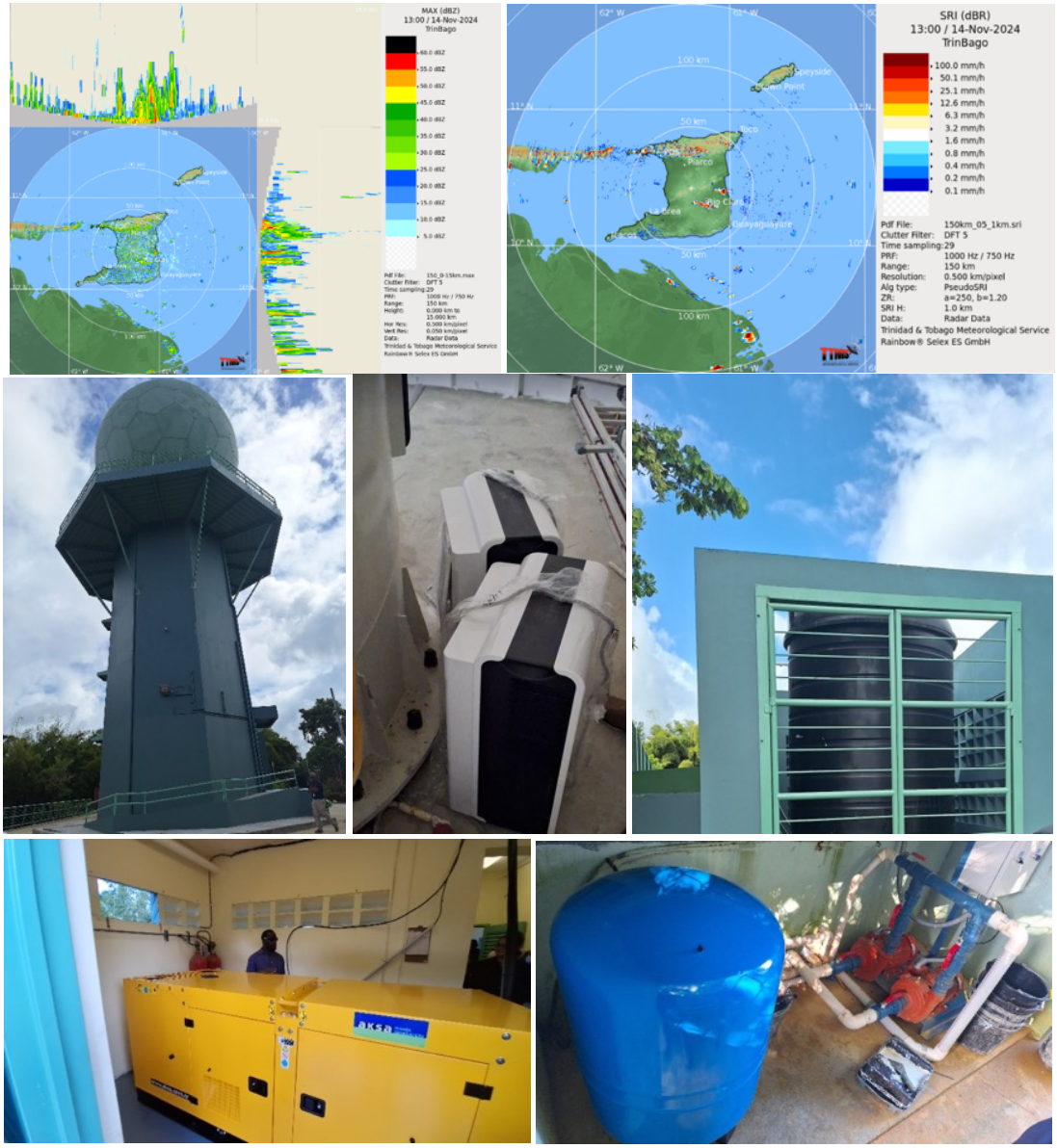

Figure 3. Operational Trinidad and Tobago Radar and Structural Refurbishment

Tobago Radar

13. The radar in Tobago continues to function without any hardware or software issue and remains up-to-date in terms of manufacturer maintenance schedules and software licenses. However, challenges with irregular voltage at the office building continue to affect the radar, including radar freezing and at times a complete radar shutdown. Steps are being taken to resolve the issue and this expected to be resolved by the end of the year. A damaged router continues to prevent the ISP device from performing dual WAN routing functions. A new router is scheduled to be implemented.

Barbados Radar

14. Since the Barbados Meteorological Service (BMS) upgraded the Barbados Doppler Weather Radar in 2022 with state-of-the-art, dual-polarization technology, the radar has been operational and continues to improve the BMS's ability to track severe weather events and issue early severe weather warnings. The radar is integrated with the BMS unmanned surface vessels (USV), which roam the ocean's surface, collecting oceanographic and atmospheric data as shown in Figure 4. This enhances the capability of the BMS to monitor and warn of impending severe weather.

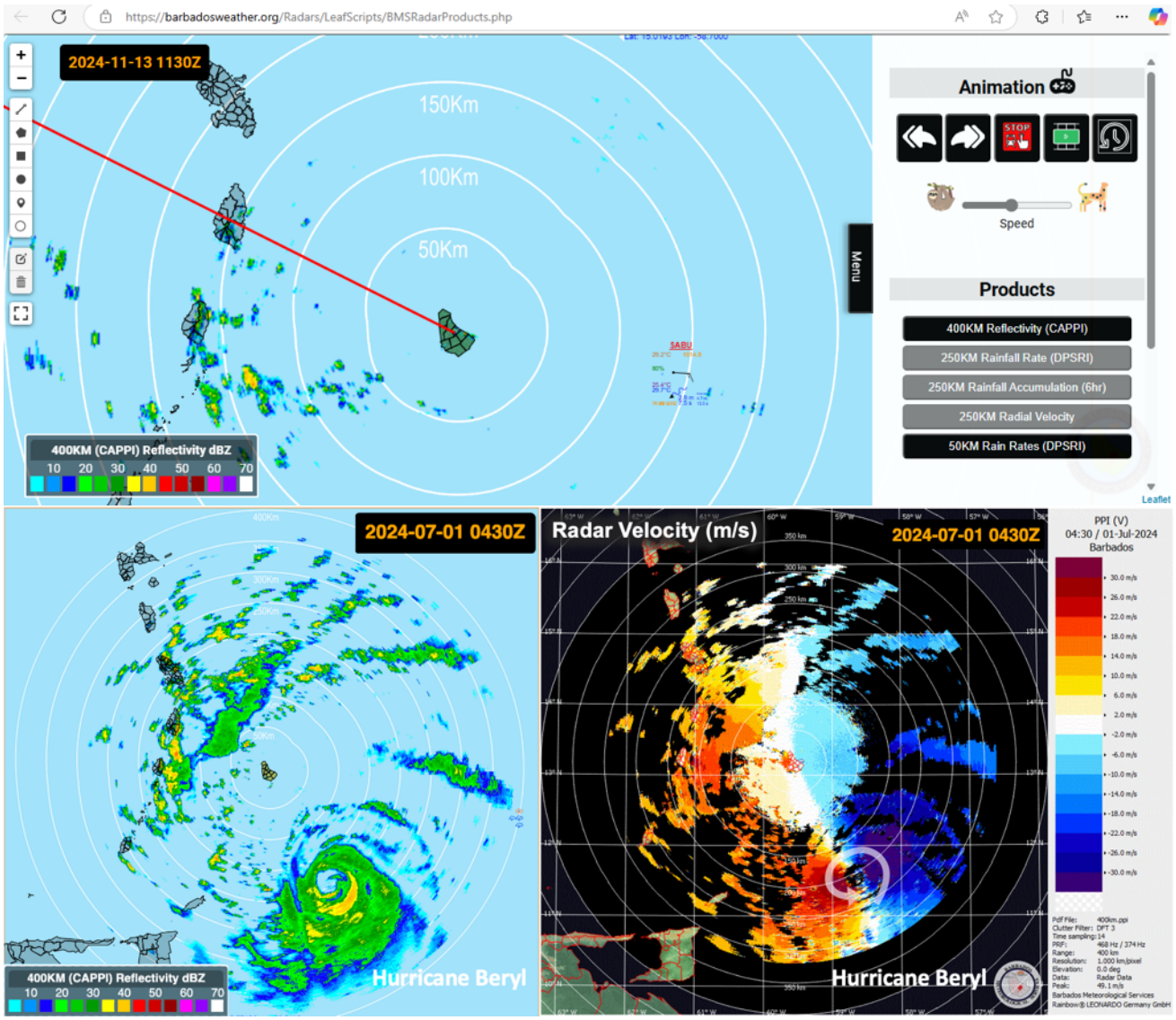

Figure 4. Snapshot of Barbados weather radar integrated with the unmanned surface vessel, which provide surface weather observations in the marine environment; (lower-left) Radar Reflectivity and (lower right) Radar radial wind velocity showing Hurricane Beryl on 1 July 2024 at 0430 UTC.

Problems encountered during the year

15. During the intersessional period, the BMS radar encountered very few operational challenges. The BMS radar was offline on two occasions during scheduled periods of bi-annual maintenance and calibration performed by the service provider, Leonardo on: 6–8 March 2024 and 15–17 October 2024. During the most recent maintenance period, the Leonardo technician discovered a burst grease distribution line in the elevation section of the radar pedestal. Further investigations indicated that the grease distributor was faulty and not allowing the grease to flow to critical distribution points. Attempts to change it were hindered due to the replacement grease distributor not being compatible with the current radar. As a result, another distributor was shipped to Barbados and installed on 1 November 2024, by a Leonardo technician.

16. Apart from this, there was one occasion when the radar images became unavailable on the BMS website due to a malfunctioning firewall at the radar site, which was replaced after checks revealed that the radar was still operational but the images were not reaching the portal. On another occasion, an air conditioner (AC) unit became faulty; however, the backup AC unit was able to provide sufficient cooling until repairs to the faulty AC were completed.

Best practices employed to keep radar functioning during the year

17. The technical team of the Barbados Meteorological Service continues to perform weekly physical checks at the radar site. When physical visits are not possible, the advanced software-based maintenance and control platform that is built into the radar system is used to check on the radar functionality. In addition, budgeting has been allocated for the bi-annual visits by the technicians from Leonardo and the availability of spare parts. The BMS plans to upgrade the servers at the radar site during 2025 and to acquire additional spare parts for the radar in an effort to minimize downtime.

Belize Radar

18. At the time of writing this document, Tropical storm Sara was threatening Belize, and the weather radar was expected to play a significant role in the provision of early warning information. Presently, the weather radar in Belize is in working condition (Figure 5) but is experiencing some challenges, including the following:

- Microwave signal generator not fully functional
- Test equipment requires calibration
- An inoperative hand-held antenna control unit
- Reduced capacity to purchase spares directly from the radar manufacturer
- Some essential spares, such as the waveguide dehydrator, are not currently in the inventory

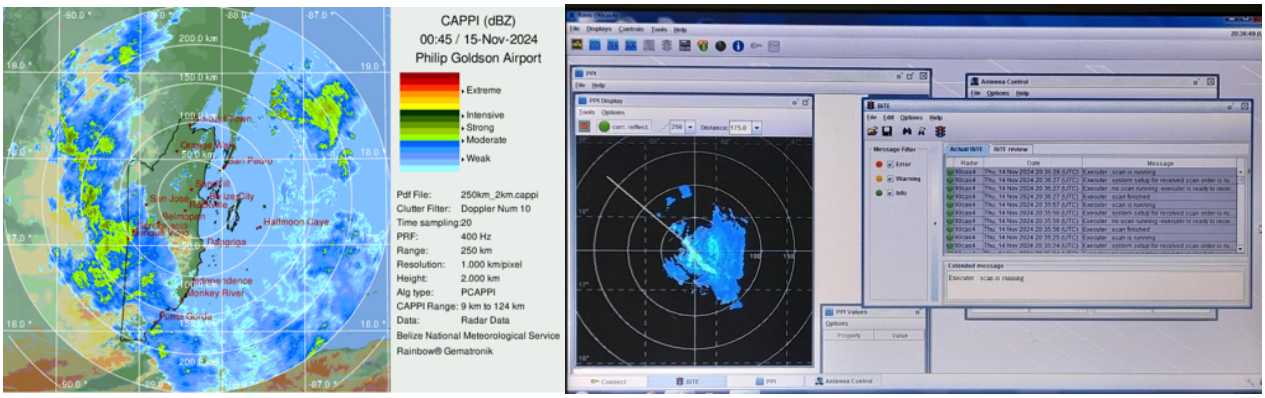

Figure 5. Belize radar sample image for the public and Ravis radar operations monitoring display.

19. During the intersessional period, Belize radar encountered some challenges related to faulty transmitter signal boards, on-board cooling fans, failed safety PLCs (programmable logic controllers), and faulty cabinet fans.

Best practices employed to keep radar functioning during the year

20. To ensure the radar uptime is preserved, Belize employed the following during the year:

- Maintained ambient temperature and relative humidity in the radar room at optimal levels, that is, below 25 degrees Celsius and 60%, respectively.
- Performed scheduled preventative maintenance servicing and calibration procedures as recommended by the manufacturer, and
- Archived radar data using WinSCP routinely.

Near future plans to keep the radar functioning

21. Belize plans to perform calibration procedures and scheduled maintenance as recommended by the radar manufacturer and request the acquisition of necessary spare parts, such as the waveguide dehydrator unit.

Cayman Islands Radar

22. After experiencing a major radar outage just prior to DMS 2024, the Cayman Islands dual-polarization Doppler weather radar return to an operational state in May 2024, with all of the radar's major components fully functional, following repairs performed by technicians from Leonardo.

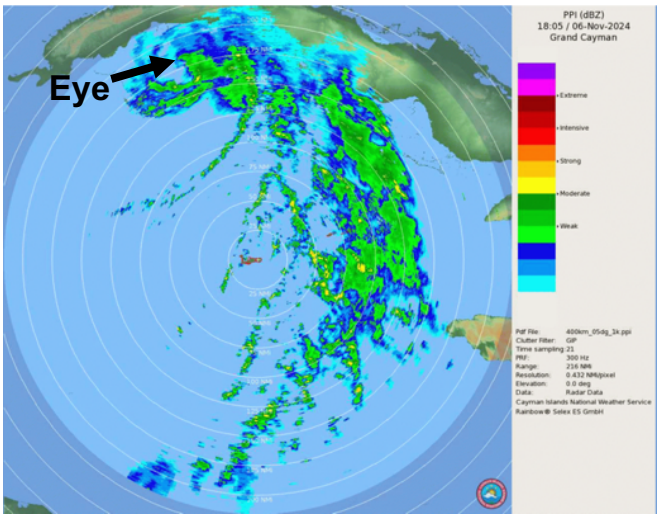

Figure 6. Cayman Islands: Radar reflectivity showing the eye and rain bands of Hurricane Rafael

Best Practices employed to sustain radar operations since the radar returned to operations

23. Following the repair of the Cayman Islands weather radar, on the recommendation of Leonardo, the Government of the Cayman Islands recently signed a one (1) year technical support service contract with Leonardo GmbH, which includes:

- Two (2) annual preventative maintenance site visits by Leonardo's technicians
- One (1) corrective maintenance site visit by Leonardo's technicians
- One hundred (100) hours of helpdesk support
- Participation in Leonardo's spare parts pool, which puts the Cayman Island on list of radar operators that will enable it to get ahead of others not in the pool to access spare parts when needed
- 5 days' hardware and 5 days' software training at the Leonardo factor for the Cayman Island radar technician.

24. As another best practice, the Cayman Islands was also advised to perform an audit of its spare parts inventory to determine the status of critical spare components and have them replaced. This audit was conducted during the visit of Leonardo's technician, following which the critical spares parts were replaced, and the inventory is now up to date.

25. The Cayman Islands radar signal processor is due for replacement as a result of the age of the system. The new system has already been procured and will be replaced during the first week of December 2024, after the conclusion of the 2024 hurricane season, when the Leonardo technician is scheduled for a preventative maintenance visit.

26. Currently, there is a challenge related to failing condensers in air conditioners (AC) at the radar site. However, new AC units are being procured to ensure that optimal conditions continue for the radar. In addition to this, the Cayman Islands Government is carrying out a structural assessment of radar facility to ensure the building meets local safety standards. Upon completion, critical maintenance will be carried out.

Future Plans

27. The Cayman Islands plan to conduct the following in the short to medium term:

- **Safety System Replacement**: to increase the safety for maintenance staff and the environment by replacing critical component, including the replacement of old TR limiters which contain tritium and the removal of the waveguide filter which contains SF6 gas.
- **Radar Upgrade**: The Cayman Islands National Weather Service recently gained approval for a full radar upgrade. The current S-Band radar will be upgraded with the latest technology, which will increase the lifetime and availability of the Cayman Islands Radar, while reducing the maintenance cost.

Guyana Radar

28. Since June 2024, Guyana Hydro-meteorological Service (GHMS) has been experiencing radar outage due to mechanical damage to the radar antennae. A Leonardo technician visited in July to start the repair process, which involves purchasing of spare parts from Leonardo and local fabrication of parts by the GHMS.

Jamaica Radar

29. The Meteorological Service of Jamaica (MSJ) continued to experience weather radar outage as the plans of the radar manufacturer to restore the radar to an operational state not materialize. The Government of Jamaica has initiated steps to repair the radar utilizing its allocated funds held for stations by the CMO Headquarters.

Saint Lucia radar

30. The Saint Lucia Meteorological Services (SLMS) radar is currently offline. At the start of the 2024 Dry Season, a decision was taken to turn the radar off as a measure to protect the radar magnetron. There is no dedicated operational staff or fully trained technicians for the maintenance of the radar. Due to a lack of sufficiently trained personnel, attempts to restart the radar have failed.

St Maarten Radar

31. The Meteorological Department of Sint Maarten (MDSM) recently-installed radar continues to function without any issues. The radar data are provided to both Barbados and Météo-France Martinique for use in the radar mosaic, and the images are now available online to the public. From time to time, internet instability affects the availability of images.

<u>Best practices to sustain the radar functionality</u>

32. The MDSM has a five-year maintenance contract with Vaisala, which includes:
    - Site visits by the service provider technicians if needed
    - Remote access, 24-hour support

The MDSM also has a three-year spare parts agreement with the company to ensure easy access to spare parts for corrective maintenance.

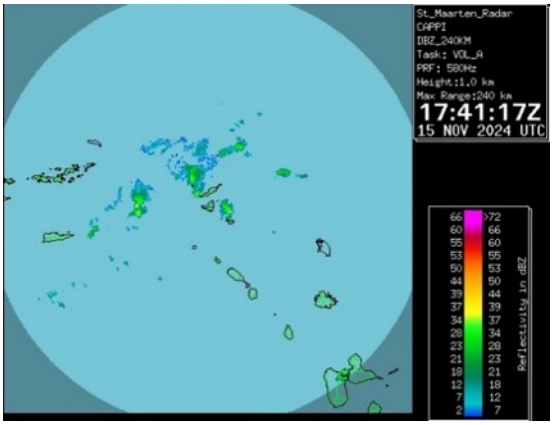

Figure 7. Sint Maarten weather radar screen image

Météo-France Martinique radar

33. Both the Guadeloupe and newly installed Martinique Leonardo 700S Doppler weather radars are operational (Figure 8). However, there have been challenges with the Martinique radar associated with the network. The radar also experienced electronic issues, but this was solved by a visit from Leonardo's technician as the radar is still under warranty. There are also challenges with the air conditioning system at the radar site.

Best practices employed to have radar functioning throughout the year

34. The employed practices include:

- Preventative maintenance checks every other week
- Remote monitoring every morning (except on weekends, but forecasters can call the technician if needed).
- Every three years an in-depth maintenance is performed by a visiting team of experts from France.
- There is a maintenance contract with service providers for the air conditioning system and generators.

Near future plans over the next year

35. Météo-France plans for the radars include the following:

- **Guadeloupe**: Fix an electrical issue not directly on the radar but with the management of the switch between the generator and the general current.
- **Guadeloupe and Martinique**: Upgrade the network to 4G for the backup data transmission
- **Martinique**: Have an electrical audit done at the radar site by an approved provider. Perform an overview assessment from the radar to identify masks that alter the reflectivity and the rainfall accumulation.

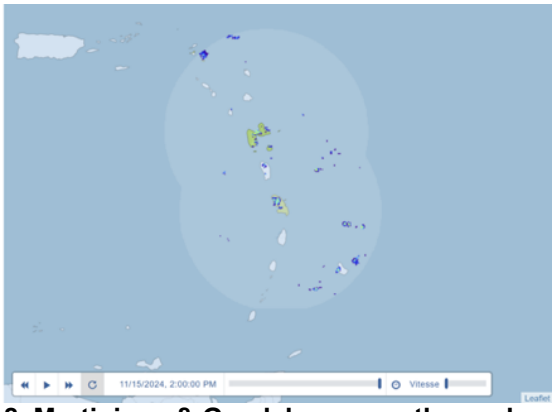

Figure 8. Martinique & Guadeloupe weather radar mosaic

(c) Caribbean Weather Radar Mosaic and Regional Benefit

36. The Council is asked to recall the vital role played by the Barbados Meteorological Service (BMS) in generating the Caribbean radar composite maps every 15 minutes. At the time of CMC65 (November 2023), the radar composite maps consisted of radar data from nine (9) regional radars providing mosaic products for rainfall rates and rainfall accumulations at 1, 3, and 6 hourly durations. This mosaic includes all the Caribbean radars available in the network, along with radars in Miami, Columbia, and Suriname, and the mosaic can reach a maximum of 18 contributing radars. The radar mosaic is only possible due to regional and international data exchange of national radar data outside of CMO Member countries through the WMO *Global Telecommunications System*.

37. Since CMC65, the BMS has expanded the composite radar maps to include radar data from Tobago and Saint Lucia. Following a request from the BMS, the CMO Headquarters and the WMO Regional Office facilitated meetings between the BMS and the Dominican Republic (DR) National

Meteorological Service, which led to further expansion of the mosaic with the DR and Cuba radars now included.

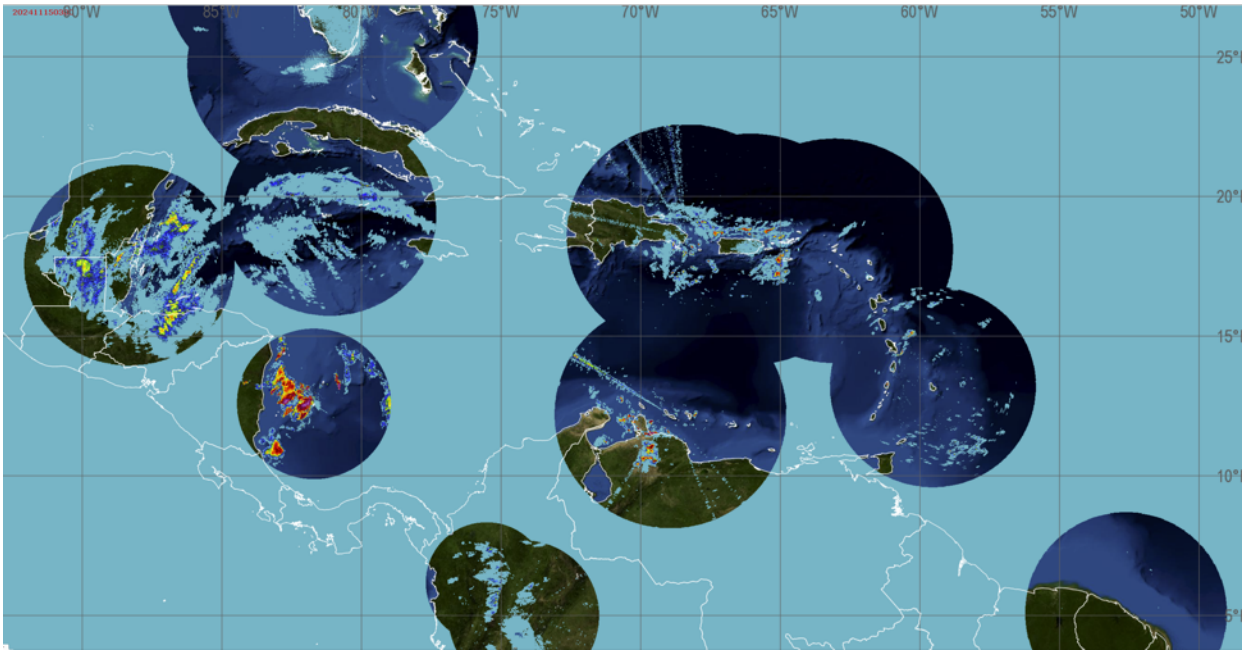

Figure 9. Sample of Caribbean Radar Composite provided by the Barbados Meteorological Service. Note that data will be missing for some periods because of outages or delay in data transmission.

Figure 9 shows the extent of the area covered by the radar mosaic, which Currently, Guyana's radar data is absent from the composite due to ongoing radar outage. now has an extended severe weather detection range over eastern and northern Caribbean. There is also increased overlap between radars, which is very useful in the event of scheduled radar outages or unexpected failures.

38. The Council is informed that due to the success of the radar composite provided by the BMS, the *National Oceanic and Atmospheric Administration* (NOAA) has shown an interest in using the Caribbean radar composite data in the data assimilation system of one of NOAA's new Numerical Weather Prediction (NWP) models. The NWP system is a unique system being developed at high spatial resolution, including over the Caribbean, and is expected to become operational in 2025. The request to have the radar data integrated with the model is to provide more accurate predictions and public weather forecasts.

39. CMO Headquarters arranged a preliminary meeting between the BMS and NOAA to discuss the feasibility of having the Caribbean composite radar data assimilated into NOAA's NWP model system. Prior to this meeting, an invited presentation by NOAA to the CMO Operational Radar Group showed improvement in the skill of the weather prediction model with assimilation of radar data from the Cayman Islands. However, in order for NOAA to use the region's radar data in its NWP models, the radar data must be compatible with NOAA's requirement and be in one common format.

40. Council is asked to note that, furthermore, CMO Headquarters met with the WMO Data and Information Management Division regarding assisting the Caribbean radar operators to output one common radar data format. The WMO team is working on putting together a project that will use the Caribbean to pilot a WMO common radar data format, to enable data exchange among stakeholders.

(d) CMO Headquarters Radar Modernization Project

41. The protection and safety of the people of CMO Member States from the hazardous impacts of severe weather events are key priorities for governments. A modern and reliable weather-forecasting system initialized with higher quality radar data will better guide governments in the safeguarding of their populations.

42. The Council is reminded of its endorsement at the CMC59 (Anguilla, 2019) of the CMO Headquarters proposal to seek funding to upgrade and modernize the remaining CMO radar infrastructure to meet current operational standards.

43. The Council is informed that the CMO Headquarters continues to work with the *Caribbean Development Bank* (CDB), CREWS Secretariat, *Green Climate Fund* (GCF) and WMO on a project to scale-up Caribbean Hydrometeorological and Multi-hazard Early Warning Services in Belize and Trinidad and Tobago. The first draft of the GCF Simplified Approval Process Funding Proposal (FP) for the project was uploaded to the GCF Portfolio Performance Management System (PPMS) Platform for GCF review on 13 November 2024.

44. A major activity in the GCF FP is to upgrade the Doppler Weather Radar systems in Belize and Trinidad and Tobago and enhance the capacity in weather radar operations and maintenance and optimize usage of the data for early warning through technical training and infrastructure improvements. Particularly, the activity includes but is not limited to the following:

- Doppler weather radar upgrading with latest dual polarization components for enhancement of nowcasting, severe weather and climate monitoring
- Technical support including a training programme focused on maintenance and operational sustainability, including technical staff training (factory and other), remote support, and service level agreement contract for manufacture technical visit at least once per year
- Training for IT staff in radar software applications including data archiving and data mining to improve data handling, analysis and transmission
- Sufficient spare parts procured to support an effective maintenance schedule
- Lightning suppression at radar site enhanced
- Enhancement of cybersecurity on the supporting network
- Provide specialized training for forecasters on the use of the upgraded radar products in weather prediction, enhancing the accuracy and timeliness of severe weather forecasts
- Additional radar software licenses to facilitate training and teaching on use of upgraded radar data at the CIMH and The University of the West Indies (UWI)

45. The modern dual polarized radars will significantly improve the precision of total precipitation estimates and rain rates, and distinguish between hail and heavy rain. These improvements will increase lead time for flash flood warnings, because of greater confidence in dual-polarimetric radar. Furthermore, because dual polarized radar directly detects supercooled liquid water above the freezing level, improved aircraft icing detection and warnings will be enabled.

46. When completed, the upgrade of the weather radars and the related activities will represent a significant advancement in weather forecasting technology and capability at the National Meteorological and Hydrological Services (NMHSs) and across the region. The information from these new radars will be useful to almost every sector of the economy, including water management, construction, public health, media, disaster management, environmental management, agriculture, and transportation.

47. The CMO Headquarters radar modernization project is responding to the needs and expectations of NMHSs, the public and Member governments, to deliver excellent, people-centred services and underscores the CMO Headquarters commitment to carry out the Council's decisions.

48. The radar modernization project aligns with the CMO's strategic priorities to

- Strengthen early warning systems to enhance disaster preparedness and reduce loss of life and property from extreme hydrometeorological and other severe weather events.
- Support the strengthening and maintenance of observation networks and information services.

(e) Engage Nationally to Protect Weather Radars from Radio Frequency Interference

49. It is being reinforced that weather radars are the backbone of day-to-day local, national, and regional nowcasting, weather forecasting, and warning. Weather radars utilize segments of the Radio Frequency Spectrum that are well suited to their operation, i.e., detecting local heavy rainfall and severe thunderstorms, strong winds, and icing aloft. However, radio frequency interference (e.g., Figure 10), especially from wireless devices such as local area telecommunication networks and surveillance cameras, causes severe interference for weather radars because they use the same operational radio frequencies and are a significant contamination source for weather radar data.

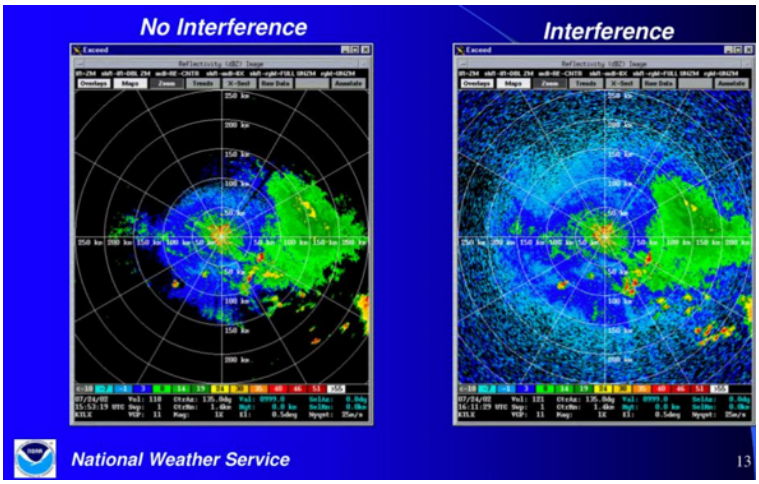

Figure 10. Radio frequency interference on radar detection of meteorological echoes (NOAA/NWS)

50. The *International Telecommunications Union* (ITU), the UN agency responsible for international regulation of radio spectrum use and allocating use to a particular frequency band, has allocated the frequencies specifically for meteorological radars (Table 1). These allocations are defined in international agreements and updated every four years at the World Radiocommunication Conference (WRC). The meteorological community is concerned that the increasing competition for bandwidths, including from the next-generation mobile phone data service, 5G, may be at the detriment of established applications relating to Earth observation satellites, radiosondes, aircraft, radar, and other observing systems. CMO Headquarters has been coordinating on these radio frequency matters with the WMO and the Caribbean Telecommunications Union (CTU).

51. The selection of a weather radar band type is a function of the tradeoffs between the distance and scale of detection desired, which vary due to the physics of rainfall attenuation, and the cost.

Table 1. Weather Radar Frequency Bands

Frequency Band (MHz)	Band Name	Benefits and Trade-offs
2700-2900	S-Band	Well suited for detecting heavy rain at very long ranges, e.g., up to 300 km
5250-5725 (mainly 5600-5650)	C-Band	Good compromise between range and reflectivity and cost and can provide rain detection up to a range of 200 km
9300-9500	X-Band	Low cost compared to S- or C-band systems and are more sensitive than S- or C-band radars to interference and are used for short-range weather observations up to a range of about 50 – 100 km

The majority of radars in the Caribbean radar network are S-band radars and provide the best performance in severe weather and therefore are the backbone of national and regional severe weather warning systems. Although Radio Frequency Interference is most prevalent with the C band, radars operating in the S band can also suffer.

52. Weather radars on the Caribbean network must be protected from radio frequency interference due to frequency encroachment. Weather radars with higher sensitivity lead to greater interference sensitivity. Because of the limitation of the available radio frequency spectrum, **the frequency band used by weather radars needs to be protected at national levels**.

53. The goal here is to ensure that frequencies used operationally at NMHSs continue to be allocated to this application area without interference from new users as the demands of different application areas increase. Radio frequency interference has multiple impacts on weather radars, that could reduce forecasters' situational awareness during hazardous weather events and thus hinder the provision of reliable data on which severe thunderstorms, heavy rainfall or flash flood warnings depend.

54. Members are asked to ensure that their NMHSs are involved in the radio frequency coordination and work in close contact with their national radio authorities to ensure that meteorological interests are taken into account in any decision-making process on the future usage of wireless devices to avoid interfering with the meteorological observations. The WMO has requested that the Members provide **National Focal Points for radio-frequency matters**. The CORG has recommended this as well.

(f) CMO Operational Radar Group (CORG)

55. The Council will recall that the *CMO Operational Radar Group* (CORG) serves to improve the maintenance and sustainability of the radar network and to provide advice and recommendations to the CMO and Directors of Meteorology on methods to improve the use of the radars, among other matters. The CORG met four (4) times in 2024 and continues to operate as a community of practice and serves as an example for other regions. As a result of this, the WMO requested that a representative of the group join its *Expert Team on Operational Weather Radars* (ET-OWR). Mr. Brian Murray, Deputy Director of the BMS and co-Chair of the CORG, is the region's representative on the ET-OWR.

CORG Activities

NOAA NWP Regional Radar Data Requirement & Added Value

56. Dr. Vijay Tallapragada, a Senior Scientist from the NOAA National Weather Service (NWS) National Center for Environmental Prediction (NCEP), delivered a presentation that demonstrated the value of having Caribbean radar data ingested in NOAA's NWP models, how this can be done, and what was required to achieve this sustainably. He showed the positive impact that radar data from the Cayman Islands had on NOAA's model data assimilation. The call by NOAA for access to the region's radar data not only presents an opportunity for the Caribbean to help improve the NOAA model forecasts, which are used across the region, but also aligns with a previous decision of the CORG to find a common radar data format for data exchange with stakeholders.

MeteoPress Proposal to assist the CORG and Members with Weather Radars

57. The CORG was also exposed to a presentation by Mr Michael Najman, founder and CEO of Meteopress, a radar manufacturer based in the Czech Republic. His presentation proposed to assist CORG Members with technical assistance, to solve some of the radar operation issues identified by the CORG, such as radar data format uniformity and calibration, and synchronizing the Caribbean radars data format to match the US requirements without compromising the current radar data.

CORG Abstract Presentation at AMS 104th Annual Meeting

58. Council is asked to recall that the CORG submitted an abstract that was accepted for presentation at the 104th American Meteorological Society (AMS) Annual Meeting held 28 January to

1 February 2024, in Baltimore, Maryland, USA. On 31 January, Mr. Kenneth Kerr represented the CORG and delivered a presentation entitled "*CMO Operational Radar Group – A Model for Capacity Development in Radar Operations and Coordination, Supporting Early Warning for All*", which was well received and generated several questions.

59. The CMO Operational Radar Group, per its Terms of Reference, is providing the following recommendations to the Council:

1. Agree to the implementation of a common weather radar data format across radars in the CMO network, in line with WMO standards, for use and exchange at national, regional, and international levels.

2. Agree that Members with radars should consider and respond to the request from NOAA to share their radar data with NOAA to improve the model output and inform the CORG of their decision.

3. Endorse the CORG decision to develop a test/pilot program as a short project to identify the needs to get Members radar data integrated into the NOAA model initialization process.

4. Encourage Members with dual-polarization radars to consider, where possible, inviting other Member States NMHSs radar engineers or technicians to attend their calibration session when the Leonardo engineers visit to enable hands-on exposure and training.

5. Encourage members with radars to strengthen the lightning suppression and dissipation at their radar sites as a priority, given the impact that lightning has had on the radars on the network and given the recommendations in the radar technical study report by Dr. Jeffrey Keeler, World Bank Radar Consultant.

6. Encourage Members NMHSs to involve themselves in national radio frequency matters and work closely with national radio authorities in the interest of radio frequency protection for meteorological weather radars.

Actions Proposed to Council:

60. The Council is invited to:

(i) **Note** the contribution of radars in the CMO network, the fragile nature of aged radar systems, their status, and challenges faced by CMO Member States operating radars.

(ii) **Urge** CMO Members with radars to implement best practices for sustainable radar operations and to engage in regular radar preventative and corrective radar maintenance programmes, and human resource capacity development in radar capability.

(iii) **Support** the CMO Headquarters in advancing its project to upgrade the radars in Belize, and Trinidad and Tobago to dual polarization status, through the Green Climate Fund-CREWS Scaling-up Framework

(iv) **Encourage** Members with radars to strengthen the lightning suppression and dissipation at their radar sites as a priority.

(v) **Further encourage** Members to nominate a national focal point for radio frequency coordination, get their NMHSs involved in national radio frequency matters, and to work closely with national radio authorities to protect radio frequencies for weather radars**.**

(vi) **Note**, and **urge** Members with radars to **act on** the recommendations of the CORG to improve management of radars; data transmission, archiving and retrieval; sharing of core radar products for public safety; and secure the digital assets and the physical radar site.

(vii) **Request** the re-establishment of Memoranda of Understanding for the Weather Radar Network Warning System in the Caribbean Region with the Members operating radars and the CMO Headquarters, to ensure sustainability of the network.

(viii) **Agree** with the CORG on the implementation of a common weather radar data format across radars on the network, to be developed in line with WMO standards.

(ix) **Further agree** that Members should consider and respond to the request from NOAA to share their radar data with NOAA to improve their model, whose outputs are freely available and widely used in the region, and inform the CORG of their decision.

CMO Headquarters

November 2024