



**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**

**REPORT OF THE
ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL
SERVICES**

Tortola, BRITISH VIRGIN ISLANDS

7 NOVEMBER 2009

INTRODUCTION

1.1 At the kind invitation of the Government of the British Virgin Islands, the 2009 Meeting of Directors of Meteorological Services was held at the Brumant Fellowship Hall, Tortola, British Virgin Islands, on Saturday 7th November 2009 under the Chairmanship of Mr Tyrone Sutherland, Coordinating Director of the Caribbean Meteorological Organization (CMO).

1.2 The Meeting fixed its hours of work and determined the order in which it would conduct its business.

1.3 A list of participants and observers attending the Meeting is attached as **ANNEX I** and the Agenda adopted by the Meeting is attached as **ANNEX II** to this Report.

THE 2009 HURRICANE SEASON (Agenda Item 2)

2.1 The 2009 Hurricane Season was below normal season with eight (8) named storms and two (2) tropical depressions. Two of the named storms became hurricanes and they both strengthened into intense hurricanes. As had been traditional, the Meeting discussed the impact of the season on the individual Member States and the overall effectiveness of the region's warning system for hurricanes and other severe weather.

2.2 To initiate discussions, a general summary of the 2009 hurricane season was presented. The summary below focuses on the main systems to affect the CMO Member States. Preliminary statistics on the weather systems are also provided:

- The 2009 Atlantic Hurricane season started in May; with the birth of Tropical Depression #1 off the coast of North Carolina.
- August produced four tropical cyclones in the Atlantic, namely, tropical storms Ana, Claudette, Danny and Bill which became an intense hurricane. **Ana** was the first cyclone to make landfall on an island in the Eastern Caribbean.
- September's activity was below normal with two named cyclones forming in the Atlantic Basin. These were **Hurricane Fred** and **Tropical Storm Erika**. **Erika** was the second cyclone to make landfall on a Caribbean island.
- October produced two tropical storms, Grace and Henri. Grace may have the record as the storm which formed at the highest latitude in the Atlantic Basin.

2.3 **Ana** developed from a tropical wave to the west of the Cape Verde Islands. The cyclone was in a shearing environment for most of its life as it crossed the Atlantic Ocean and degenerated into a depression on 13th August but restrengthened into a tropical storm on 15th August. The centre of the cyclone made landfall on Guadeloupe at approximately 0400UTC on 17th August as a depression. Ana produced a gust of 39kt over **Antigua** and a maximum one minute wind of 32kt; there was also localized flooding. Ana also caused the closure of the airports in the **British Virgin Islands** and **Montserrat**.

2.4 **Erika** formed to the east of the Leeward Islands on 1st September and its general movement was towards west-southwest. The centre of the storm made landfall on Guadeloupe at approximately 1900UTC on 2nd September. Erika produced torrential rainfall on **Antigua and Barbuda, Montserrat and St. Kitts/Nevis** on 3rd September. Erika, like Ana produced gusty winds and localized flooding in **Antigua**. The highest gust recorded at the V.C. Bird International Airport was 38kt with the maximum one-minute mean of 30kt.

PRELIMINARY 2009 HURRICANE SEASON STATISTICS

NAME	DATES	MAX WIND (MPH)	DEATHS
Tropical Depression # 1	28 -29 MAY	35	0
Tropical Storm ANA	11-17 AUG	40	0
Hurricane BILL	15 – 24 AUG	132	0
Tropical Storm CLAUDETTE	16 – 18 AUG	52	0
Hurricane DANNY	26 - 29 AUG	58	0
Tropical Storm ERIKA	01 -03 SEP	60	0
Hurricane FRED	07 - 12 SEP	121	0
Tropical Depression # 8	25 – 26 SEP	150	0
Tropical Storm GRACE	05 – 06 SEP	69	0
Tropical Storm HENRI	06 – 08 SEP	52	0

2.5 The Meeting was informed that there was a deficit in rainfall in all Member States that were present, although in Trinidad and Tobago, there was excessive rainfall during the months of July and August. The Director of the Trinidad and Tobago Meteorological Service also indicated that they experienced two tornadoes on 9 August.

THE MEETING:

2.6 **Commended**, the Meteorological Service of Antigua and Barbuda for their timely and accurate warnings for its country and area of responsibility during the 2009 hurricane season.

TRAINING (Agenda item 3)

3.1 The Principal of the Caribbean Institute for Meteorology and Hydrology (CIMH) informed the Meeting that the four-month Entry-level Meteorological Technician course started during the months of February and August. Further, a six-month Medium-level Meteorological Technician course started during August 2009. A Senior-level Meteorological Technician course was scheduled to start during January 2010.

3.2 The view was expressed that there seemed to be insufficient interest by other departments of governments in some of the short courses offered by the CIMH, which has led to the last-minute cancellation in some cases due to limited or no participants. The Directors were urged to indicate their interest in courses well in advance to avoid cancellation.

3.3 Although no courses in Instrument Maintenance at the level of a Mid-level Meteorological Technician would be offered in 2010, the Principal enquired as to the relevance of the course to National Meteorological Services given the changes to the syllabus to include more electronics, both theory and practical. It was indicated that while the course is relevant to the Services, Directors would prefer that even greater emphasis be placed on electronics as it pertains to modern meteorological instruments. The Director of the Trinidad and Tobago Meteorological Service agreed with the sentiments expressed by the Directors. However, he noted that his Service enrolled its Mid-level Meteorological Technicians who had completed the Instrument Maintenance course, in an Electrical/Electronics Engineering Technology course to complete their educational requirements.

3.4 The Meeting was informed that CIMH, in partnership with the Caribbean Catastrophe Risk Insurance Facility (CFRF), will be providing training in marine meteorology. This was tentatively scheduled for March 2010 and it was intended to be an introductory course designed to expose coastal zone management and other marine personnel to the simple concepts of weather, weather observations, and oceanography, with a focus into local and regional oceanography and air-sea interactions. In the first instance, there would be no cost to participants from government institutions; however, this may change in the future.

3.5 Ms Kathy-Ann Caesar of the CIMH gave a presentation to the Meeting on the intended changes to the WMO Publication 258 – *“Guidelines for Education and Training of Personnel in Meteorology and Hydrology.”* She informed the Meeting that the WMO Executive Council requested its Task Team on Aviation Forecaster Qualifications (TT-AFQ) to report to EC-LXI on methodologies to revise and strengthen Supplement No.1 to WMO-258 and to develop the instruction and assessment "kit".

3.6 The Meeting was informed that the Task Team reviewed the background and issues related to the qualifications required by Aeronautical Meteorologists and recommended a new pathway for personnel without a university degree to acquire this qualification and certification. The Team also recommended that the methods to become a WMO Meteorologist be incorporated in the next (fifth) edition of WMO Publication 258 - Vol. 1 Meteorology. The new pathway will ensure that anyone taking this route has an appropriate breadth and depth of meteorological knowledge supported by an underlying knowledge of physics and mathematics, which would be expected of someone designated as a WMO Meteorologist.

3.7 The proposed paths to become a “WMO Meteorologist” specializing in one of the elective fields and ready for operational duties are provided in the **table**. It also provides an indication of the minimum times required for personnel to reach operational status for the three entry pathways.

Meteorological Degree	Non Meteorological Degree ¹	No Degree
Qualifies as WMO Meteorologist	Condensed BIP-M	Prerequisite Math, Physics as set out in WMO-No. 258
Role specific education and training	Qualifies as WMO Meteorologist	Condensed BIP-M
Closely supervised OJT in operational area, does not independently issue any products (minimum 300 hours)	Role specific education and training	Qualifies as WMO Meteorologist
Close monitoring, feedback and ongoing assessment prior to finally being 'signed-off' as competent to perform fully independent operations	Closely supervised OJT in operational area, does not independently issue any products (minimum 300 hours)	Role specific education and training
Recommended minimum 6-month period of training and assessment from initial recruitment to fully independent operation	Close monitoring, feedback and ongoing assessment prior to finally being 'signed-off' as competent to perform fully independent operations	Closely supervised OJT in operational area, does not independently issue any products (minimum 300 hours)
	Recommended minimum 12-month period of training and assessment from initial recruitment to fully independent operations.	Close monitoring, feedback and ongoing assessment prior to finally being 'signed-off' as competent to perform fully independent operations
		Recommended minimum 24-month period of training and assessment from initial recruitment to fully independent operations

3.8 An overview of the teaching timetable for the Senior-level Meteorological Technician course scheduled to commence in January 2010 was provided to the Meeting. The changes which have been made to the timetable reflected the need to incorporate more practical training to the students, especially in aeronautical meteorology.

3.9 THE MEETING:

- (i) **Noted** the courses to be offered during 2010;
- (ii) **Commended** the Institute on the marine meteorology course to be offered in 2010;
- (iii) **Expressed** the need for more electronics to be offered in the Mid-level Meteorological Technician course (Instruments).

CMO OPERATIONAL METEOROLOGY ADVISORY GROUP (COMAG)
(Agenda Item 4)

4.1 The Meeting was reminded that COMAG had been working primarily on a new verification scheme for the meteorological Terminal Aviation Forecast (TAF) and that, at its meeting in Georgetown, Guyana in 2008, it requested COMAG to act on three recommendations and to report to the meeting of the Directors of Meteorological Services in 2009. The recommendations were:

1. CIMH be considered as the TAF verification centre for CMO Member States;
2. CIMH be tasked with providing a detailed cost of implementing a year-long TAF verification scheme through COMAG;
3. COMAG provides a full report to the next meeting of the Directors of Meteorological Service, detailing cost, data requirements, data transmission methodology etc for a decision on implementation.

4.2 The Meeting recalled that a TAF verification scheme was an integral part of a Quality Management System (QMS). It was reminded that an International Standards Organization (ISO) 9000 certified QMS does not guarantee the quality of the products and services, but it does provide documentary evidence that process monitoring systems are in place that will facilitate a responsible management response to the information provided.

4.3 Further, the World Meteorological Organization was in the process of developing a Quality Management Framework (QMF) to assist its Members in their mission to provide at the highest standards, meteorological and hydrological services to their societies, to their communities and to all economic sectors.

4.4 In this regard, one of the stated aims of the QMF was *“to assist in managing costs and risk”*; hence it was not necessary for all CMO Member States to perform their own verification procedures since this would increase cost for each Meteorological Services, whereas with a centralized verification scheme, the cost will be shared. The Meeting was reminded that all Meteorological Services are required by the International Civil Aviation Organization (ICAO) to have a functional and certified QMS from November 2010 (see Agenda Item 6(c) below).

4.5 The Caribbean Institute for Meteorology and Hydrology had completed the interim work on developing the TAF verification program that it commenced in 2007. The CIMH indicated that the following actions had been accomplished, which had incurred a developmental cost of **BDS \$73,250.00**:

- (a) an investigation of existing TAF verification programs;
- (b) modification of the TAFVer program of the US National Weather Service (NWS);
- (c) data collection, analysis and TAF verification.

4.6 To make the verification programme operational, the following would be required:

- a dedicated computer;
- the implementation of a continuous database to archive the results;
- finalization of performance thresholds;
- development of access interface between sub-programs;
- development of reporting protocol.

4.7 The estimated cost of the verification programme, as determined by CIMH, was **BD\$ 35,300.00**. This included the acquisition of a computer, data storage, as well as support and maintenance for both. Incidentals expenditure included the generation of reports for Meteorological Services.

4.8 Although in its development stage, the Meeting discussed in some detail, the results of the TAF verification undertaken during the last year. In particular, it discussed the sources of errors that emerged, such as:

- **Missing data:** - efforts should be made to ensure receipt of a complete set of TAFs and observations as absolute serial completeness will be impossible if there are communications problems, coding errors, etc;
- **Coding errors:** - The decoder rejects any TAF and/or METAR which do not adhere to the TAF/METAR code;
- **Short-lived weather changes:** - Forecasts are not amended for changes in the weather which do not persist for more than 20 minutes. If short-lived events such as this occur during an observation, they would be reflected as “*unforecasted*.”

4.9 The Directors were provided with the benefits and mitigating factors against two (2) possible scenarios for the verification of the TAFs as required by a Quality Management System. The two choices were:

1. Each National Meteorological or Hydrometeorological Service (NMS) undertakes its own verification;
2. Centralized the verification at CIMH.

4.10 It was noted that coding errors in the METARs and TAFs were negatively impacting on the time taken for verification and hence the roll-out of the verification program. In an effort to assist in reducing these errors, Mr Keithley Meade, Acting Director, Antigua and Barbuda Meteorological Service, offered to create, by early 2010, an interface which would check the code forms for errors before they are disseminated. The Principal of CIMH offered to create a batch script to execute the three subprograms of the verification software by February 2010.

4.11 Beta testing of the interface and the verification software would commence in March 2010 in all Meteorological Services under the guidance of the CIMH. The Science and Technology Officer of the CMO HQ and the Principal of the CIMH would develop the software development and verification plans. It was expected that the final version of the software would be ready for use by June 2010.

4.12 Although some Directors wanted the verification to be centralized at the CIMH, a significant number wanted it to be done by the NMS. In any case, there was the view that, given the limited resources available to the CIMH for 2010, it would be difficult for the CIMH to undertake the full-time TAF verification, once the development process had been completed.

4.13 The Meeting:

- (i) **Decided** that the CIMH should complete the TAF verification scheme as early as possible in 2010;
- (ii) **Also decided** that the verification of the TAFs will be undertaken in each Meteorological Service with the support of the CIMH;
- (iii) **Commended** Mr Meade and the Principal for the offer of their assistance to rollout the verification software to each Meteorological Service in 2010;
- (iv) **Requested** the Coordinating Director to inform WMO and ICAO of the verification scheme, once it became operational.

THE CMO RADAR PROJECT – TECHNICAL ISSUES

(Agenda Item 5)

5.1 The Meeting was informed that in 2009, CMO Radar Project primarily focussed on the completion of the construction of the radar tower, delivery, installation and commissioning of the radar in Guyana. Further, the Belize radar was installed in September 2008 but the burn-in test and site acceptance testing (SAT) were not completed until February 2009.

5.2 The radar was installed in Guyana during March. However, due to incomplete civil works activities, especially with respect to the electrical works, the radar was not powered up until July and the SAT was completed in August 2009. The radar was commissioned and handed over to the Government of Guyana in October 2009.

5.3 The visual display units (VDUs) were distributed to twelve (12) Meteorological Services. The distribution of VDUs to the Meteorological Services in the Cayman Islands, Guyana, Jamaica and the Turks and Caicos Islands was to be undertaken before the end of 2009. The Director of the Antigua and Barbuda Meteorological Service indicated his service's displeasure on the quality and frequency of data displayed on the VDU shipped to Antigua. Further, he indicated that the computer was slow to perform commands which were executed and pixilation occurs when the "zoom" function was used. Other Meteorological Services indicated some problems to varying degrees. The Chairman indicated that the CMO Headquarters would resolve the problems.

5.4 The Meeting was informed that, to-date, only data from the radar in Trinidad had been integrated into the regional mosaic with Météo-France in Martinique. For the most part, the internal arrangements in Barbados, Belize and Jamaica had prevented the integration of their data, although there had been some problems in connecting with Martinique in one case. Further, ftp access of the individual radar data had not been completed by all the radar countries. The Meteorological Service in Trinidad and Tobago and the CIMH had created ftp access to-date.

5.5 The Meteorological Services of radar host countries agreed to participate in a technical committee along with representatives of the other Radar Stations and the Météo-France facility in Martinique (SRMA), to determine all technical matters in connection with the Composite Service. The CMO Headquarters would initiate formalities for this to be activated as soon as possible.

5.6 As part of the Project, training was provided to thirteen (13) technicians from the four countries and the CIMH both at the radar factory and in each country. The Meeting was informed that it was imperative for a mechanism to be found to network the technicians so that they could collaborate on the problems identified at each radar site, thereby continuously honing their skills.

5.7 Similarly, a methodology must be established for managing the Central Stores Facility at CIMH in Barbados, where each radar host country could have easy access to the spares, through a replacement system. The Meeting noted that the 49th session of the Caribbean Meteorological Council would be asked to make decisions on this matter.

5.8 THE MEETING:

- (i) **Noted** the problems identified by the various Meteorological Services about the display of the mosaic on the visual display units;
- (ii) **Further Noted** the technical committee which was to be created to manage the regional composite;
- (iii) **Also Noted** the two methodologies which must be created to assist the transfer of knowledge between the radar technicians and for the managing the Central Stores Facility.

OPERATIONAL MATTERS

(Agenda item 6)

6.1 The Meeting was made aware of a number of matters which were particularly related to the operations and the services delivered by Meteorological Services in the Caribbean.

(a) WMO Annual Global Monitoring

6.2 The Chairman noted that many Meteorological Services of the Member States, which have stations in the Regional Basic Synoptic Network (RBSN), did not participate in the World Meteorological Organization (WMO) Annual Global Monitoring (AGM), which monitors the data disseminated over the Global Telecommunication Service (GTS). These Meteorological Services were urged to participate in the AGM.

6.3 No information was available for the 2009 Annual Global Monitoring (AGM) since the reporting period had ended not long before this Meeting, but for the 2008 Annual Global Monitoring, only four countries submitted monitoring reports by the deadline of 15 November 2008.

6.4 The Meeting was also presented with the results of the four Special Pilot Main Telecommunication Network (MTN) Monitoring for 2008 which showed that the Regional Telecommunication Hub (RTH) received less than 50% of the observations on average from Belize (34%), Dominica (46%) and Guyana (14%). This monitoring was conducted and analysed by the RTH during the first month of every quarter. The Chairman urged the National Meteorological and Hydrological Services to investigate the cases and to seek solutions.

(b) Migration to BUFR Code Form

6.5 The Migration Plan to binary code forms of the World Meteorological Organization (WMO) calls for the migration of the SYNOP, TEMP, PILOT and CLIMAT code forms to BUFR, to be completed by November 2010. Further, the operational exchange of aviation code forms had been set to start from November 2008 and migration of these code forms to BUFR were scheduled to be completed in November 2016.

6.6 The binary code forms will replace the traditional alphanumeric code form, because the new systems offer expandability, self description, flexibility, sustainability and compression. The systematic passing of metadata including geographical coordinates (latitude, longitude, height) in every report, which is easily performed with the Table Drive Code Forms (TDCFs), would alleviate the notorious problem of wrong coordinates for a station. More and better quality data will lead to better data assimilation, and consequently the generation of better products by data processing centres leading to improvements in weather forecasts and climate studies.

6.7 The Meeting was provided with information on the methodology which should be used to install the BUFR software created by the European Centre for Medium-Range Weather Forecasts (ECMWF) on computers which use the Windows and Linux operating systems. The CMO Headquarters sought to ascertain the success of the installation of the software. Only the St. Lucia Meteorological Service indicated any success in the installation of the software.

6.8 The Meeting discussed the fact that migration to BUFR will change the method of producing plotted charts for analysis since the code form is only machine readable, so that the use of hand-plotting would naturally come to an end. Therefore, it was suggested that consideration should already be given to the future utility and assignment of members of staff who currently plot synoptic charts.

6.9 It was noted that students who recently completed the Entry-level Meteorological Technician courses at the CIMH were unaware of the upcoming changes to the manner in which SYNOP, TEMP, CLIMAT and CLIMAT TEMP would be coded. The CIMH was urged to obtain the latest information from the WMO Website.

(c) Aeronautical Meteorology Matters

6.10 The Meeting reviewed available information, summarized below, on the recommendation of the International Civil Aviation Organization (ICAO) that every designated Meteorological Authority has to establish and implement a properly organized quality management system (QMS). The QMS has to conform to ISO 9000 standards and it must be certified by an approved organization. The quality system must include verification and validation procedures.

6.11 The ICAO publication "*Meteorological Services for International Air Navigation*," which is Annex 3 to the Convention on International Civil Aviation, states that each of its Member States shall designate a Meteorological Authority to provide or to arrange for the provision of meteorological service for international air navigation on its behalf. Further, each Member State shall ensure that the designated Meteorological Authority complies with the requirements of the World Meteorological Organization in respect of qualifications and training of meteorological personnel providing service for international air navigation.

6.12 ICAO also recommended that *“In order to meet the objective of meteorological service for international air navigation, the Contracting State should ensure that the designated Meteorological Authority establishes and implements a properly organized quality system comprising procedures, processes and resources necessary to provide for the quality management of the meteorological information to be supplied to operators, flight crew members, air traffic services units, search and rescue services units, airport managements and others concerned with the conduct or development of international air navigation.”* It recommended that the quality management system be ISO 9000 certified.

6.13 All Meteorological Services of Member States of the CMO which provide services to the aviation community (forecast and non-forecast offices) are required to have a QMS in place by the November 2010 deadline. The QMS covers all aspects of aeronautical meteorological meteorology from the frequency of the calibration of equipment, qualification of staff, etc.

6.14 The certification of Meteorological Services has implications to the recurrent costs of providing services for the aviation community nationally. If however, Member States of the CMO chose not to seek certification, there is the possibility of loss of revenue due to the downgrading of airports.

(d) NOAA ISCS-2Ge

6.15 The Chairman provided to the Meeting an overview of the planned changes to the International Satellite Communication System (ISCS) managed by the National Oceanographic and Atmospheric Administration (NOAA) for the WMO.

6.16 NOAA's existing ISCS Contract will end on December 31, 2009 and telecommunication services are required to meet on-going operational needs of the WMO Regional Meteorological Telecommunications Network (RMTN). This is primarily for RA-IV (North and Central America and the Caribbean), but Guyana and a few countries outside of RA IV utilize the ISCS. The existing ISCS RMTN equipment will no longer be supported by the satellite provider Verizon and as such, the satellite modem must be replaced at each site in the RMTN. Further, it was found that the third generation 2-way satellite modems would be cost prohibitive for all users in RA-IV.

6.17 Therefore NOAA National Weather Service (NWS) proposed to extend Verizon's current contract through to 31 March 2010 and transition the ISCS to more sustainable satellite/terrestrial communications architecture. The new satellite/terrestrial communications service would be referred to as the ISCS Generation 2 Extended or ISCS-G2e would use a Multiple Protocol Label Switching (MPLS) 64Kbps digital terrestrial circuit which would be installed for the transmission of RMTN Member State data to the NOAA National Weather Service Telecommunications Gateway (NWSTG) File Transfer Protocol (FTP) server for distribution on the Global Telecommunications System (GTS).

6.18 The present workstations in Antigua and Barbuda, Barbados, Belize, Cayman Islands, Dominica, Grenada, Guyana, Jamaica, St. Lucia and Trinidad and Tobago will need to be configured to transmit products using FTP over the MPLS digital terrestrial circuits. The workstation manufacturers can be contacted for assistance to configure workstations. The Personal Earth Station (PES) 8000 2-way satellite modem would be replaced with a 1-way Comtech modem and new IFL cable would be installed in the countries noted above. At CIMH, no change will be made to the modem since a 1-way Comtech modem was installed originally.

6.19 A major benefit to the ISCS-2Ge would be the removal of the cost sharing of the ISCS/RMTN space segment. The only fees associated with the ISCS-2Ge would be maintenance, as required and it will be borne by the individual Member States.

(e) EDIS input to the RTH (alternative transmission to RTH)

6.20 Mr Keithley Meade gave a presentation on an operational program which he created called EDIS, which stands for email Data Input System. The National Weather Service of the United States, which operates the RTH in Washington, offers three methods of submitting observations via the Internet as an alternate to the GTS. These are via email, file transfer protocol (ftp) or web bulletin.

6.20 EDIS is an interface which allows the observer to enter observational data in a user specified format and choose the method of dissemination to the RTH either via the Internet or the ISCS from any computer which would be on the local area network.

6.21 The Meeting:

- (i) **Noted** the performance or lack thereof of Meteorological Services in the Special MTN Monitoring;
- (ii) **Commended** the Meteorological Services which participated in the WMO Annual Global Monitoring;
- (iii) **Urged** the Meteorological Services which had not participated in the WMO Annual Global Monitoring; to do so;
- (iv) **Also Noted** the WMO's plan to migrate to the BUFR Code form;
- (v) **Further Urged** the Meteorological Service to make plans to migrate to the BUFR code form before the deadline of November 2010;
- (vi) **Recommended** to the CIMH that they build in-house capacity on the BUFR code forms;
- (vii) **Urged** all Meteorological Services that provide services to the aviation community to implement an ICAO-recognized Quality Management System by the November 2010 deadline;
- (viii) **Also Commended** Mr Meade on the EDIS interface.

SCIENTIFIC TOPIC

The use of Doppler Radar to investigate Tornadic Activity in Trinidad
(Agenda item 7)

7.1 Mr Glendell De Souza, Science and Technology Officer of the CMO Headquarters, gave a presentation of the use of Doppler radar to identify tornadic activity. Newspaper reports in Trinidad and Tobago suggested that on 9 August 2009, "a twister caused a stir in east and central Trinidad." For any vortex to be classified a tornado, it must be in contact with the ground *and* the cloud base and there were sufficient images captured by the general public to show the vortex was a tornado.

7.2 Mr De Souza presented tornadic theory from the mid-latitudes to show that tornadic signature in radar reflectivity is the presence of a hook-shaped echo and in Doppler winds, it is

the presence of a velocity couplet which is oriented so that a concentrated area of radial winds moving away from the radar appears on one side of the beam axis, while a concentrated area of radial winds moving toward the radar appears on the opposite side of the beam axis.

7.3 The radar reflectivity data from Trinidad on August 9 suggested that multiple hook-shaped echo were present at different times, starting from after 1600UTC. However, from this sample data, they were not as pronounced as mid-latitude tornados and the Doppler winds couplets to show a "rotation", i.e. couplets going and away from the radar on either side of the radar beam, were evident but also not as pronounced. The theory which was put forward was that temperate contrast between the downdrafts and the rotating column was not sufficient to generate a strong rotating column which led to weak hook echoes. Nonetheless, this initial use of the Doppler radar to identify and study tornadoes and waterspouts was very encouraging. It was strongly recommended that this and other similar data from all the radars be archived for future studies.

7.4 **The Meeting:**

- (i) **Thanked** Mr De Souza for the presentation on the use of the radar data;
- (ii) **Recommended** that the radar data from this and similar events be archived for future investigations.

OTHER MATTERS

(Agenda Item 8)

8.1 Mr Moolchan informed the Meeting that the Trinidad and Tobago Meteorological Service would enter into a contract with the Meteorological Institute of Finland (FMI) to provide training for nine (9) months on the data visualization software named SmartMet. Jamaica and Trinidad and Tobago had earlier participated in a pilot project under the umbrella of the SIDS-Caribbean Project which was funded by Finland and they received both hardware and the SmartMet software.

8.2 At the recently concluded Fifteenth Session of RA-IV Meeting which was held from 24 April to 1 May 2009 in the Bahamas, countries which received the SmartMet software requested additional training. This contract was a result of that request.

8.3 The CIMH has partnered with the Caribbean Agricultural Research and Development Institute (CARDI) and ten Meteorological Services for the implementation of the Caribbean Agrometeorological Initiative (CAMI). CAMI was being financed by the European Union through its African, Caribbean and Pacific Secretariat in Brussels and would focus on building agrometeorological capacity within the ten Meteorological Services in the Caribbean, in order to provide useful information particularly related to agriculture to farmers and other national agricultural agencies.

8.4 Mr Adrian Trotman, Agrometeorologist at the CIMH and the Project Coordinator, reminded the partner Meteorological Services of their commitment to the Project and with the initial disbursement of funds expected to be in January 2010, urged the Meteorological Services to be in readiness for the start of the Project, which would begin with the digitizing of their data which is stored in paper format.

8.5 CIMH urged the Directors of Meteorological Services to develop a vision for their Services which should encompass different fields of meteorology and address the socio-

economic needs of their society. The visions, once completed, should indicate their training needs and these should be communicated to CIMH, so that programmes could be aligned with these needs.

8.5 **The Meeting:**

- (i) **Noted** the contract that the Trinidad and Tobago Meteorological Service will enter into with the Meteorological Institute of Finland;
- (ii) **Commended** the CIMH for efforts in moving the CAMI Project forward;
- (iii) **Urged** the ten (10) partner Meteorological Services to be ready for the start of the Project which was expected to be in January 2010.

ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES
CONVENTION CENTRE, LILIENDAAL, EAST COAST DEMERARA, GUYANA

7th NOVEMBER, 2009

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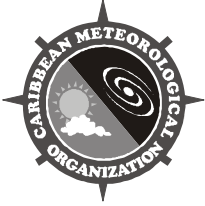
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CARIBBEAN METEOROLOGICAL ORGANIZATION

ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES
TORTOLA, BRITISH VIRGIN ISLANDS - 7th NOVEMBER 2009

AGENDA

1. INTRODUCTION
 2. THE 2009 HURRICANE SEASON
 3. TRAINING
 4. CMO OPERATIONAL METEOROLOGY ADVISORY GROUP (COMAG)
 5. THE CMO RADAR PROJECT – THE FUTURE
 6. OPERATIONAL MATTERS
 - (a) WMO Annual Global Monitoring
 - (b) Migration to BUFR Code Form
 - (c) Aeronautical Meteorology matters
 - (d) NOAA-ISCS-G2e
 - (e) EDIS input to the RTH (alternative transmission to RTH)
 7. SCIENTIFIC TOPIC
 - The use of Doppler Radar to investigate Tornadoic Activity in Trinidad
 8. OTHER MATTERS
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