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

St. Mary's, ANTIGUA AND BARBUDA

4 DECEMBER 2006

INTRODUCTION

1.1 At the kind invitation of the Government of Antigua and Barbuda, the 46th annual Meeting of Directors of Meteorological Services was held at the Jolly Beach Resort, Bolans Village, Antigua and Barbuda, on Monday 4th December 2006 under the Chairmanship of Mr Tyrone Sutherland, Coordinating Director of the Caribbean Meteorological Organisation (CMO). The meeting was addressed by Ms. Elaine Carter, Permanent Secretary, Ministry of Tourism and Civil Aviation who welcomed the participants to Antigua and Barbuda. She expressed the hope that participants would get an opportunity to see more of the Island. She also indicated that she was particularly interested in hearing more about the CMO Radar Project and plans for CWC 2007. Ms. Carter stated that she was especially pleased that the Meeting was being convened during Tourism Week in Antigua and Barbuda.

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 2006 HURRICANE SEASON
(Agenda Item 2)

2.1 The 2006 Hurricane Season was a near-normal season with nine (9) named storms, five (5) hurricanes and two (2) 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 2006 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 2006 Atlantic Hurricane season started in June; with one tropical storm Alberto which developed in the north western Caribbean Sea.

- July produced the lone Tropical Storm Beryl, which were developed in the western Atlantic near South Carolina.

- August produced three tropical cyclones which in the Atlantic, these were Tropical Storms Chris and Debby and Hurricane Ernesto.

- September was closer to the climatological normal, with the development of four cyclones Florence, Gordon, Helene and Isaac; they all became hurricanes, with Gordon and Helene becoming intense hurricanes.

PRELIMINARY 2006 HURRICANE SEASON STATISTICS

NAME	DATES	MAX WIND (MPH)	DEATHS
Tropical Strom ALBERTO	10 -14 JUN	70	0
Tropical Storm BERYL	18 -21 JUL	60	0
Tropical Storm CHRIS	1 - 5 AUG	65	0
Tropical Storm DEBBY	21 - 27 AUG	50	0
Hurricane ERNESTO	24 AUG – 2 SEP	75	2
Hurricane FLORENCE	3 -12 SEP	90	0
Hurricane GORDON	10 -20 SEP	120	0
Hurricane HELENE	12 - 24 SEP	125	0
Hurricane ISAAC	27 SEP - 2 OCT	85	0

2.3 All Directors gave brief reports of the impact of the hurricane season on their countries. **Tropical Storm Chris** and **Hurricane Ernesto** briefly threatened some member states. Chris briefly threatened the islands of **Anguilla, Antigua and Barbuda** and the **Turks and Caicos Islands**, but no significant rainfall or wind speeds were reported. **Ernesto** in its embryonic stage produced over 100 mm of rainfall in **Barbados**. The Meteorological Service in Antigua and Barbuda issued watches and warnings for Tropical Storm Chris, and the Meteorological Services in Jamaica and Cayman Islands issued watches and warnings for Ernesto.

2.4 A tropical wave on June 13th, affected St. Vincent, producing strong downdrafts with sustained winds of 20–30 kt with gusts in excess of 48 kt. The strong winds damaged twenty (20) homes across the island. The Head of the St. Vincent Meteorological Service thanked the Barbados Meteorological Service and in particular Mr. Clement Williams for the timely and accurate forecasts and warnings during this severe weather episode.

2.5 The Director of the Trinidad and Tobago Meteorological Service informed the meeting that the Government of the Trinidad and Tobago has mandated it Meteorological Service to build capacity for the production of alerts and warning for Grenada and its Dependencies, through short-term attachments of its meteorologists to the Grenada Meteorological Services.

2.6 Mr. Fred Sambula gave a brief presentation of the recently concluded International Workshop on Tropical Cyclones (IWTC) which brought together operational meteorologists and researchers. The IWTC issued a Summary Statement on Tropical Cyclones and Climate Change, which include the statement:

> *Though there is evidence both for and against the existence of detectable anthropogenic signal in tropical cyclone climate record to date, no firm conclusions can be made at this point.*

The full Summary Statement is attached in **Appendix III**

2.5 **THE MEETING**:

Commended the Meteorological Services of Barbados and Trinidad & Tobago for their timely and accurate forecast and warnings which were issued to the countries for which they are responsible during the 2006 hurricane season.

TRAINING
(Agenda item 3)

3.1 The Meeting discussed the Mid-Level Technician course and it was observed that in the recent past this course has concentrated on instruments. Members requested that greater focus be placed on other areas such as applied meteorology and public weather services. It was also suggested that there should be more practical training within the course. The Principal indicated that the course has been expanded from six (6) to eight (8) months to incorporate, among other things a disaster management component.

3.2 The Meeting was informed of a mission to Guyana to assist in the installation of CLIDATA and training in the use of the software. Guyana was able to access funding from the World Meteorological Organization (WMO) for the CLIDATA mission, from unused funds from the Finland funded SIDS-Caribbean Project. Jamaica has requested a similar mission.

3.3 Members requested that the Caribbean Institute for Meteorology and Hydrology (CIMH) examine the Senior Level Meteorological Technician syllabus to identify methods to include the subject of marine meteorology in the curriculum. This was identified as a critical need given the dependence of Member States on tourism, fishing, and shipping. Once the component is instituted it was felt that there should be brief courses for the professionals without the training. The Principal undertook to examine these proposals

3.4 The Principal informed the Meeting that the CIMH was moving away Windows based software, not only based on his personal preference but also because both the operating system and many software packages are developed under the open-source platform, thus reducing the cost of software. An offer of assistance was extended by the Principal to the Members if they wish to migrate to the Linux Platform.

3.5 The Meeting was informed of the generation of numerical weather products through the use of the MM5 and WRF models at the CIMIH. The output from the models is distributed to Member States in the Eastern Caribbean from Dominica southward to Trinidad and Tobago.

3.6 The Chairman indicated that he will visit the WMO together with the Principal to explore avenues for funding a project to review and modernize the CIMH. The need for a review of the meteorological programme at the CMIH was recognized. In this connection, the Director, Barbados Meteorological Services, indicated that he would be willing to hold discussions with others as part of such a review process.

3.7 The Principal lamented the fact that the Hydrology Programme is under-utilised even though water was a commodity with which there were many problems. Against this background it was the intention of the CIMH to make the hydrology programme accessible to high school students and teachers as well as university students during the summer vacation. Concern was expressed over the future of the programme at CIMH, particularly with the plans by COSTTAAT to offer a diploma in water resource management.

3.8 The Director, Trinidad and Tobago Meteorological Services articulated a need for a shortened version of the Senior Level Meteorological Technician course for personnel with degrees in Mathematics, Physics and Computer Science. This will alleviated the staffing pressures presently experience by that Service.

THE MEETING:

Noted, the generation of numerical weather products through modelling at the CIMH;

Urged Member States to provide the relevant e-mail contacts to the CIMH to facilitate transmission of the MM5 modelling output;

Congratulated, CIMH on the intention to provide a disaster management component in all its courses taught at the Institute;

Recommended, disaster risk management be included within the Senior level Meteorological Technician course.

THE CMO RADAR PROJECT IMPLEMENTATION

(Agenda Item 4)

4.1 The Meeting was provided with an overview on the status of the 13.2 million EURO CMO Radar Project funded by the European Union. The Project which officially started on 18 December 2003 had a deadline of October 31, 2006 for the commitment of funds under various contracts and work programmes as stated in the Financing Agreement.

4.2 Members noted the activities which were implemented during 2006 and congratulated the Coordinating Director and the Project Management Unit on the effort which was undertaken to meet the "N + 3" deadline of October 31. However, the continuing risk to the Project was also noted.

(a) Hosting of Internet Servers by Radar Host Countries

4.3 The Directors from the Radar Host countries were reminded of Article 6.5 of the Memorandum of Understanding, which was signed between their Governments and the Caribbean Forum of African, Caribbean and Pacific (ACP) States (CARIFORUM), which stated:

> *The National Meteorological Service will operate an Internet Server or any agreed superseding technologies to provide radar data to the public and other users*.

4.4 The Meeting was given examples of methods which could be used to fulfil this obligation. The examples include requirement for computer hardware, software, staffing and methods of hosting websites.

4.5 Mr. Joyette indicated the bandwidth concerns which will have to be addressed by the radar host countries especially during severe weather episodes, due to the excessive number of "hits", which can degrade their network performance.

4.6 THE MEETING

Noted the agreement of the Governments of the Radar Host Countries to Article 6.5 of the Memorandum of Understanding;

Also Noted the different methodologies for fulfilling the agreement.

OPERATIONAL MATTERS
(Agenda item 5)

5.1 The Meeting was made aware of matters, which are particularly related to the operations and the services delivered by Meteorological Services in the Caribbean.

(a) Operational Status of VSAT and EMWIN Systems

5.2 The Meeting discussed the operations of the VSAT telecommunication system which became operational in April 2004 and the efforts made to have COROBOR implement a part of the functionality of the workstations for which it was contracted and received payment. The urgency to implement the ability to decode and display "T4 chart" from BUFR code was communicated to COROBOR by WMO, due to the deadline of November 30, for the cessation of the transmission of charts in the "T4" format.

5.3 Members discussed the changes to the EMWIN system and its expansion in the Caribbean. They noted the training event on the new EMWIN, which will transmit data for the Caribbean, scheduled from 5 -9 March 2007 in Miami, involving personnel from Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis and St. Lucia.

(b) Disaster Mitigation

5.4 Members were informed of the *First Session of the IOC Intergovernmental Co-ordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions,"* its outcomes and impacts on the operations of National Meteorological Services.

5.5 The Meeting discussed the issues raised in the Flash Flood Forecasting Workshop and information presented on Disaster Risk Management. It recognised that Disaster Risk Management is the way forward to engage all stakeholders in an end to end system whose goal is the reduction in the loss of life and property.

(c) WMO Annual Global Monitoring

5.6 The Chairman noted that many of the Member States, Meteorological Services which are members of the Regional Basic Synoptic Network, do not participate in the WMO Annual Global Monitoring (AGM), which monitors the data disseminated over the Global Telecommunication Service. Members were urged to participate in the AGM.

The Meeting

Noted, the planned changes to the COROBOR workstations by the vendor to fulfil their contract specifications;

Expressed, concern on the status of the implementation of these changes by the vendor before 1 December 2006;

Also Noted, the outcomes of the Meeting on Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions;

Expressed, concern about the role of the National Meteorological Services within the communication plan of the Tsunami Warning System without a legislative framework;

Recommended, that Services with secondary offices, such as Montego Bay (Jamaica), Castries (St. Lucia), Crown Point (Tobago), Melville Hall (Dominica) as well as the CIMH make use of the EMWIN systems to receive data in these offices.

Also Recommended, that since the system is relatively inexpensive, the services should use its own resources for the purchase of the system.

PROJECT UPDATES/PROPOSALS

(Agenda item 6)

(i) WMO/Finland SIDS Caribbean Project – Pilot Project Status

6.1 The Chairman informed the meeting of the status of the Pilot Project funded by the Government of Finland and implemented by the World Meteorological Organization (WMO). The Pilot Project was to be implemented in the countries of Cuba, Jamaica and Trinidad and Tobago; however, Cuba has removed itself from the Project.

6.2 Training was provided to two staff members from the Meteorological Services of Jamaica and Trinidad and Tobago at the Finland Meteorological Institute (FMI) in Helsinki during May 2006. Staff from FMI installed the necessary hardware and software and provided training at the Jamaica Meteorological Service from 17 October to 3 November. Trinidad and Tobago's installation and training, which started on 20 November and will continue to 8 December, benefited from the experiences learnt in Jamaica and their installation was completed in two (2) days.

(ii) CARIB-HYCOS

6.3 The Chairman informed the Meeting of his dissatisfaction of the implementation by World Meteorological Organization of the island component of CARIB-HYCOS. During the past year no progress in implementation has occurred notwithstanding resources committed to the Project by the Regional Government of Martinique and other French Authorities. He indicated that this Project will not be raised at Caribbean Meteorological Council until a satisfactory response from WMO is received.

(iii) Cricket World Cup 2007

6.4 The Chairman informed the Meeting of the difficulties encountered in the exploration of methodologies for the provision of weather services to the Cricket World Cup 2007 (CWC 2007). He indicated that the new radars will not be installed in time, and members will have access to radar data from those already in the Caribbean in Jamaica, Guadeloupe, Martinique and Puerto Rico.

6.5 He canvassed Members on the methodologies on the way forward. Based on the responses from the Members it was decided to adapt the methodology which will be used by the Jamaican Meteorological Service, who were contracted by their Local Organizing Committee to provide weather services for CWC 2007 for the other eight (8) countries in which games will be played.

The Meeting

Noted, that a Special Cricket Forecast should be provided by Meteorological Services in countries hosting the cricket games, whether or not it is requested by the Local Organizing Committee;

Mandated, the CMO to be the lead in formulating a methodology to provide the Special Cricket Forecast based on the Jamaican Plan.

WMO RELATED ISSUES
(Agenda item 7)

(i) Overview of the WMO Information System

7.1 The Meeting received a presentation from Mr. Fred Sambula, Cayman Islands on an ***Overview of the WMO Information System (WIS),*** in his capacity as Chairman, Working Group on Planning and Implementation of the World Weather Watch in Region Association IV. WIS was conceived as a multi-purpose system which will serve all the requirements of WMO and WMO-sponsored programmes for the collection and exchange of all relevant data and products.

7.2 The intention of the design was to provide a flexible and scalable infrastructure which makes use of the existing structures and design principles, e.g. of the World Weather Watch, in particular the Global Telecommunication System (GTS) and other dedicated communications systems, such as satellite broadcast and managed data communication networks. Further, it is supposed to integrate existing data centres operating under the various WMO programmes and, where appropriate, other centres offering relevant data and products.

7.3 The Meeting was also informed of the need to utilize international industry standards for protocols, of-the-shelf hardware and software with a view to increasing the cost and effectiveness of the exchange of data and products while ensuring best possible serviceability and reliability of the System.

CMO OPERATIONAL METEOROLOGICAL ADVISORY GROUP (COMAG)

(Agenda Item 8)

8.1 The Meeting was reminded of the establishment of the CMO Meteorological Advisory Group (COMAG) during the Forty-fifth Meeting of the Caribbean Meteorological Council. It was noted that the membership of the first COMAG, included meteorologists from the countries of Antigua and Barbuda, Barbados, Belize, Guyana, St. Vincent and the Grenadines and Trinidad and Tobago.

8.2 The Chairman also indicated the problems encountered in having the first meeting of COMAG during 2006, notwithstanding the purchase of tickets for the participants to travel to Trinidad. The Meeting also noted that there will be a meeting of COMAG within the first two months of 2007.

SCIENTIFIC TOPIC

(Agenda Item 9)

(i) Caribbean Meteorological Services – Improving visibility through the use of Multimedia technology

9.1 Historically, the Caribbean Meteorological Services have struggled to be visible at the national and regional level. This has hampered these Services from receiving the public recognition and governmental support which are necessary to attract the qualified nationals for staffing and adequate funding to support their projects and services.

9.2 This lack of visibility has for the most part been a product of the reluctance of these Services to embrace new technology or to be part of weather presentations to the general public via the electronic media.

9.3 Mr. Joyette, St. Vincent and the Grenadines Meteorological Service gave a well received presentation on ***Caribbean Meteorological Services – Improving visibility through the use of Multimedia technology.*** He particularly stressed the Meteorological Services in Caribbean need to have an Internet presence and that the smaller Meteorological Services should look into providing forecast to the television stations using presentation technology such as PowerPoint, Corel Presentations and Adobe Acrobat.

9.4 It was also stressed that once an Internet presence is established it is imperative that the websites are maintained and updated regularly and routinely. Once properly instituted these options are relatively inexpensive, which needs dedicated personnel to reap the rewards of visibility

OTHER MATTERS
(Agenda Item 10)

(i) Aeronautical Codes

10.1 The Director, Barbados Meteorological Service noted that aeronautical observations disseminated by the Caribbean Meteorological Services do not necessarily conform to the requirements of the METAR code form. It has been noted that observations with statements in the "**Remarks**" section of the code form do not differentiate between national and international code forms.

(ii) WMO Catalogue

10.2 Members from countries with non-forecast Meteorological Offices were reminded about the request from the CMO Headquarters Unit for a list of WMO publications needed by their offices. This request was made to the relevant heads of the respective services during the second quarter of 2006 with a response from one Service.

(iii) Sea Level Monitoring Stations

10.3 The Meeting was informed that eight (8) of the sea level monitor stations which were deployed under the Caribbean Planning for Adaptation to Climate Change (CPACC), will be revitalized under the Mainstream Adaptation to Climate Change (MACC). However, the funding agency, the World Bank has placed constraints on the use of funds for the revitalization of the stations.

10.4 Through an agreement between Caribbean Community (CARICOM) and the Caribbean Community Climate Change Centre (5Cs') the CIMH will be responsible for the maintenance of four (4) of the stations in the countries of Antigua and Barbuda, Barbados, Grenada and Guyana. This agreement for the maintenance will continue for a period of ten (10) years and after this period the Member States will assume the responsibility for maintenance.

(iv) Bereavement

The Directors of Meteorological Services of Member States were informed of the passing of Mr. David Smedley. Mr. Smedley was the first Principal of the Caribbean Meteorological Institute, serving in the position from 1967 to 1971. The Institute was just established under the auspices of a joint United Nations Development Programme/World Meteorological Organization Project.

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ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL COUNCIL
BOLANS VILLAGE, ANTIGUA AND BARBUDA
4 DECEMBER 2006

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ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES
St. John 's, Antigua and Barbuda, 4 DECEMBER 2006

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Summary Statement on Tropical Cyclones and Climate Change

The surfaces of most tropical oceans have warmed by 0.25 – 0.5 degree Celsius during the past several decades. The Intergovernmental Panel on Climate Change (IPCC) considers that the likely primary cause of the rise in global mean surface temperature in the past 50 years is the increase in greenhouse gas concentrations.

The global community of tropical cyclone researchers and forecasters as represented at the 6th International Workshop on Tropical Cyclones of the World Meteorological Organization has released a statement on the links between anthropogenic (human-induced) climate change and tropical cyclones, including hurricanes and typhoons. This statement is in response to increased attention on tropical cyclones due to the following events:

a) There have been a number of recent high-impact tropical cyclone events around the globe. These include 10 landfalling tropical cyclones in Japan in 2004, five tropical cyclones affecting the Cook Islands in a five-week period in 2005, Cyclone Gafilo in Madagascar in 2004, Cyclone Larry in Australia in 2006, Typhoon Saomai in China in 2006, and the extremely active 2004 and 2005 Atlantic tropical cyclone seasons - including the catastrophic socio-economic impact of Hurricane Katrina.

b) Some recent scientific articles have reported a large increase in tropical cyclone energy, numbers, and wind-speeds in some regions during the last few decades in association with warmer sea surface temperatures. Other studies report that changes in observational techniques and instrumentation are responsible for these increases.

Consensus Statements by International Workshop on Tropical Cyclones-VI (IWTC-VI) Participants

1. Though there is evidence both for and against the existence of a detectable anthropogenic signal in the tropical cyclone climate record to date, no firm conclusion can be made on this point.
2. No individual tropical cyclone can be directly attributed to climate change.
3. The recent increase in societal impact from tropical cyclones has largely been caused by rising concentrations of population and infrastructure in coastal regions.
4. Tropical cyclone wind-speed monitoring has changed dramatically over the last few decades, leading to difficulties in determining accurate trends.
5. There is an observed multi-decadal variability of tropical cyclones in some regions whose causes, whether natural, anthropogenic or a combination, are currently being debated. This variability makes detecting any long-term trends in tropical cyclone activity difficult.

6. It is likely that some increase in tropical cyclone peak wind-speed and rainfall will occur if the climate continues to warm. Model studies and theory project a 3-5% increase in wind-speed per degree Celsius increase of tropical sea surface temperatures.
7. There is an inconsistency between the small changes in wind-speed projected by theory and modeling versus large changes reported by some observational studies.
8. Although recent climate model simulations project a decrease or no change in global tropical cyclone numbers in a warmer climate, there is low confidence in this projection. In addition, it is unknown how tropical cyclone tracks or areas of impact will change in the future.
9. Large regional variations exist in methods used to monitor tropical cyclones. Also, most regions have no measurements by instrumented aircraft. These significant limitations will continue to make detection of trends difficult.
10. If the projected rise in sea level due to global warming occurs, then the vulnerability to tropical cyclone storm surge flooding would increase.