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

Port of Spain, TRINIDAD AND TOABGO

5 DECEMBER 2005

INTRODUCTION

1.1 At the kind invitation of the Government of Trinidad and Tobago, the annual Meeting of Directors of Meteorological Services was held at the Crowne Plaza Hotel, Port of Spain, Trinidad, on Monday 5th December 2005 under the Chairmanship of Mr Tyrone Sutherland, Coordinating Director of the Caribbean Meteorological Organisation (CMO). The meeting was addressed by Mr Earl Nesbitt, Permanent Secretary, Ministry of Public Utilities and the Environment who welcomed the participants to his country and to the city of Port of Spain. He expressed his Government's great pleasure to have been able to host this and related meetings of the CMO this year, particularly one in which the weather has had such a major impact on the lives of the people of the Caribbean.

1.2 A list of participants and observers attending the Meeting is attached as **Annex I to this Report** and a copy of the Agenda adopted by the Meeting is attached as **Annex II to this Report**.

THE 2005 HURRICANE SEASON
(Agenda Item 2)

2.1 The 2005 hurricane season was a record breaking one with twenty-seven (27) named storms, fifteen (15) hurricanes and of these seven (7) became 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 2005 hurricane season was presented by the Director of the Cayman Islands Meteorological Service. The summary below focuses on the main systems that affected the CMO Member States. Preliminary statistics on the weather systems are also provided:

- The 2005 Atlantic hurricane season started in June with two tropical storms Arlene and Bret developing in the Western Caribbean Sea and the Gulf of Mexico, respectively.

- July had unprecedented activity with five named storms, breaking the record of four named storms of 1995. Two of the named storms Dennis and Emily became intense hurricanes and affected Caribbean islands. Dennis developed from a tropical wave in the eastern Caribbean Sea and passed to the northeast of Jamaica on July 7th and over Cuba on July 8th. Emily directly impacted Grenada as a category one hurricane on July 13th.

- August, like July, was a month of above average tropical cyclone activity with the development of five named storms. Two of the storms ***Irene*** and ***Katrina*** became the hurricanes. Katrina became the first category five hurricane of the season with winds of 175 mph on August 28th. The eye of Katrina impacted on New Orleans on August 28th and the combination of wind, storm surge and floods produced more than one thousand causalities in the United States of America.

- The intense cyclone activity continued into September with the development of five hurricanes and one depression. Two of the hurricanes, Maria and Rita, intensified into category three hurricanes, with Rita reaching category five with a peak wind intensity of 175 mph on September 22nd. Rita made landfall just east of the Texas/Louisiana border on September 24th.

- During October six (6) tropical cyclones formed, with four (4) intensifying into hurricanes Stan, Vince, Wilma and Beta. During Hurricane Wilma, the operator of small boat ignored the rough sea warnings, which caused three (3) lives to be lost.

- November produced three (3) cyclones, Gamma, Delta and Epsilon. Epsilon intensified into a hurricane on December 1st, the thirteenth hurricane of the season, breaking the old record of twelve (12) set in 1969. Gamma, like Hurricane Wilma in the previous month, caused the lost of five (5) lives from Belize because warnings were again not heeded.

- ***Dennis*** developed from a depression in the Caribbean Sea after its passage through the islands of the Eastern Caribbean as a tropical Wave. It became a tropical storm on July 5th and strengthened into a ***hurricane*** on July 6th. It passed within 50 miles of the east coast of ***Jamaica*** on July 7th. It then crossed Cuba and moved into western Florida Panhandle, resulting in many deaths and destruction across Florida. Ten (10) deaths were reported in the USA, four in Cuba and ***one in Jamaica***.

- ***Emily***, which formed over the Atlantic, and in the night of July 13th passed approximately ten miles to the north of ***Tobago*** as a tropical storm. It immediately strengthened into a ***hurricane*** and the centre impacted on ***Grenada*** just after 3:00 am, on July 14th, ***St. Vincent and the Grenadines*** to the north, felt the effects of strong winds and wind gusts in excess of 72 mph. It continued strengthening as it passed to the south of ***Jamaica*** on July 16th and the ***Cayman Islands*** on the 17th, as a *category four* hurricane. T*here were five (6) deaths attributed to the passage of the hurricane through the Caribbean, one (1) occurred in Grenada and five (5) in Jamaica.*

- ***Katrina*** formed from a tropical wave becoming a depression to the southeast of Nassau on August 23rd. Tropical Storm Katrina was formed on August 24th. Katrina moved towards the northwest through the *Bahamas* and turned westward while gradually strengthening. Katrina became a category one hurricane on August 25th and made landfall on south Florida during the evening of the 25th. After crossing south Florida, Katrina entered the Gulf of Mexico and strengthened, becoming a ***category five hurricane*** on the 28th, with peak intensity of 175 mph. Katrina turned towards the northwest and then to the north, making landfall to the south of Buras, Louisiana, with winds of 140 mph on August 29th. Katrina continued as a category three hurricane through the ***Louisiana/Mississippi border***, eventually becoming a depression near Clarksville, Tennessee. *Katrina has caused the greatest lost of human life for the 2005 Atlantic Hurricane season.*

- A tropical wave which crossed the Windward Islands on October 21st intensified into ***Tropical Storm Alpha*** on the 22nd. Its movement was towards the northwest and made landfall near Bararhona, Dominican Republic, with winds of 50 mph. Alpha though weakened over Hispaniola, continued its northwestward motion over the South-eastern Bahamas and further in the Atlantic on the 23rd. Alpha weakened into a trough and was absorbed into the circulation associated with Hurricane Wilma.

- The tropical disturbance which evolved in Tropical Storm ***Gamma*** had its genesis in an area of cloudiness generated by an upper-level trough. The trough was stationary just to the west of the ***Eastern Caribbean*** and it interacted with a tropical wave to give birth to the twenty-seventh tropical depression of the hurricane on November 13th. The *radar in Martinique assisted forecasters* to identify the system and fix its centre. Depression # 27 remained in an unfavourable shearing environment from November 13th to 18th while moving westward to Nicaragua. On the 18th the depression first dissipated in a disturbance then intensified in

Tropical Storm Gamma, the twenty-fourth named storm of the season. Gamma remained a tropical storm until the 20th producing heavy rainfall, while meandering off the coast of Nicaragua. Gamma dissipated on the 21st, however, before it dissipated, ***Gamma*** caused thirty-eight (39) deaths, ***two (2) in Trinidad, two (2) in St. Vincent*** and thirty-five (35) in Nicaragua.

PRELIMINARY 2005 HURRICANE SEASON STATISTICS

NAME	DATES	MAX WIND (MPH)	DEATHS
Tropical Strom Arlene	8 -13 JUN	70	1
Tropical Storm BRET	28 -29 JUN	40	0
Tropical Storm CINDY	3 - 8 JUL	70	0
Hurricane DENNIS	**4 - 12 JUL**	**150**	41
Hurricane EMILY	**10 - 20 JUL**	**155**	5
Tropical Storm FRANKLIN	21-29 JUL	70	0
Tropical Storm GERT	23 -25 JUL	45	0
Tropical Storm HARVEY	2 - 8 AUG	65	0
Hurricane IRENE	4-18 AUG	105	0
Tropical Storm JOSE	22 - 23 AUG	50	6
Hurricane KATRINA	**23 - 31 AUG**	**175**	1200
Tropical Storm LEE	28 AUG – 1 SEP	40	0
Hurricane MARIA	1 - 9 SEP	115	0
Hurricane NATE	5 - 10 SEP	90	0
Hurricane Ophelia	7 – 17 SEP	85	1
Hurricane Philippe	17 – 23 SEP	80	0
Hurricane Rita	**18 - 25 SEP**	**175**	6
Hurricane Stan	2 – 4 OCT	80	783
Tropical Storm Tammy	5 – 6 OCT	50	0
Hurricane Vince	9 – 10 OCT	75	0
Hurricane Wilma	**15 – 25 OCT**	**175**	38
Tropical Storm Alpha	22 – 24 OCT	50	29
Hurricane Beta	**27 - 31 OCT**	**115**	0
Tropical Storm Gamma	**13 – 20 NOV**	**50**	39
Tropical Storm Delta	23 - 28 NOV	70	0
Hurricane Epsilon	29 NOV – 8 DEC	86	0

2.3 Mr David Robertson of Grenada, Mr. David Burgin of St. Vincent, Mr. Evan Thompson of Jamaica, Mr. Jamell Robinson of the Turks and Caicos and Mr Fred Sambula of the Cayman Islands all made presentation of the passage and impact of Hurricanes Dennis, Emily, Katrina and Rita across their countries, which were highly appreciated by the Meeting.

2.4 It was pointed out that the tropical cyclone activity in 2005 was a reflection of the annual activity over the last decade, with the exception of the El Niño years such as 1997 and 2002, and that the Atlantic basin was currently in a cycle of high cyclone activity and likely to remain so for a while.

2.5 All Directors gave brief reports of the impact of the hurricane season on their countries. It was clear that, in addition to the impact of the many tropical storms and hurricanes, the year was marked by the excessive rainfall received through most of the year. Barbados and Jamaica reported abundant rainfall during the hurricane season and both islands commended the Caribbean Institute for Meteorology and Hydrology for the in the precipitation forecast. Most States experienced several major flood events resulting in landslides, crop damage and some loss of life.

2.6 Discussion also surrounded the probabilistic forecast issued by the National Hurricane Center (NHC). Members have been asked to review this forecast issued by the NHC for the tropical storms and hurricanes, which may have affected the islands and the operations of the Meteorological Services. These reviews can be communicated to the NHC for feedback in their decision process.

2.7 Discussions also surrounded the operation of the regional warning system, including the coordination and communication between forecast offices and non-forecast offices, and the local Disaster preparedness agencies and officials. Grenada indicated that level of warnings were decreased and then increased prior to Hurricane Emily making landfall on the island. However, Trinidad and Tobago, which has responsibility for issuing warnings on behalf of Grenada, indicated they did not change the level of warnings.

2.8 Reports on the impact of the hurricane season on the various countries, are given in **Annex III to this Report.**

2.9 **THE MEETING**:

Expressed condolences to the countries that suffered from the impacts of the hurricanes this year, as well as the loss of life and damage from all the other systems this year.

Commended the Meteorological Services of Barbados, Grenada, Trinidad & Tobago, Jamaica, the Cayman Islands and Belize for their timely and accurate warnings for their countries during 2005 hurricane season.

TRAINING
(Agenda item 3)

3.1 The Principal of the Caribbean Institute of Meteorology and Hydrology (CIMH), Dr Colin Depradine, informed the Meeting that a Catalogue of the training programmes and courses being offered at the Institute was circulated early to Member States to facilitate advance planning. The information contained in the Catalogue is also listed on the CIMH web-site. It was pointed out that the Institute wished to know well in advance those students who were coming to study so that early application could be made for student visas. The Principal remarked that the short courses which were also listed in the Catalogue were not well attended due to funding constraints.

3.2 With regard to housing for students, the Principal explained that on occasions the Institute, upon request, arrange housing for students. However, some students for whom accommodation was arranged indicate upon arrival that they had made separate arrangements. This causes a measure of disappointment both for the arrangers and the providers of such accommodation.

3.3 The Principal discussed the problem of some students arriving in Barbados without funding and expected the CIMH to provide. In such cases, he advised Directors to make prior arrangements with the CIMH if they needed CIMH to advance funds to a student. The difficulties in recovering funds loaned to students in the absence of prior arrangements with Directors were articulated.

3.4 With regard to funding for training at the CIMH the Principal, who participated at a meeting of a WMO Panel of Experts on Education and Training, reported that it was said at the meeting that the Caribbean was not applying for WMO fellowships. He explained that the WMO Fellowships Committee meets four times per year and that early applications should be made for such fellowships. A similar situation obtained with regard to Commonwealth Fund for Technical Cooperation (CFTC) fellowships. In that context it was noted that the CFTC was only making partial fellowships available.

3.5 For purposes of information the Meeting was advised that a new Supplement for aeronautical meteorology will be issued to WMO Members shortly. The Meeting was also advised that the Institute was now in possession of an English version of CLIMSOFT.

3.6 With regard to the gathering of data from the Automatic Weather Stations (AWS) of CMO Members, the Principal urged Directors to submit such data to the Institute on a monthly or quarterly basis. With regard to the dissemination of such data the Principal requested Directors to make specific requests for the sharing of country data with third parties.

THE CMO RADAR PROJECT IMPLEMENTATION
(Agenda Item 4)

4.1 Mr. Michael Dalrymple, Project Manager, CMO Radar Project, provided an abbreviated power-point overview on the status of the 13 million EURO CMO Radar Project funded by the European Union, due to constraints of time. The Project officially started on 18 December 2003. He informed Directors that detailed information on the Project can be accessed on the website www.cmo-radar.org. This includes EU procurement notices, contracts and the ability to register for a newsletter which gives details on the project development. Directors can also share their advice and concerns electronically.

4.2 It was pointed out that in the short term emphasis would be placed on procurement of the engineering design and of the supply of equipment. There was ongoing dialogue with Metéo-France with a view to ensuring compatibility with the radars to be installed in CMO Member States and those in the French DOMs. The long term objective was to achieve integration of radar images.

4.3 It was reported that the main challenge facing the Project was the committal of the 13.2 million EUROS by 31 October 2006. It was stated that while this required special effort it was an achievable goal. However, it was pointed out that implementation of the Project would continue after the committal of funds.

4.4 In the ensuing discussion it was explained that dates for the completion of all aspects of the project as well as detailed timeline charts were available.

OPERATIONAL MATTERS
(Agenda item 5)

(i) Changes to the METAR/SPECI Code Forms

5.1 Members were reminded that on November 2nd, modifications to the METAR/SPECI came into force. Members were urged to ensure that they are fully compliant with the METAR/SPECI code forms.

5.2 Members were reminded of the two attempts to convene a meeting to develop a "*Caribbean Protocol for the Cooperation between NMSs for the Management of Emergencies*. Such a Protocol has already been developed for the Central American countries, although ratification by the respective countries is still pending. Members were urged to discuss the concept of the Protocol and make recommendations to the 45th session of the Caribbean Meteorological Council.

(a) Telecommunication – Operational Status of VSAT and EMWIN Systems

5.3 The Meeting discussed the operations of the VSAT telecommunication system that became operational in April 2004. The representative from Barbados and Cayman Islands queried the ability of the VSAT workstation to decode data in the BUFR code form, especially with the planned migration from T4 charts to BUFR. *The meeting agreed that the Chairman will follow-up with COROBOR and MORCOM on these matters*.

5.4 Members discussed configuration of the EMWIN system. The EMWIN systems in the islands of Montserrat, St. Vincent and the Grenadines, Dominica have been configured to receive data via the internet. It was recognized that this is not the best mean of receiving data and the members we urged to rectify this situation. Dominica has indicated that they are not satisfied with the EMWIN system.

(b) Status of Website Implementation

5.5 The Chairman noted that many of the Meteorological Services do not have a web presence. He noted that in this information era, a Meteorological Service Website was the primary tool for reaching the public and the various users of its products. He commended the efforts of those that had Websites in operation. He pointed out to the Meeting that simple Websites had been developed under the WMO/Finland SIDS-Caribbean Project for the small non-forecast offices but not all of these are in operation. *Members were again urged to develop or have developed a website for their National Meteorological Service.*

(c) Forecast & Warning Services for Non-Forecast Offices

5.6 The meeting discussed the issuances of forecast and warnings for Non-Forecast Offices, highlighting the problems experienced. It was stated by Barbados, that they were unable to contact the Senior Meteorological personnel or the Senior Disaster Mitigation personnel in St. Vincent and the Grenadines, after 10:00 pm in the event of severe weather. The representative of St. Vincent and the Grenadines indicated that there two (2) lives lost, in the rainfall event associated with the embryo of Tropical Storm Gamma; however, they received no warnings from Barbados on this weather event. The Coordinating Director urged members to establish clear line of communications to address this problem.

(d) Migration Schedule to the BUFR and GRIB Code

5.7 Members were reminded of the transition schedule for the migration from the alpha-numeric code form (METAR/SPECI) to the table driven code form (BUFR). Complete migration is expected to be achieved by the end of 2015.

(e) Launch of the CMO Operational Advisory Group (COMAG)

5.8 The Chairman again brought to the meeting the establishment of a **CMO Operational Meteorology Advisory Group** (COMAG). Members were in agreement to establishment of such and advisory group and have undertaken to nominate a senior meteorologist to the CMO to serve on the advisory group.

5.9 The Members expressed concern that the period of the Chairmanship of the advisory group and the time between formalised meetings are the same and there will be no continuity of the projects. The Chairman indicated that the period between formal meetings can be shortened.

5.10 **The Meeting**:

Agreed that the CMO Operational Meteorology Group should be established,

(f) Weather Buoys in RA IV

5.11 The meeting was asked to note the number and position of buoys in the Atlantic Ocean and the Caribbean Sea. The data from the buoys is available on the Global Telecommunication System and it is also available on the internet. The Chairman urged National Meteorological Services to make use of the available data in their analyses.

(g) International Workshop on Tropical Cyclones

5.12 The Chairman informed the committee of the next international workshop on tropical cyclones, which is scheduled to take place in San José, Costa Rica from November 21 – 30, 2006. The Chairman nominated senior meteorologists from the Anglophone Caribbean after collaboration with various Directors of Meteorological Services. A lecturer from the CIMH was also nominated by the Chairman.

(h) CLIMSOFT Workshop

5.13 The meeting was asked to note the request from the World Climate Programme (WCP) to organize a workshop on the CLIMSOFT database software for countries in the Caribbean. The countries to benefit from the workshop are those who did not receive the CLIDATA database software from WMO/Finland SIDS-Caribbean Project. Members expressed the view that the workshop would be of benefit and requested the Chairman to communicate with the WCP to finalise arrangements for the workshop.

PROJECT UPDATES/PROPOSALS

(Agenda item 6)

6.1 The Chairman re-introduced the proposal for the Meteorological Services to develop products for the 2007 Cricket World Cup. He indicated that members should not depend on data availability from the weather radars and suggested the possibility of cheap off-the-shelf automatic weather stations as a means of servicing this data need.

6.2 The Meeting requested the Chairman explore this type of automatic weather stations and the possibility of corporate funding for the purchase of the stations. The Chairman reminded Members of the need for Meteorological Services to develop websites for the dissemination of the products created for the Cricket World Cup.

SCIENTIFIC LECTURE – *PRODUCTION OF FLOOD HAZARD MAP FOR THE CARIBBEAN*

(Agenda item 7)

7.1 Among the natural hazards experienced by Caribbean countries, flooding has the most significant adverse impacts on the region's economic development. A recent project funded by the Japanese government is building capacity in the region for producing flood hazard maps. Production of such maps would assist in formulating effective flood mitigation strategies. Important limitations currently exist in the capability of many countries to produce reliable maps and these shortcomings stem mainly from inadequacies in input data and observed streamflow

data for subsequent validation of the hydrologic and hydraulic procedures needed for producing these maps.

7.2 Efforts are needed to improve the databases, the most significant areas of attention being in the streamflow data and to a lesser extent on establishing the temporal distribution patterns applicable to the Caribbean region. The careless use of existing data can have serious consequences as small errors in estimation of the input model parameter values could lead to very erroneous outputs.

7.3 Dr. Vincent Cooper made a presentation of the data needs, analysis methods and software requirements, to develop flood hazards maps for flood prone basins.

OTHER MATTERS
(Agenda Item 8)

8.1 The Meeting received a presentation from Mr. Dennis Gonguez, on the MACC project, **A Handbook for Concepts and Issues in Climate Change: Global and Regional Perspectives.** He explained that the handbook was launched in August 2005 and was designed to enable journalists to qualitatively improve their articles on issues relating to climate change. It was also intended to educate, inform and warn the general public on matters relating to climate change. The handbook was available on the Caribbean Community Climate Change Center (CCCCC) web-site.

8.2 The content of the handbook focussed on issues including the challenges facing the Caribbean in the area of climate change including vulnerability. It also outlined the country by country effects of possible climate change scenarios.

8.3 Mr. Gonguez informed Directors that the Handbook is being revised and invited their comments.