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**TROPICAL  
CYCLONE PROGRAMME**

Report No. TCP-30

**Regional Association IV  
(North and Central America and the Caribbean)  
Hurricane Operational Plan**

**2001 Edition**



## SWITZERLAND

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## INTRODUCTION

The regional activities under the WMO Tropical Cyclone Programme consist mainly of the programmes pursued by groups of countries acting in concert to improve their warning systems. In Region IV (North and Central America) there is a long history of collective action specifically designed to protect people and property from the severe tropical cyclones which are called hurricanes in the Region. A working group, known as the RA IV Hurricane Committee, was established by the seventh session of Regional Association IV (Mexico City, April - May 1977) to promote such activities within the framework of the Tropical Cyclone Programme (Tropical Cyclone Project until Eighth Congress, 1979).

At its first session (San Juan, May 1978), the RA IV Hurricane Committee took a novel approach to its problems by drawing up an RA IV Hurricane Operational Plan with a view to ensuring the most effective co-operation and co-ordination between the countries in preparing and issuing meteorological forecasts and warnings of all tropical cyclones affecting the area. The plan was shortly thereafter adopted by Regional Association IV. It defines the observing, forecasting and warning responsibilities of all co-operating Members and deals with other related items such as terminology and communications. The Committee repeatedly reviews the operational plan and has concluded that it contributes in a very real sense to the improvement of warning systems in the hurricane areas of Region IV. It also serves as a valuable information source for the operational services. Other regional tropical cyclone bodies of the WMO Tropical Cyclone Programme family, the RA I Tropical Cyclone Committee for the South-West Indian Ocean, the WMO/ESCAP Panel on Tropical Cyclones for the Bay of Bengal and the Arabian Sea, the ESCAP/WMO Typhoon Committee and the RA V Tropical Cyclone Committee for the South Pacific and the South-East Indian Ocean have followed this initiative.

As requested by the Hurricane Committee, the RA IV Hurricane Operational Plan has been made available to all concerned through this document. New editions and supplements will be issued from time to time in the years ahead to reflect further development, updating and other changes to the plan.



**RESOLUTION 14 (IX-RA IV) - RA IV HURRICANE OPERATIONAL PLAN**

**REGIONAL ASSOCIATION IV (NORTH AND CENTRAL AMERICA)**

**NOTING:**

- (1) Resolution 2914 (XXVI) of the General Assembly of the United Nations - International action for the mitigation of the harmful effects of storms,
- (2) Resolution 13 (IX-RA IV) - RA IV Hurricane Committee,

**CONSIDERING:**

- (1) The need to enhance the co-operative efforts of countries within Region IV in carrying out effectively their roles in preparing for and issuing meteorological forecast and warnings of all tropical cyclones affecting the area,
- (2) That to achieve this aim it is essential to have an agreed "Hurricane Operational Plan" defining the observing, forecasting and warning responsibilities of all co-operating countries,

**DECIDES** to adopt the "RA IV Hurricane Operational Plan"\*;

**AUTHORIZES** the president of RA IV to approve on behalf of the Association amendments to this Hurricane Operational Plan, as recommended by the RA IV Hurricane Committee;

**REQUESTS** the Secretary-General:

- (1) To maintain the WMO publication on the RA IV Hurricane Operational Plan in print and to keep it up to date;
- (2) To inform all Members concerned of any amendments and updating of the publication.

\* Published as WMO/TD-No. 494 Report No. TCP-30

# CHAPTER 1

## GENERAL

### 1.1 Introduction

The purpose of this plan is to enhance the co-operative efforts of Members within WMO Region IV in the carrying out of their roles of preparing for and issuing forecasts and warnings of all tropical cyclones affecting the area. Responsibilities of Members are defined. Tropical cyclone releases issued by the Regional/Specialized Meteorological Centre with activity specialization in tropical cyclone analysis, tracking and forecasting, in Miami (RSMC Miami - Hurricane Center) are explained and examples provided. Observational platforms, including land-based radar, satellites and aircraft reconnaissance are discussed. Where differences exist between the USA's National Hurricane Operational Plan (NHOP) and this plan, aircraft radar and upper-air observations made by the US Department of Defense will comply with USA's NHOP. Communication procedures are outlined with special emphasis on headings required to assure proper computer-processing and distribution of messages. The lists of hurricane names for the Caribbean Sea, Gulf of Mexico, the North Atlantic Ocean and the eastern North Pacific are included.

### 1.2 Terminology used in RA IV

#### 1.2.1 Standard terminology in RA IV

- I. Tropical Cyclone A non-frontal cyclone of synoptic scale, developing over tropical or subtropical waters and having a definite organized surface circulation.
- A. Hurricane A warm core tropical cyclone in which maximum average surface wind (one-minute mean) is 118 km/h (74 mph) (64 knots) or greater.
- B. Tropical storm A well organized warm-core tropical cyclone in which the maximum average surface wind (one-minute mean) is in the range 63-117 km/h (39-73 mph) (34-63 knots) inclusive.
- C. Tropical depression A tropical cyclone in which the maximum average surface wind (one minute mean) is 62 km/h (38 mph) (33 knots) or less.
- II. Subtropical cyclone A low pressure system, developing over subtropical waters which initially contains few tropical characteristics. With time the subtropical cyclone can become tropical.
- A. Subtropical Storm A subtropical cyclone in which the maximum sustained surface wind is 63 km/h (39 mph) (34 knots) or greater.
- B. Subtropical depression A subtropical cyclone in which the maximum sustained surface wind

is less than 63 km/h (39 mph) (34 knots).

III. Tropical wave A trough or cyclonic curvature maximum in the trade wind easterlies or equatorial westerlies. The wave may reach maximum amplitude in the lower middle troposphere, or may be the reflection of an upper-troposphere cold low or equatorial extension of a mid-latitude trough.

IV. Tropical disturbance A discrete system of apparently organized convection originating in the tropics or sub-tropics, having a non-frontal migratory character and having maintained its identity for at least 24 hours.

V. Advisory (English messages) A formal message from a Hurricane Warning Office giving warning information together with details on tropical cyclone location, intensity and movement, and precautions that should be taken. Where possible, the RSMC Miami-Hurricane Center advisory will contain a resumé of all warnings in effect.

A. Hurricane warning A warning that one or both of the following dangerous effects of a hurricane are expected in a specified area in 24 hours or less: (a) average winds 118 km/h (74 mph) (64 knots) or higher; (b) dangerously high water or a combination of dangerously high water and exceptionally high waves, even though winds expected may be less than hurricane force.

B. Hurricane watch An announcement for a specific area that a hurricane or an incipient hurricane condition poses a possible threat within 36 hours.

C. Gale and tropical storm warning\* A warning for tropical storm conditions, including possible sustained winds within the range 63-117 km/h (39-73 mph) (34-63 knots) are expected in specified areas within 24 hours or less.

D. Tropical storm watch\* An announcement for a specific area that a tropical storm or an incipient tropical storm condition poses a possible threat within 36 hours.

VI. Bulletin (Spanish messages) A formal message from a Hurricane Warning Office giving warning information, together with details on tropical cyclone location, intensity and movement, and precautions that should be taken.

\* The terms "Tropical Storm Warning" and "Tropical Storm Watch" or their equivalent in Spanish are used in coastal or land area warnings by the RSMC Miami-Hurricane Center

and an increasing number of Members.

- A. Hurricane Warning (same as English)
- B. Hurricane Watch (same as English)
- C. Gale or Tropical Storm Warning (same as English)
- D. Tropical Storm Watch (same as English)
- E. Advisory Information on tropical cyclone not requiring watches or warnings at this time.

VII. Bulletin (English) A public release from a weather office issued in the event of the occurrence or forecast occurrence of severe weather, including the developing stage of a tropical cyclone or after formal advisories on a hurricane or tropical cyclone have been discontinued. Bulletins emphasize features which are significant for the safety of the public and summarize all warnings in effect.

#### 1.2.2 Meaning of other terms used

I. Local action statements A public release prepared by a Weather Service Office in or near a threatened area giving specific details for its area of responsibility: (a) weather conditions (b) sections that should be evacuated and (c) other precautions necessary to protect life and property.

II. Hurricane season The portion of the year having a relatively high incidence of hurricanes. In the Atlantic, Caribbean and the Gulf of Mexico, it is the period from 01 June to 30 November, and in the East Pacific, from 15 May to 30 November.

III. Storm surge The difference between the actual water level under influence of a meteorological disturbance (storm tide) and the level which would have been attained in the absence of the meteorological disturbance (i.e. astronomical tide).

IV. Storm tide The actual sea level as influenced by a weather disturbance. The storm tide consists of the normal astronomical tide and the storm surge.

V. "Eye" The relatively clear and calm area inside the circular wall of convective clouds, the geometric centre of which is the centre of the tropical cyclone (hurricane).

VI. Reconnaissance aircraft centre fix of the tropical cyclone, vortex fix The location of the centre of a tropical cyclone obtained by reconnaissance aircraft penetration.

VII. Centre fix of the tropical cyclone The estimated location of the centre of a tropical cyclone.

1.2.3 Equivalent terms

<u>English</u>	<u>French</u>	<u>Spanish</u>
Advisory	Bulletin météorologique	Boletín
Hurricane season	Période des cyclones	Temporada de huracanes
Hurricane warning	Alerte cyclone - Consignes ORSEC N° 2	Alerta de huracán
Hurricane watch	Pre-alerte cyclone - Consignes ORSEC N° 1	Aviso de huracán

1.3 International hurricane scale (IHS)

The scale related to hurricane maximum kinetic energy is as follows:

IHS No.	Corresponding wind speed ( $V_n$ )			
	n	$m s^{-1}$	$km h^{-1}$	knots
1.0	33	118	64	74
1.5	40	144	78	90
2.0	46	166	90	103
2.5	52	186	100	116
3.0	57	204	110	127
3.5	61	220	119	137
4.0	65	235	127	146
4.5	69	250	135	155
5.0	73	263	142	164
5.5	77	276	149	172
6.0	80	288	156	179
6.5	83	300	162	186
7.0	87	311	168	194
7.5	90	322	174	200
8.0	92	333	180	207
8.5	95	343	185	213
9.0	98	353	191	219
9.5	101	363	196	225
10.0	103	372	201	231

The wind speed corresponding to IHS numbers greater than 10 may be derived from the following relationships:

$$\text{m s}^{-1}: V_n = 32.7 \sqrt{n}$$

$$\text{knots: } V_n = 63.563568 \sqrt{n}$$

$$\text{km h}^{-1}: V_n = 117.72 \sqrt{n}$$

$$\text{m.p.h.: } V_n = 73.147938 \sqrt{n}$$

where  $V_n$  represents a hurricane with  $n$  times the kinetic energy per unit mass of the threshold hurricane ( $V_1$ ).

#### 1.4 The Saffir/Simpson hurricane scale

The Saffir/Simpson Hurricane Scale from one to five based on the hurricane's present intensity, used operationally within RA IV is as follows:

One: Winds 119-153 km h<sup>-1</sup> (74-95 m.p.h)

Two: Winds 154-177 km h<sup>-1</sup> (96-110 m.p.h).

Three: Winds 178-209 km h<sup>-1</sup> (111-130 m.p.h)

Four: Winds 210-250 km h<sup>-1</sup> (131-155 m.p.h)

Five: Winds greater than 250 km h<sup>-1</sup> (155 m.p.h)

## ATTACHMENT 1A

**RA IV HURRICANE COMMITTEE GLOSSARY OF STORM-RELATED TERMS  
(other than those in Chapter 1)**

<b>ENGLISH</b>	<b>SPANISH</b>	<b>DESCRIPTION</b>
Analogue method	Método analógico	Forecasting method based on the assumption that a current synoptic situation will develop in the same way as a similar synoptic situation in the past.
Anticyclone	Anticiclón	An area of high pressure, with the highest pressure at the centre. Commonly referred to as "High".
Anticyclogenesis	Anticiclogénesis	Formation of a new anticyclone or intensification of an existing one.
Average one-minute wind speed	Velocidad promedio del viento en un minuto	Determined by averaging observed values from a direct-reading instrument or a recorder over a 1 minute period. The standard height of the windmeasurer instrument is 10 meters.
Baroclinic	Baroclínico	An atmospheric state in which the pressure depends upon other variables in addition to density. The isobaric surfaces do not, therefore, coincide with the surfaces of constant specific volume. In a baroclinic atmosphere the variations of the wind with elevation may be quite large.
Barotropic	Barotrópico	A state of the atmosphere in which isobaric surfaces coincide with surfaces of equal density. In a Barotropic atmosphere the variations of the wind elevation is slight.
Blocking	Bloqueo	Interruption of normal eastward motion due to the stagnancy of an anticyclone (or, less frequently, a cyclone) in their paths.
Circulation	Circulación	General or primary patterns of wind-flow in the atmosphere. Cyclonic circulation is considered positive and Anticyclonic circulation negative.
Climatological forecast	Pronóstico Climatológico	Forecast based on the climate of a region rather than upon the dynamic implications of current weather.

<b>ENGLISH</b>	<b>SPANISH</b>	<b>DESCRIPTION</b>
Cold low	Baja fría	Depression or low pressure zone which is cold with respect to its surroundings at the same level of the atmosphere.
Convergence	Convergencia	Increase of mass into an atmospheric layer when the winds are so that there is a net horizontal flow toward inside the layer. Is the opposite to "divergence".
Cyclogenesis	Ciclogénesis	The process that creates a new cyclone or intensifies an existing one.
Cyclone	Ciclón	An area of low pressure, with the lowest pressure at the centre. Commonly referred to as "Low".
Deepening	Profundización	The process by which the central pressure of a system (i.e. cyclone) decreases with time. Deepening is related to cyclogenesis and results in an increase of the wind speed around a low pressure area.
Divergence	Divergencia	Net outward mass flow into a layer of the atmosphere. Is the opposite to "convergence".
Dropsonde	Dropsonda	A small radio transmitter, that is dropped from an aircraft with a parachute and transmits to the plane data on temperature, pressure and relative humidity.
Extra-Tropical Cyclone	Ciclón extratropical	A cyclone which attributes the majority of its energy from baroclinic processes. An extra-tropical cyclone has significant vertical wind shears, and a distinctive asymmetric temperature and moisture field. It may develop a cold core in its later stages.
Fetch	Fetch	Length of the section over sea water along which wind blows with almost uniform direction and speed. Height of wind waves is function of the fetch.



<b>ENGLISH</b>	<b>SPANISH</b>	<b>DESCRIPTION</b>
Filling	Llenado	Process by which the central pressure of cyclones increases. It is the opposite of "deepening".
Flash flood	Crecida repentina	A flood that rises quite rapidly with little or no advance warning; usually as a result of an intense rainfall over a small area, or, possibly a dam failure etc.
Frontogenesis	Frontogénesis	Process of formation or intensification of a front or frontal zone by means of physical (e.g. radiation) or kinematical (e.g. air motion) influences.
Frontolysis	Frontólisis	Process of weakness or dissipation of a front or frontal zone by means of physical (e.g. radiation) or kinematical (e.g. air motion) influences.
Gale	Viento duro	Sustained winds within the range 63 to 117 km/h (39 to 73 miles per hour) (34 to 63 knots).
Gradient	Gradiente	Change rate of any element value with distance in any given direction.
Gust	Racha	Fluctuation in a short time of wind speed with a variation of 10 knots or more between peaks and lowest speeds.
Hurricane centre or eye	Centro u ojo del huracán	The relatively calm area in the centre of the storm. In this area winds are light and the sky often is only partly covered by clouds.
Hurricane Committee	Comité de Huracanes	Regional Association IV (North and Central America) Working Group established in 1977 to promote collective action specifically designed to minimize loss of life and damage to property from tropical cyclones in the Region.
Inter-tropical Convergence Zone	Zona de Convergencia Inter-Tropical	Narrow zone where the trade winds of the two hemispheres meet. (It is also known as the Equatorial Convergence Zone).

<b>ENGLISH</b>	<b>SPANISH</b>	<b>DESCRIPTION</b>
Inversion	Inversión	Condition of the atmosphere when temperature of an air layer increases with height rather than diminish.
Isobar	Isobara	Line connecting points of equal atmospheric pressure on a given surface.
Isochrone	Isocrona	Line connecting all points where a phenomena occurs at the same time.
Isohyet	Isoyeta	Line connecting points where quantity of precipitation collected during a given period has the same value.
Isotach	Isotaca	Line connecting points of equal wind speed.
Isallobar	Isalobara	Line connecting points with the same barometric change during a given period.
Knot	Nudo	Wind speed unit equal to one nautical mile (6.080 feet) (1.8 km) per hour.
Long wave	Onda Larga	Atmospheric waves with wavelength varying from 50° to 120°.
Meridional flow	Flujo meridional	A predominantly north-south wind circulation.
Modelling	Modelización	Use of a theoretical scheme, usually in a mathematical form, of a system or a complex reality that is developed to facilitate its understanding and the study of its behaviour.
Near gale	Viento fuerte	Wind within the speed range 50 to 62 km/h (32 to 38 miles per hour) (28 to 33 knots) (Number 7 of Beaufort Scale).
Numerical Weather Prediction (NWP)	Predicción Numérica del Tiempo (PNT)	Forecast of a pressure field by means of numerical solution of motion equations in a simplified form, usually with the support of electronic computers.

<b>ENGLISH</b>	<b>SPANISH</b>	<b>DESCRIPTION</b>
Persistence forecast	Pronóstico de persistencia	Forecast entirely based on tendency to weather persistence.
Polar trough	Vaguada polar	A low pressure trough embedded in the westerly winds prevailing at medium latitudes. They generally move from west to east accompanied by abundant clouds at all levels. Occasionally a well developed polar trough extends until tropical regions. Western Caribbean hurricanes of June and October are frequently formed on polar trough.
Post Tropical Cyclone	Ciclón Post-Tropical	A cyclone in the subtropics or middle latitudes that is in transition from tropical to extra-tropical. It may be involved with a frontal system, but continues to possess significant tropical characteristics including a warm core.
Reconnaissance flight	Vuelo de reconocimiento	Flight realized by an aircraft penetrating a tropical storm or hurricane, with the purpose of carrying out observations.
Recurvature	Recurvatura	Change in the track direction of a tropical cyclone from an initial westward movement until its later normal movement poleward and eastward.
Ridge of high pressure	Cuña de alta presión	Elongated area of high pressure displacing between two depressions or troughs.
Spiral band	Banda espiral	A long and narrow spiral band found inserted into wind circulation around a hurricane. Convergence and rainfall reach maximum values into spiral bands.
Squall	Turbonada	Atmospheric phenomenon characterized by a very large variation of wind speed: it begins suddenly, has a duration of the order of minutes, and decreases its speed quickly. It is often accompanied by showers or storms.

ENGLISH	SPANISH	DESCRIPTION
Squall line	Línea de turbonada	Fictitious moving line, sometimes of considerable extension, along which squall phenomena occurs. They frequently precede cold fronts, but occasionally they are present within the external area of the hurricane cloud cover.
Statistical forecast	Pronóstico estadístico	Objective forecast based on a statistical study of the past behaviour of the atmosphere, expressed in the form of regression formulae, probabilities, etc.
Subsidence	Subsidencia	Slow downfall of an air mass over an extended region. It is usually accompanied by horizontal divergence at lower layers.
Swell	Mar de leva	Any water waves system which has not been generated locally.
Thunderstorm	Tormenta	One or more sudden electrical discharges manifested by a luminous flash (lighting) and a sharp or noisy sound (thunder).
Tornado	Tornado	A severe rotating windstorm of small diameter and great destructive power. It is the most violent natural meteorological phenomenon. With certain frequency they can occur within hurricanes circulation. Although tornadoes occur over land areas in many parts of the world associated with several weather situations, they are relatively frequent in the forward portion of the hurricane periphery.
Tropical weather outlook	Perspectivas del tiempo en los trópicos	A report containing information on possible evolution of tropical weather prepared by RSMC Miami - Hurricane Center from 1 June through 30 November, and transmitted at 05:30, 11:30 and 17:30 Eastern local time. The outlook discusses which areas are expected to remain stable, which disturbed or suspicious areas are becoming favourable for tropical development during the next day or two.

ENGLISH	SPANISH	DESCRIPTION
Trough of low pressure	Vaguada de baja presión	An elongated area of low pressure with U-shaped or V-shaped isobars which concavities are addressed toward low pressure.
Typhoon	Tifón	Name given to "hurricanes" in the China Sea and, more commonly, in the north-west Pacific Ocean.
Vortex	Vórtice	Any rotating wind system.
Vorticity	Vorticidad	Tendency of a fluid to turn or rotate around an arbitrarily oriented axis.
Waterspouts	Tromba marina	Small, revolving storm over oceans or inland waters. They occasionally move towards inland and cause some damage, but winds are less severe than those in tornadoes, which they resemble in appearance.
Wind	Viento	The horizontal movement of the air with respect to earth surface.
Wind shear	Cizalladura del viento	Space variation of wind speed in a given direction (horizontal or vertical).
Wind stress	Fuerza del viento	The drag or tangential force per unit area exerted on the surface of the earth by the adjacent layer of moving air.

**ACRONYMS:****SIGLAS:**

GOES	GOES	Geo-stationary Operational Environmental Satellite
HOMS	HOMS	Hydrology Operational Multipurpose System
IOC	COI	Intergovernmental Oceanographic Commission
RSMC	CMRE	Regional Specialized Meteorological Centre
TCP	PCT	Tropical Cyclone Programme

WWW

VMM

World Weather Watch Programme. Consists of the following elements:

- GOS (SMO)      - Global Observing System;
- GTS (SMT)      - Global Telecommunication System;
- GDPS (SMPD)   - Global Data Processing System.



## CHAPTER 2

### RESPONSIBILITIES OF MEMBERS

#### 2.1 Forecasts and warnings for the general population

2.1.1 In Region IV the responsibility for preparing and issuing warnings is as follows:

Antigua & Barbuda	The islands and coastal waters of Antigua, Anguilla, Barbuda, British Virgin Islands, Montserrat, Nevis and St. Kitts;
Bahamas	The islands and coastal waters of the Bahamas, Turks and Caicos Islands;
Barbados	The islands and coastal waters of Barbados, Dominica, St. Vincent and the Grenadines;
Belize	The islands, coastal waters and inland areas of Belize;
Bermuda	The islands and coastal waters of Bermuda;
Canada	The islands, coastal waters and inland areas of Canada;
Cayman Islands	The islands, and coastal waters of Cayman Islands;
Colombia	The islands, coastal waters and inland areas of Colombia;
Costa Rica	The islands, coastal waters and inland areas of Costa Rica;
Cuba	The islands, coastal waters and inland areas of Cuba;
Dominican Republic	The islands, coastal waters and inland areas of the Dominican Republic;
El Salvador	The islands, coastal waters and inland areas of El Salvador;
Guatemala	The coastal waters and inland areas of Guatemala;
Honduras	The islands, coastal waters and inland areas of Honduras;
Jamaica	The coastal waters and islands of Jamaica;
France	The coastal waters and islands of Martinique; Guadeloupe (Grande Terre and Basse Terre); Marie-Galante, Desirade and Les Saintes; St Barthelemy; St Martin;
Mexico	The islands, coastal waters and inland areas of Mexico;

Netherlands Antilles & Aruba	The islands and coastal waters of Aruba, Bonaire, Curaçao, Saba, St. Eustatius and St Maarten;
Nicaragua	The islands, coastal waters and inland areas of Nicaragua;
Panama	The islands, coastal waters and inland areas of Panama;
St. Lucia	The islands, coastal waters and inland areas of St. Lucia;
Trinidad and Tobago	The islands and coastal waters of Trinidad, Tobago, and Grenada and its dependencies;
United States of America	The islands, coastal waters and inland areas of the United States of America, including Puerto Rico and the US Virgin Islands. In addition, the USA has agreed to issue warnings for Haiti, and its coastal waters. The USA provides Bermuda with information on threatening tropical storms and hurricanes. Forecasts issued by the USA are discussed in Chapter III;
Venezuela	The islands, coastal waters and inland areas of Venezuela.

The dissemination of these warnings within each country or territory is the responsibility of that country or territory.

2.1.2 When, because of disruptions caused by a tropical cyclone, it is not possible for

- (a) Antigua or
- (b) Bahamas or
- (c) Barbados or
- (d) Cayman Islands or
- (e) Jamaica or
- (f) Netherlands Antilles and Aruba or
- (g) St. Lucia or
- (h) Trinidad and Tobago,

to meet its responsibility as set out above, the temporary changes to the assignment of responsibilities given in section 2.1.1 shall be, respectively:



Figure 1-A : Tropical cyclone warning responsibility of RA IV

2000 Edition

2-4

countries described in paragraph 2.1

Figure 1-B : Tropical cyclone warning responsibility of

2000 Edition

RA IV countries described in paragraph 2.1

- (a) Barbados to take over the responsibility of Antigua and/or St. Lucia;
- (b) Antigua to take over the responsibility of Barbados with respect to the islands and coastal waters of Dominica.
- (c) Trinidad and Tobago to take over the responsibility of Barbados with respect to the islands and coastal waters of Barbados and St. Vincent and the Grenadines;
- (d) USA to take over the responsibility of Bahamas and Jamaica;
- (e) USA to take over the responsibility of the Netherlands Antilles and Aruba;
- (f) Barbados to take over the responsibility of Trinidad and Tobago.
- (g) Jamaica to take over the responsibility of the Cayman Islands.

## 2.2 Forecasts and warnings for the open sea and civil aviation

2.2.1 In accordance with the WMO Manual on Marine Meteorological Services, the USA is responsible for preparing marine tropical cyclone forecasts and warnings for the Caribbean Sea, Gulf of Mexico and the North Atlantic Ocean. These forecasts and warnings are available as part of a tropical cyclone forecast/advisory bulletin (reference chapter 3, section 3.2.4).

2.2.2 In accordance with the International Civil Aviation Organization (ICAO) Air Navigation Plans (ANPs) for the Caribbean (CAR), North Atlantic (NAT) and South American (SAM) Regions, warnings of tropical cyclones for international air navigation are issued as SIGMET messages, including an OUTLOOK, by designated meteorological watch offices (MWOs), each of which provides information for one or more specified flight information regions (FIRs) or upper information regions (UIRs). The boundaries of the FIRs/UIRs are defined in ICAO ANPs for the CAR, NAT and SAM Regions.

2.2.3 SIGMET information is provided in accordance with WMO-No. 49 - Technical Regulations, Volume II (Meteorological Services for International Air Navigation). SIGMETs for tropical cyclones are issued for those tropical cyclones having a 10-minute mean surface wind speed of 63 km/h (34 kt) or more, **except in Regional Association IV where the mean surface wind will be averaged over a one-minute period.** While ICAO wished to standardize the practice of averaging globally, it recognized that the RA IV practice does not constitute a safety problem for aviation; it simply implies that some additional SIGMET messages would be issued for those tropical cyclones in which the ten-minute average would remain below the specified 63 km/h (34 kt) threshold.

2.2.4 The RSMCMiami – Hurricane Center disseminates advisory information on positions of the centre of the tropical cyclones to MWOs as appropriate for use in the preparation of OUTLOOKs appended to SIGMETs for tropical cyclones.

### 2.3 Satellite rainfall estimates

The USA will provide satellite rainfall estimates when a tropical system is within 35 hours of making landfall within the region.

### 2.4 Observations

- (a) Radar: Canada, the Caribbean Institute of Meteorology and Hydrology (CIMH), Bahamas, Barbados, Belize, Cuba, Dominican Republic, France (Martinique and Guadeloupe), Jamaica, Mexico, Netherlands Antilles (Curaçao and St. Maarten), Trinidad and Tobago, and the USA will take and distribute radar observations whenever a tropical cyclone is within radar range. Frequency and times of observations will be in accordance with US or WMO radar reporting procedures;
- (b) Reconnaissance: The USA will make available all operational weather reconnaissance observations obtained in connection with tropical disturbances;
- (c) Satellite: Near-polar-orbiting and geostationary satellite products will be made available to countries having the necessary receiving equipment (see WMO-No. 411);
- (d) Surface: In addition to routine observations, additional observations will be taken by Members when requested by RSMC Miami - Hurricane Center;
- (e) Upper-air: Besides routine observations, additional six-hourly rawinsonde observations will be taken by Members when requested by RSMC Miami - Hurricane Center.

### 2.5 Communications

Members will disseminate forecasts, warnings and observations in accordance with established communications headings presented in the Manual on the Global Telecommunication System (WMO-No. 386).

### 2.6 Information

RSMC Miami - Hurricane Center will serve as a regional information centre on tropical meteorology including tropical cyclones. This function is performed both during active tropical cyclone periods and as a source of information on past tropical cyclone activity.

## CHAPTER 3

### TROPICAL CYCLONE PRODUCTS OF THE UNITED STATES OF AMERICA

#### 3.1 Tropical weather outlook

Tropical weather outlooks are prepared by RSMC Miami - Hurricane Center from 1 June until 30 November and are transmitted at 0530, 1130, 1730 and 2230 Eastern Local Time. Normally, these outlooks cover only the tropical and subtropical Atlantic, the Caribbean and the Gulf of Mexico. The outlook discusses meteorologically which areas are expected to remain stable and which disturbed or suspicious areas are becoming favorable for tropical development during the next day or two. For the first 24 hours of a tropical cyclone, the Tropical Weather Outlook shall include a separate final statement which identifies the WMO/AFOS header for the advisory.

The outlook may also be used for public tropical depressions, tropical storms, and hurricanes that are not expected to threaten land areas. In these cases, the outlook will include in brief form the location, size, movement and intensity. Map co-ordinates will not be used in giving the location. Whenever advisories are being issued on a tropical cyclone west of 35°W, the tropical outlook may include areas under threat and/or not expected to be under threat.

Tropical weather outlooks for the East Pacific will be issued at 0400 1000, 1600 and 2200 Pacific Local Time\*- by RSMC Miami - Hurricane Center from 15 May until 30 November.

Monthly summaries of tropical weather will also be included as part of the outlook to describe briefly past tropical cyclone activity or lack of it and, if possible, to determine how general atmospheric circulation patterns influenced those events.

#### Example:

ABNT 20 KNHC 091530  
TROPICAL WEATHER OUTLOOK FOR THE ATLANTIC...THE CARIBBEAN SEA  
AND THE GULF OF MEXICO  
NATIONAL WEATHER SERVICE MIAMI FL  
1130 AM EDT WEDNESDAY JUNE 9, 1976  
SATELLITE PICTURES THIS MORNING INDICATE THAT SHOWER ACTIVITY  
OVER THE NORTHWESTERN CARIBBEAN SEA AND ADJACENT LAND  
AREAS HAS INCREASED SIGNIFICANTLY SINCE TUESDAY. THERE IS NO  
EVIDENCE THAT A LOW PRESSURE CENTRE IS DEVELOPING AT THE  
PRESENT TIME...HOWEVER LOCALLY HEAVY RAINS MAY OCCUR OVER  
ISLANDS OF THE NORTHWESTERN CARIBBEAN SEA AND PORTIONS OF  
BELIZE...HONDURAS...AND NICARAGUA  
TROPICAL STORM FORMATION IS NOT EXPECTED THROUGH THURSDAY.

#### 3.2 Public advisories

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\* UTC - 7 hours during daylight saving time and - 8 hours otherwise.

Public advisories are the primary means used by the USA to issue information concerning tropical and subtropical cyclones. In the eastern Pacific, public advisories are only issued for systems threatening land.

### 3.2.1 Tropical depression advisories

Public tropical depression advisories are routinely issued for the Atlantic, Caribbean and Gulf of Mexico. Information on eastern North Pacific tropical depressions is contained in routinely-issued marine advisories and tropical weather outlooks issued for the eastern North Pacific basin. All public tropical depression advisories are distributed on the same time schedule as tropical storms and hurricanes. Public advisories for the Atlantic basin will be numbered consecutively. The less frequently issued eastern North Pacific tropical depression advisories will receive the same number as the corresponding routinely-issued marine advisory.

Public tropical depression advisories will give the same centre position in terms of latitude and longitude as listed in the corresponding marine advisory. However, the public advisory will contain a statement of the degree of uncertainty of the estimate of the centre position. For example, "...the poorly defined centre of the tropical depression was located within about 50 miles ... 80 km ... of latitude 17.0 north ... longitude 57.0 west or about 180 miles east of the north-east lesser Antilles".

#### Example:

WTNT 31 KNHC 100900  
 BULLETIN  
 TROPICAL DEPRESSION DANIELLE ADVISORY NUMBER 13  
 NATIONAL WEATHER SERVICE MIAMI, FL  
 5 AM EDT WED SEP 10 1986

THE GOVERNMENT OF JAMAICA HAS ISSUED A SEVERE WEATHER WATCH FOR JAMAICA. AT 5 AM EDT...0900Z...THE POORLY DEFINED CENTER OF TROPICAL DEPRESSION DANIELLE WAS ABOUT 175 MILES...280 KM SOUTH SOUTHEAST OF KINGSTON JAMAICA. THE SYSTEM IS MOVING TOWARD THE WEST AT 25 TO 30 MPH...40 TO 50 KM/H AND IS EXPECTED TO CONTINUE THIS MOTION FOR THE NEXT 12 TO 24 HOURS. BASED UPON THE VERY FAST FORWARD SPEED AT WHICH THE DEPRESSION IS MOVING...IT IS HIGHLY UNLIKELY THAT DANIELLE COULD REGENERATE TO TROPICAL STORM STRENGTH WITHIN THE NEXT 24 HOURS.

MAXIMUM SUSTAINED WINDS ARE NEAR 35 MPH...55 KM/HR...WITH HIGHER GUSTS IN SQUALLS EAST AND NORTH OF THE CENTER. REPEATING THE 5 AM POSITION...175 MILES...280 KM...SOUTH SOUTHEAST OF KINGSTON...MAXIMUM WINDS 35 MPH...55 KM/HR...MOVEMENT WEST 25 TO 30 MPH...40 TO 50 KM/HR.



THE NEXT ADVISORY WILL BE ISSUED BY THE NATIONAL HURRICANE CENTER AT 11 AM EDT  
CASE

### 3.2.2 Hurricane and tropical storm advisories

Only the USA will issue tropical storm and hurricane advisories on a regional basis. The initial tropical storm advisory will be issued when either the wind speed in a tropical cyclone reaches, or is soon expected to reach, tropical storm strength or the central pressure falls or is soon expected to fall to 1 005 hPa or less. Tropical storms will be given a name in the initial advisory, and this name will continue to be used until the last advisory is issued. The initial scheduled and special advisories in the Atlantic, Caribbean, and Gulf of Mexico will be numbered consecutively. Once numbering begins, it will be continued as long as advisories are being issued, even if the storm decreases to tropical depression strength. In the eastern North Pacific, initial public advisories will be given the same number as the marine advisory with which they are issued.

#### (a) Issuance times

Scheduled advisories will be issued at 0300Z, 0900Z, 1500Z, and 2100Z. Intermediate advisories will be prepared at two- or three-hour intervals between scheduled advisories whenever a warning is in effect for land areas. Alphabetic designators will be used to identify intermediate advisories.

As an example, if the regular advisory were 12 then the next intermediate advisory would be 12A. Specific warnings from Members' national Meteorological Services should be transmitted to RSMC Miami - Hurricane Center at least one and a half hours prior to the transmission time of the advisory in order to be included in the RSMC advisory;

#### (b) Special advisories

Scheduled or intermediate advisories will be updated whenever the following criteria are met:

- (i) The classification of a tropical or subtropical cyclone changes;
- (ii) there is a significant change in the forecast;
- (iii) upon request of a member nation for conditions such as a change in the warning status.

These special advisories will be numbered in sequence with the scheduled advisories;

#### (c) Format and content

All advisories will begin with a "headline" statement which highlights the contents. This headline will be separated from the rest of the advisory. The information in the remainder of

the advisory will be presented in descending order of importance or urgency. At the end of the advisory the storm position, maximum winds, current pressure and present speed and direction will be repeated, and the time and office responsible for the next advisory will be given. Following this, the forecaster's name will be included.

Advisories will summarize all coastal warnings and watches that are in effect and should include those areas where operators of small craft should take precautions. The first advisory in which a hurricane/tropical storm watch or warning is mentioned will give the time it becomes effective. All advisories will include the tropical cyclone location both as distance and direction from a well-known point and as latitude and longitude of the centre. The present movement will be given to 16 points of the compass, if possible. A 24-hour forecast of movement and speed will be included in terms of a continuation or departure from the current movement and speed. This may be reduced to a 12-hour forecast if conditions do not permit a sufficiently high verification probability of the longer period forecast. Uncertainties in either storm location or movement will be explained in the advisory. When a named storm or hurricane (or a tropical depression forecast to become a named storm) is forecast to threaten land areas within 72 hours, a statement indicating where a table of strike probabilities can be found is included at the end of the advisory.

Although movement forecasts apply to the storm centre, centre landfall forecasts will be made with caution to avoid giving the public any false sense of security. It will be stressed that the effects of the hurricane will not be confined to a small area.

Other parameters used to describe the storm will include wind, pressure, storm tide and rainfall. The radius of both hurricane and gale-force winds will be given together with the speed of the maximum sustained winds and specific gust values. Otherwise phrases such as "briefly stronger gusts", "winds stronger in squalls" etc, will be used. Observed storm-tide heights along the coast will be given for specific locations when available.

Wind forecasts will be made in all advisories and, when appropriate, forecasts of flooding induced by storm tide or heavy rain, and any tornado threat. Intensity forecasts will be for 12 hours only and stated in terms of an increase, decrease, or no change from the present intensity. The storm may also be compared to some memorable hurricane, or referred to in terms of the Saffir/Simpson Hurricane Scale. The wind forecasts will indicate the approximate times of gale- and hurricane-force winds along the mainland coasts or island chain. Storm-tide forecasts will give the time of significant heights at areas along the coast and include wave information, if possible.

Whenever, a "watch" or a "warning" is issued by a country, the advisory will include a sentence that advises interests in the area to refer to Bulletins being issued by the relevant National Weather Service.

Examples:

WTNT 31 KNHC 210900  
BULLETIN  
TROPICAL STORM ANNA...ADVISORY NUMBER 4  
NATIONAL WEATHER SERVICE MIAMI, FLORIDA  
500 AM EDT MON AUG 21 1978

---ANNA MOVING WESTWARD...NO IMMEDIATE THREAT TO LAND---

THE NATIONAL HURRICANE CENTRE ADVISES AT 5 AM EDT...THAT TROPICAL STORM ANNA WAS CENTERED NEAR LATITUDE 14.5 NORTH LONGITUDE 76.5 WEST OR ABOUT 240 MILES...385 KM SOUTH OF KINGSTON, JAMAICA. THE STORM WAS MOVING TOWARDS THE WEST AT 10 MPH...16 KM/H AND SHOULD CONTINUE TO DO SO THROUGH TUESDAY MORNING.

THE LOWEST PRESSURE IN THE STORM WAS ESTIMATED TO BE 999 HECTOPASCALS...29.50 INCHES. ANNA IS EXPECTED TO INCREASE IN INTENSITY BY TONIGHT. MAXIMUM SUSTAINED WINDS AT 5 AM WERE 60 MPH...95 KM/H NEAR THE CENTER WITH TROPICAL STORM FORCE WINDS EXTENDING OUT 75 MILES...120 KM NORTH AND 50 MILES...80 KM SOUTH OF THE CENTER. INTERESTS IN NICARAGUA, HONDURAS, GUATEMALA, BELIZE, AND THE YUCATAN PENINSULA OF MEXICO SHOULD KEEP IN CLOSE TOUCH WITH FUTURE ADVICE ON THIS STORM.

REPEATING THE 5 AM EDT LOCATION...14.5N 76.5W...MAX WINDS 95 KM/H...60 MPH...PRESSURE 999HPA...

FOR DETAILED INFORMATION REFER TO STATEMENTS ISSUED BY YOUR NATIONAL WEATHER SERVICE.

THE NEXT ADVISORY ON TROPICAL STORM ANNA WILL BE ISSUED BY THE NATIONAL HURRICANE CENTER IN MIAMI AT 11 AM EDT.

LAWRENCE

WTNT 32 KNHC 142100  
BULLETIN  
HURRICANE LADY ADVISORY NUMBER 7  
NATIONAL WEATHER SERVICE MIAMI FLORIDA  
5 PM EDT WED SEPT 14 1978

...LADY EXTREMELY DANGEROUS...CONTINUES TOWARDS LEEWARDS...BASED ON RECONNAISSANCE AIRCRAFT REPORTS AND SATELLITE PHOTOGRAPHS THE CENTER OF DANGEROUS HURRICANE LADY WAS ESTIMATED AT 5 PM EDT...2100Z...TO BE LOCATED NEAR LATITUDE 12.0 NORTH...LONGITUDE 51.2 WEST OR ABOUT 560 MILES...900 KM EAST OF BARBADOS. IT IS MOVING TOWARDS THE WEST ABOUT 15 MPH...25 KM/H AND IS EXPECTED TO MAINTAIN THAT COURSE AND SPEED

TONIGHT.

HIGHEST SUSTAINED WINDS NEAR THE CENTER ARE ABOUT 140 MPH...225 KM/H AND HURRICANE FORCE WINDS EXTEND OUTWARD 50 MILES...80 KM IN ALL DIRECTIONS. TROPICAL STORM FORCE WINDS EXTEND 150 MILES...240 KM IN THE NORTHERN AND 100 MILES...160 KM IN THE SOUTHERN SEMICIRCLE. THE LOWEST PRESSURE IS 940 HECTOPASCALS...27.75 INCHES. GRADUAL STRENGTHENING IS EXPECTED DURING THE NEXT 24 HOURS. ALL INTERESTS AROUND THE LEEWARD AND WINDWARD ISLANDS...THE VIRGIN ISLANDS AND PUERTO RICO SHOULD KEEP IN CLOSE TOUCH WITH FUTURE ADVICES AS THIS DANGEROUS HURRICANE CONTINUES TO APPROACH. SMALLER CRAFT AROUND THE LESSER ANTILLES FROM GRENADA NORTHWARD SHOULD REMAIN IN PORT. SHIPS IN THE PATH OF THE HURRICANE SHOULD EXERCISE EXTREME CAUTION.

REPEATING THE 5 PM EDT POSITION...12.0N 51.2W...MAX WINDS 225 KM/H/140 MPH...PRESSURE 940HPA...MOVEMENT WEST 25KM/H...15MPH. FOR DETAILED INFORMATION REFER TO STATEMENTS ISSUED BY YOUR NATIONAL WEATHER SERVICE.

THE NEXT ADVISORY WILL BE ISSUED BY THE NATIONAL HURRICANE CENTER IN MIAMI AT 11 PM EDT.

CLARK

WTNT 32 KNHC 150900

BULLETIN

HURRICANE LADY ADVISORY NUMBER 9

NATIONAL WEATHER SERVICE MIAMI FLORIDA

5 AM EDT THU SEPT 15 1978

...HURRICANE THREATENS PORTIONS OF LEEWARD AND WINDWARD ISLANDS... AT 5 AM EDT THE WEATHER SERVICE OF BARBADOS ISSUED HURRICANE WARNINGS FOR THE ISLANDS OF BARBADOS...ST VINCENT...ST LUCIA...AND DOMINICA. THE WEATHER SERVICE OF MARTINIQUE AT 5 AM EDT ALSO ISSUED HURRICANE WARNINGS FOR MARTINIQUE. HURRICANE WARNINGS THEREFORE EXTEND FROM ST VINCENT NORTHWARD THROUGH DOMINICA. TROPICAL STORM WARNINGS AND A HURRICANE WATCH CONTINUE OVER GRENADA AND THE GRENADINES AND FROM NORTH OF DOMINICA THROUGH ANTIGUA.

AT 5 AM EDT...0900Z...THE CENTER OF HURRICANE LADY WAS ESTIMATED FROM RECONNAISSANCE AIRCRAFT REPORTS TO BE NEAR LATITUDE 12.5 NORTH LONGITUDE...55.0 WEST OR ABOUT 300 MILES...480 KM EAST OF BARBADOS.

IT IS MOVING TOWARD THE WEST NORTHWEST ABOUT 15 MPH...25 KM/H AND IS EXPECTED TO CONTINUE THIS COURSE AND SPEED TODAY.

HIGHEST SUSTAINED WINDS NEAR THE CENTER ARE 150 MPH...240 KM/H WITH GUSTS UP TO 180 MPH...288 KM/H. HURRICANE FORCE WINDS EXTEND 50 MILES...80 KM IN ALL DIRECTIONS. TROPICAL STORM FORCE WINDS EXTEND 150 MILES...240 KM IN THE NORTHERN AND 100 MILES...160 KM IN THE SOUTHERN SEMICIRCLE. THE LOWEST PRESSURE IS 930 HECTOPASCALS...27.46 INCHES. SOME FURTHER STRENGTHENING IS LIKELY DURING THE DAY. TROPICAL STORM FORCE WINDS WILL REACH BARBADOS THIS AFTERNOON AND INCREASE TO HURRICANE FORCE EARLY TONIGHT. ELSEWHERE IN THE HURRICANE WARNING AREA TROPICAL STORM FORCE WINDS WILL BEGIN TONIGHT AND HURRICANE FORCE WINDS WILL BEGIN BY FRIDAY MORNING. TROPICAL STORM FORCE WINDS OR HIGHER ARE LIKELY FROM GRENADA THROUGH ANTIGUA BY FRIDAY MORNING. TIDES ARE BEGINNING TO INCREASE AND ARE EXPECTED TO REACH 5 FEET ABOVE NORMAL IN THE HURRICANE WARNING AREA TONIGHT AND 10 TO 15 FEET ABOVE NORMAL AROUND BARBADOS AS THE CENTER OF THE HURRICANE NEARS THE ISLAND FRIDAY MORNING.

INTERESTS IN THE REMAINDER OF THE LEEWARD ISLANDS AND THE VIRGIN ISLANDS SHOULD KEEP IN CLOSE TOUCH WITH FUTURE ADVICES.

SMALL CRAFT FROM TRINIDAD TO PUERTO RICO SHOULD REMAIN IN PORT. REPEATING THE 5 AM EDT POSITION 12.5N...55.0W.. MAX WIND 240KM/H/150MPH.. MOVEMENT WEST NORTHWEST 25KM/H/15MPH.

FOR DETAILED INFORMATION REFER TO STATEMENTS ISSUED BY YOUR NATIONAL WEATHER SERVICE.

AN INTERMEDIATE ADVISORY WILL BE ISSUED BY THE NATIONAL HURRICANE CENTER AT 8 AM EDT FOLLOWED BY THE NEXT COMPLETE ADVISORY AT 11 AM EDT  
SHEETS

Statements in the advisories issued by the RSMC Miami - Hurricane Center concerning Members will also, where possible, be co-ordinated with the national Meteorological Services concerned.

### 3.2.3 Subtropical cyclone advisories

Advisories shall be issued by hurricane centers on subtropical storms. The content, format and criteria for updates are similar to those for tropical storms and hurricanes. Distribution of these advisories shall be on the same time schedule as for hurricanes and tropical storms.

Subtropical storms should be referred to as "storms" and associated advisories entitled "storm advisories". Subtropical depressions may be referred to as low pressure systems in advisories.

Example:

WTNT 31 KNHC 120900  
 BULLETIN  
 STORM ADVISORY NUMBER 4  
 NATIONAL WEATHER SERVICE MIAMI FL  
 500 AM EDT THU JUN 12 1980

...COASTAL STORM BRINGS FLOOD THREAT TO MID-ATLANTIC STATES  
 THIS AFTERNOON AND TONIGHT...

EVERYONE IN SOUTH AND NORTH CAROLINA SHOULD BE PREPARED TO  
 PROTECT THEMSELVES AGAINST FLOODING OR BE READY TO MOVE TO  
 AREAS SAFE FROM FLOODING IF NECESSARY.

HEAVY RAINS FROM THE STORM CENTERED 50 MILES (81 KM) SOUTH OF  
 CHARLESTON SOUTH CAROLINA ARE OCCURRING OVER MOST OF  
 SOUTH CAROLINA THIS MORNING. THE STORM IS MOVING NORTH  
 NORTHWEST AT 12 MPH (19 KM/H) BUT SHOULD SLOW DOWN BY  
 TONIGHT. THIS MEANS RAINFALL AMOUNTS GREATER THAN 3 INCHES  
 MAY OCCUR IN SOUTH CAROLINA TODAY AND IN NORTH CAROLINA  
 TONIGHT.....some of text not shown.....

A SUMMARY ON THIS STORM WILL BE ISSUED BY THE  
 HYDROMETEOROLOGICAL PREDICTION CENTER IN WASHINGTON DC AT 1  
 PM EDT.  
 FRANK

### 3.2.4 Tropical cyclone forecasts/advisories

Tropical cyclone forecasts/advisories are prepared only by the US National Hurricane Center at the regional level. They are prepared for all tropical depressions, tropical storms, or hurricanes within a centre's area of responsibility. Advisories will cease when tropical cyclones drop below depression stage or have gone inland and winds over the water dropped below gale force.

#### (a) Time of issuance

In the Atlantic, Caribbean, and Gulf of Mexico these advisories should be distributed 30 minutes prior to their valid times of 0300, 0900, 1500, and 2100Z. In the eastern North Pacific the advisories are scheduled for 0300, 0900, 1500, and 2100Z.

#### (b) Special advisories

Special advisories will be issued for important changes in tropical cyclones such as changes in direction, intensity, etc. In addition, special marine advisories will be issued whenever public special advisories are issued;

(c) Naming and numbering cyclones and advisories

Tropical depressions will be numbered consecutively each season, beginning with one. In the eastern Pacific, the number of the depression in the advisories will be followed by the letter E (i.e., 1E, 2E, etc.) in order to distinguish eastern Pacific depressions from those occurring in the western Pacific.

If a tropical depression becomes a tropical storm or hurricane, it will be named and the number dropped. Later, if the named storm reverts to a tropical depression, the name will be retained to identify the depression.

In the Atlantic, Caribbean, and Gulf of Mexico, advisories will be numbered consecutively, beginning with each new depression. Special advisories will also be numbered.

In the eastern North Pacific, advisories will be numbered consecutively beginning with each new depression and continued consecutively if the depression becomes a storm or hurricane. Special advisories will be numbered in sequence with scheduled advisories. Eastern North Pacific advisories will not be numbered sequentially with NHC advisories on storms crossing Central America into the Pacific.

All forecasts/advisories on tropical and subtropical cyclones will contain 12-, 24-, 36-, 48 and 72-hour forecast positions. The 48-hour and 72-hour positions will be designated "extended outlook" positions. The following cautionary note will appear at the end of the forecasts/ advisories: "EXTENDED OUTLOOK...USE FOR GUIDANCE ONLY...ERRORS MAY BE LARGE";

(d) Content of forecasts/advisories

Tropical Cyclone forecasts/advisories will contain the following information:

- (i) Time of issue;
- (ii) Heading, advisory number, corrected, or relocated, type of cyclone, name or number and hour and day;
- (iii) Warnings in effect;
- (iv) Position, in degrees and tenths;
- (v) Time of position in UTC;
- (vi) Accuracy of position;
- (vii) Present movement;
- (viii) Estimated minimum central pressure in millibars;

- (ix) Eye diameter in nautical miles, if a reliable estimate can be made;
- (x) Present winds:
  - Maximum sustained winds and gusts;
  - Radius of 64-, 50- and 34-knot sustained winds ;
  - Radius of seas 3.7 m (12 ft.) or higher;
- (xi) Repeat centre location and time;  
Position at the most recent main hour synoptic time;
- (xii) Forecasts:
  - The 12-hour forecast position:
    - Maximum sustained winds and gusts in 12 hours;
    - Radius of 64-knot sustained winds in 12 hours;
    - Radius of 50-knot sustained winds in 12 hours;
    - Radius of 34-knot sustained winds in 12 hours;
  - The 24-hour forecast position:
    - Maximum sustained winds and gusts in 24 hours;
    - Radius of 64-knot sustained winds in 24 hours;
    - Radius of 50-knot sustained winds in 24 hours;
    - Radius of 34-knot sustained winds in 24 hours;
  - The 36-hour forecast position:
    - Maximum sustained winds and gusts in 36 hours;
    - Radius of 64-knot sustained winds in 36 hours;
    - Radius of 50-knot sustained winds in 36 hours;
    - Radius of 34-knot sustained winds in 36 hours;

The following forecasts should be used only for guidance purposes because errors may exceed a few hundred miles.

  - Extended outlook - the 48-hour forecast position:
    - Maximum sustained winds and gusts in 48 hours;
    - Radius of 50-knot sustained winds in 48 hours;
    - Radius of 34-knot sustained winds in 48 hours;



- Extended outlook - the 72-hour forecast position:
  - Maximum sustained winds and gusts in 72 hours;
  - Radius of 50-knot sustained winds in 72 hours;
  - Radius of 34-knot sustained winds in 72 hours;

(xiii) Cautionary statement;

Example:

WTNT 22 KNHC 150900  
HURRICANE LADY FORECAST/ADVISORY NUMBER 9  
NATIONAL WEATHER SERVICE MIAMI FL  
0900Z THRU SEPT 15 1978

HURRICANE WARNINGS ARE IN EFFECT FOR BARBADOS... ST. VINCENT...ST. LUCIA...DOMINICA AND MARTINIQUE. TROPICAL STORM WARNINGS AND A HURRICANE WATCH ARE IN EFFECT FOR GRENADA AND THE GRENADINES AND FROM NORTH OF DOMINICA THROUGH ANTIGUA.

HURRICANE CENTER LOCATED NEAR 12.5N 55.0W AT 15/0900Z POSITION ACCURATE WITHIN 10 NM

PRESENT MOVEMENT TOWARD THE WEST NORTHWEST OR 285 DEGREES AT 12 KT

ESTIMATED MINIMUM CENTRAL PRESSURE 930 MB  
EYE DIAMETER 20 NM

MAX SUSTAINED WINDS 130 KT WITH GUSTS TO 160 KT.

64 KT..... 50NE 25SE 25SW 50NW.

50 KT..... 75NE 50SE 50SW 75NW.

34 KT..... 150NE 100SE 100SW 150NW.

12 FT SEAS.. 150NE 100SE 100SW 150NW.

WIND AND SEAS VARY GREATLY IN EACH QUADRANT. RADII IN NAUTICAL MILES ARE THE LARGEST RADII EXPECTED ANYWHERE IN THAT QUADRANT.

REPEAT...CENTER LOCATED NEAR 12.5N 55.0W AT 15/0900Z  
AT 15/0600Z CENTER WAS LOCATED NEAR 12.4N 54.5W

FORECAST VALID 15/1800Z 13.0N 56.5W

MAX WIND 140 KT...GUSTS 170 KT.

64 KT... 60NE 30SE 30SW 60NW.

50 KT...100NE 75SE 75SW 100NW.  
34 KT...150NE 100SE 100SW 150NW.

FORECAST VALID 16/0600Z 13.3N 59.0W  
MAX WIND 140 KT...GUSTS 170 KT.  
64 KT... 60NE 30SE 30SW 60NW.  
50 KT...100NE 75SE 75SW 100NW.  
34 KT...150NE 100SE 100SW 150NW.

FORECAST VALID 16/1800Z 13.7N 61.0W  
MAX WIND 140 KT...GUSTS 170 KT.  
64 KT... 60NE 30SE 30SW 60NW.  
50 KT... 100NE 75SE 75SW 100NW.  
34 KT... 150NE 100SE 100SW 150NW.

REQUEST FOR 3-HOURLY SHIP REPORTS WITHIN 300 MILES OF 12.5N 55.0W  
EXTENDED OUTLOOK...USE FOR GUIDANCE ONLY...ERRORS MAY BE  
LARGE

OUTLOOK VALID 17/0600Z 14.0N 63.0W  
MAX WIND 140 KT...GUSTS 170 KT.  
50 KT...100NE 75SE 75SW 100NW.  
34 KT... 150NE 100SE 100SW 150NW.

OUTLOOK VALID 18/0600Z 15.0N 67.0W  
MAX WIND 140 KT...GUSTS 170 KT.  
50 KT...100NE 75SE 75SW 100NW.  
34 KT... 150NE 100SE 100SW 150NW.

NEXT ADVISORY AT 15/1500Z

PASCH

STRIKE PROBABILITIES ASSOCIATED WITH THIS ADVISORY NUMBER CAN  
BE FOUND UNDER AFOS HEADER MIASPFAT2 AND WMO HEADER WTNT72  
KNHC.

### 3.3 Tropical cyclone discussion

Each regular or special advisory is accompanied by a Tropical Cyclone Discussion, issued at the same time as the advisory. This discussion will include prognostic reasoning, observations, information on objective techniques, the status or proposed changes in warnings, and the coordinated 12-, 24-, 36-, 48- and 72-hour prognostic center positions and maximum wind speeds (unless the tropical cyclone is forecast to dissipate, move inland, or become extratropical, in which case values will be given only to that point in time).

Because of the length of discussion messages, a probability table will be transmitted as a separate product to the regular and special advisories (see 3.7 below).

3.4 Special tropical disturbance statement

A special tropical disturbance statement will be issued to describe a significant tropical disturbance that does not feature the closed wind circulation characteristic of a tropical depression. At times, straight winds associated with strong tropical disturbances may approach or exceed gale force.

3.5 Tropical weather discussion

RSMC Miami - Hurricane Center will issue a tropical weather discussion four times a day that will describe weather conditions and weather systems over the Atlantic, Caribbean Sea and Gulf of Mexico and separately for the Eastern North Pacific.

3.6 Tropical cyclone updates

Tropical cyclone updates are brief statements in lieu of or preceding special advisories to inform of significant changes in a tropical cyclone or cancellation of watches and warnings.

3.7 Strike probabilities

Whenever a tropical storm or hurricane (or a tropical depression forecast to become a named storm) is forecast to threaten land within 72 hours, the Hurricane Center issues a table of the probabilities, in percent, of the center of that cyclone passing within 65 nautical miles of listed locations during the next 72 hours. The locations will be identified by the four-letter international designator, if any. This strike probability table is issued at the same time as each regular and special advisory. Bulletin headers are as follows:

WTNT71 KNHC  
WTNT72 KNHC  
WTNT73 KNHC  
WTNT74 KNHC  
WTNT75 KNHC

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## CHAPTER 4

### GROUND RADAR OBSERVATIONS

#### 4.1 General

Radar reports during tropical cyclones are among the most important and useful observations available to the hurricane forecaster and to those whose responsibility it is to issue warnings. It is essential that continuous radar observations be taken whenever a tropical cyclone is under surveillance by a particular radar, and that all responsible officials co-operate to ensure that the observations are distributed to hurricane centers and other concerned meteorological offices.

US practice, as specified in Federal Meteorological Handbook No. 7 - Weather Radar Observations, and indicated in Attachment 4A, will be followed when exchanging radar observations related to hurricanes or incipient hurricanes. Countries using metric units will insert the word "METRIC" after the RAREP message identifier.

##### 4.1.1 Observations

Adherence to the following procedures when radar operators observe a tropical cyclone will enhance their value to users:

###### (a) Scheduled observations

Transmission of complete observations at the regularly scheduled times. These observations will include data on the eye when observed;

###### (b) Special observations

Any observation containing an eye or centre position will be designated as a special observation, including the latitude and longitude of the eye or centre and any other appropriate remarks.

##### 4.1.2 Definition of the eye or centre

The eye position is derived from a continuous and logical sequence of observations. Ideally, the radar-observed eye is readily apparent as a circular echo-free area surrounded by the wall cloud. The geometric centre of this echo-free area should be reported as the eye location. If the wall cloud is not completely closed it is usually still possible to derive an eye location by sketching the smallest circle or oval that can be superimposed inside the observed part of the wall cloud. When the circulation is identifiable but no wall cloud is observed, the centre of the circulation should be reported as a centre.

### 4.1.3 Terminology

When the central region of a storm is defined by an identifiable wall cloud, the central region should be reported as an "EYE". If the centre of circulation is recognizable, but not well defined by a wall cloud, the centre should be reported as a "CNTR". If an eye or centre is only occasionally recognizable, or if there is reason to suspect a central organization, the fix should be reported as a "PSBL EYE" or "PSBL CNTR".

Eye fixes should include a remark to indicate the degree of confidence in the fix. When the wall cloud is closed or nearly closed and the eye is symmetrical, the remark "GOOD FIX" will usually be used. When the wall cloud is poorly formed or the eye asymmetrical, the remark "POOR FIX" should be used and the remark "FAIR FIX" to express an intermediate level of confidence.

### 4.1.4 Use of spiral band overlays

Spiral band overlays may be used to estimate the location of the eye when the centre of a hurricane or tropical storm is over water. Normally, at least 90° and preferably 180° of arc of the spiral band should be observed when using spiral band overlays. Standard overlays are available with 10°, 15° and 20° crossing angles. Since the crossing angle of a given spiral band may increase from near 0° at the eye to more than 20° at distances over 160 km (100 miles) from the centre, the best results can be expected by using the spiral band overlay which best fits the intermediate portion of the band (usually 45-140 km (25-75 nautical miles) from the eye). The radar-control settings should be adjusted to enhance the definition of the spiral band when using spiral band overlays. When spiral band overlays are used, a remark specifying which crossing angle was used should be included.

## 4.2 USA coastal radars

These are operated by the US National Weather Service at the following sites:

<b>Location</b>	<b>Radar type</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Id.</b>
Boston, MA	WSR-88D	41 57' N	71 08' W	BOX
Brownsville, TX	WSR-88D	25 55' N	97 29' W	BRO
Caribou, ME	WSR-88D	46 02' N	67 48' W	CBW
Charleston, SC	WSR-88D	32 54' N	80 02' W	CHS
Corpus Christi, TX	WSR-88D	27 46' N	97 30' W	CRP
Houston, TX	WSR-88D	29 28' N	95 05' W	HGX
Jacksonville, FL	WSR-88D	30 29' N	81 42' W	JAX
Key West, FL	WSR-88D	24 33' N	81 45' W	EYW
Lake Charles, LA	WSR-88D	30 07' N	93 13' W	LCH
Miami, FL	WSR-88D	25 37' N	80 25' W	AMX
Melbourne, FL	WSR-88D	28 07' N	80 39' W	MLB
Mobile, AL	WSR-88D	30 41' N	88 14' W	MOB
Morehead City, NC	WSR-88D	34 47' N	76 53' W	MHX

New York City, NY	WSR-88D	40 52' N	72 52' W	OKX
Norfolk, VA	WSR-88D	36 59' N	77 00' W	AKQ
Philadelphia, PA	WSR-88D	39 57' N	74 27' W	DIX
Portland, ME	WSR-88D	43 53' N	70 15' W	GYX
San Juan, PR	WSR-88D	18 07' N	66 05' W	TJSJ
Slidell, LA	WSR-88D	30 20' N	89 49' W	LIX
State College, PA	WSR-88D	40 55' N	78 00' W	CCX
Sterling, VA	WSR-88D	38 58' N	77 29' W	LWX
Tampa, FL	WSR-88D	27 42' N	82 24' W	TBW
Tallahassee, FL	WSR-88D	30 24' N	84 20' W	TLH
Wilmington, NC	WSR-88D	33 59' N	78 26' W	LTX

Coastal Department of Defence sites, TPC/NHC access:

Dover AFB, DE	WSR-88D	38 50' N	75 26' W	DOX
Eglin AFB, FL	WSR-88D	30 34' N	85 55' W	EVX
Fort Hood, TX	WSR-88D	30 43' N	97 23' W	GRK
Fort Rucker, AL	WSR-88D	31 28' N	85 28' W	EOX
Maxwell AFB, AL	WSR-88D	32 32' N	85 47' W	MXX
Robbins AFB, GA	WSR-88D	32 40' N	83 21' W	JGX

#### 4.3 Panama radar

Engineering Hill	WGS-84	08°58'N	79°33'W
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#### 4.4 Bahamian radar

Nassau	MYNN	WSR-57	25°03'N	77°28'W
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#### 4.5 Canadian radars

Halifax Intl. Airport, NS	CWHX	CWSR-81	44°53'N	63°31'W
Holyrood, Nfld.	CYYT	WSR-807	47°20'N	53°08'W
Mechanic Settlement, N.B.	CWMK	CWSR-81	45°42'N	65°10'W

#### 4.6 Caribbean Meteorological Organization network of radars

<u>Identification</u>	<u>Radar</u>	<u>Type</u>	<u>Latitude</u>	<u>Longitude</u>
Belize	MZBZ	RC-32B	17°32'N	88°18'W
Kingston, Jamaica	MKJP	EEC doppler 10cm	18°04'N	76°51'W

Crown Point, Tobago	TTPT	RC-32B	11°09'N	60°50'W
Barbados	TBPO	RC-32B	13°09'N	59°37'W

4.7 Cuban radars (Collective headings, SDCU MUHA)

Havana	78325	MRL-5	23°10'N	82°21'W
Camaguey	78355	MRL-5	21°25'N	77°51'W
La Bajada	78311	RC-32B	21°55'N	84°28'W
Punta del Este	78324	RC-32B	21°34'N	82°33'W
Gran Piedra	78366	RC-32B	20°00'N	75°38'W
Pico San Juan	78336	MRL-5	21°59'N	80°10'W
Pilon	78379	MRL-5	19°55'N	77°25'W

4.8 Dominican Republic radar

Santo Domingo	MDSG	GEMA- TRONIKS (10 cm)	18°26'N	69°53'W
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4.9 French radars

Le Moule, Guadeloupe	TFFR	GEMA- TRONIKS(10 cm)	16°19'N	61°20'W
Grande Le Blond, French Guiana	SOCA	EEC 5.6 cm doppler	04°50'N	52°22'W
Mont Pavillon, Martinique	TFFF	GEMA- TRONIKS (10 cm) Doppler	14 ° 30'N	61 ° 01'w

4.10 Mexican radars**Modernized radars (C-band, 5.6 cm) - Doppler capability**

Tampico, Tamaulipas	TAM	EEC	22°15'N	97°52'W
Guasave, Sinaloa	SIN	EEC	25°34'N	108°27'W
Los Cabos, Baja California Sur	BCS	EEC	22°22'N	109°55'W
El Palmito, Durango <sup>1</sup>	DGO	EEC	25°45'N	104°54'W



4-6

Acapulco, Guerrero

GRO

EEC

16°45'N

99°45'W

**New Doppler radars (C-band, 5.6 cm)<sup>1</sup>**

Cerro de la Catedral, Estado de Mexico	MEX	Ericsson	19°33'N	99°31'W
Cd. Obregon,	SON	Ericsson	27°28'N	109°55'W
Cuyutlan, Colima	COL	Ericsson	18°56'N	104°18'W
Puerto Angel, Oaxaca	OAX	Ericsson	15°39'N	96°30'W
Alvarado, Veracruz	VER	Ericsson	18°43'N	95°37'W
Sabancuy, Campeche	CMP	Ericsson	18°56'N	91°05'W
Cancun, Quintana Roo	QRO	Ericsson	21°01'N	86°51'W

<sup>1</sup> - Dual polarization

4.11 Netherlands Antilles and Aruba radars

*Hato Airport, 68°56'W Curaçao	TNCC	WSR-74S 10 cm/250 mi	12°10'N	
*Juliana Airport, St. Maarten	TNCM	WSR-74S 10 cm/250 mi	18°03'N	63°04'W

\*out of service until 2001

4.12

**Section map for the coastal radar coverage in RA IV**

4.12.1

**Coastal radar coverage (Doppler) - map A**

4.12.2

**Coastal radar coverage - map B**

4.12.3

**Coastal radar coverage - map C**

## ATTACHMENT 4A

### STORM DETECTION (SD) SECTION OF THE US NATIONAL WEATHER SERVICE RADAR CODE

The radar code is made up of two major sections; an SD section and a digital section. The SD section is the first part of the observation. This gives radar data in an azimuth-range format that can easily be used with a minimum of processing. A brief description of the SD section of the radar code follows. There are nine basic parts.

#### SD SECTION

1. Echo configuration - the echo configuration is described by one of the following contractions:

AREA	-	An area of related echoes
LN	-	A line of convective echoes
CELL(S)	-	Isolated convective echo or echoes
LYR	-	An elevated layer of stratiform echoes
FINE LN	-	A fine line, a narrow non-precipitation echo pattern which is associated with a meteorological discontinuity
EYE	-	A hurricane eye
SPRL BAND AREA	-	A hurricane spiral band area

2. Areal coverage - the areal coverage in tenths is encoded with a one or two-digit number.

3. Precipitation type - the precipitation type is reported using symbols from the following list:

<u>Symbol</u>	<u>Precipitation</u>
R	Rain
RW	Rain shower
ZR	Freezing rain
ZRW	Freezing rain shower
S	Snow
SW	Snow shower

ATTACHMENT 4 A, p. 2

<u>Symbol</u>	<u>Precipitation</u>
L	Drizzle
ZL	Freezing drizzle
IP	Ice pellets
IPW	Ice pellet shower
A	Hail

The letter "T" is put before the precipitation symbol if thunder is occurring with the precipitation.

4. Intensity - echo intensity is reported using symbols from the following table.

Intensity Symbol	Echo Intensity Stratiform	Rainfall rate (in./h)	
		Convective	
-	Light	Less than 0.1	Less than 0.2
	Moderate	0.1 - 0.5	0.2 - 1.1
+	Strong	0.5 - 1.0	1.1 - 2.2
++	Very Strong	1.0 - 2.0	2.2 - 4.5
X	Intense	2.0 - 5.0	4.5 - 7.1
XX	Extreme	More than 5.0	More than 7.1
U	Unknown	Unknown	Unknown

5. Intensity trend - the intensity trend is reported using the following symbols:

<u>Symbol</u>	<u>Trend</u>
-	Decreasing
NC	No change
+	Increasing
NEW	Newly developed



A T T A C H M E N T 4 A, p. 3

6. Echo locations - echoes are located relative to the radar position. Directions are in degrees relative to true north. Distances are in nautical miles. Directions and distances are reported in groups of one direction and one distance. The direction is reported first, followed by the distance. They are separated by a solidus (/).

Example of a direction-distance group reporting a direction of 134 degrees and a distance of 145 nautical miles:

134/145

If the area covered by echoes is irregularly shaped, the direction and distance to salient points on its perimeter are reported. If the echoes are arranged in a line or rectangular area, the width is reported together with direction-distance groups along the axis. When the area of echoes is circular or when an isolated cell is being reported, the direction and distance to the centre are reported. In this case, the diameter of the area or cell is also reported.

7. Movement - both the direction and speed of movement are reported. The direction is reported in tens of degrees relative to true north. Speed is in knots. Movements are encoded in groups of five characters. The first character is the letter "A", "C", or "L". "A" indicates area movement, "C" cell movement, and "L" line movement. The next two characters are the direction of movement in tens of degrees. The last two characters are the speed.

Examples: An area moving from 240 degrees at 30 knots:

A2430

Cells moving from 90 degrees at 10 knots:

C0910

8. Echo tops - the heights of representative echo tops are reported in hundreds of feet. The locations of tops are reported in the direction distance format. If the echo tops are uniform, the letter "U" is entered before the height. When tops data are encoded, the highest top is indicated by the contraction "MT". Other tops are identified by the word "Top".

Examples: A maximum top of 43,000 ft. located at 75 degrees and 42 nautical miles from the radar:

MT 430 AT 75/42

A top of 28,000 ft. located at 305 degrees and 93 nautical miles from the radar:

TOP 280 AT 305/93

9. Remarks - appropriate remarks or operation status constructions are the last entry in the SD section of the observation. The following remarks are encoded whenever the associated weather phenomenon is observed:

- HOOK - Hook echo: the contraction HOOK is encoded together with a direction-distance group locating the hook.
  
- HAIL - Radar-indicated hail: whenever hail is reported in the precipitation type group, the remark HAIL is also included together with one or more direction-distance groups to locate the hail.
  
- LEWP - Line echo wave pattern: the contraction LEWP is encoded together with sufficient direction-distance groups to delineate the wave pattern.
  
- VAULT - Echo-free vault or bounded weak echo region: the word VAULT is encoded together with a direction-distance group locating the vault.
  
- MALF - Mostly aloft precipitation.
  
- PALF - Partly aloft precipitation.

When the contractions MALF or PALF are used, the remark BASE and the height of the base are also included. See the instructions for the remark BASE for instructions on the encoding of the MALF, PALF, and BASE remarks.

- BASE - Base of precipitation aloft: when reporting the contractions MALF or PALF or the configuration LYR, the remark BASE is added together with the height of the base in hundreds of feet.
  - o Example of partly aloft precipitation with a base of 4,000 ft.

PALF BASE 40

- MLTLVL - Melting level: the contraction MLTLVL, together with height in hundreds of feet, is reported whenever the melting level is observed.

The following operational status contractions are ended when appropriate:

- PPINE - Equipment performance normal in PPI mode; no precipitation echoes observed; surveillance continuing.
  
- PPIOM - Equipment inoperative or out of service for preventive maintenance; the contraction should be followed by a date-time group (UTC) to indicate the estimated time when operation will be resumed.

ATTACHMENT 4 A, p. 5

PPINA - Observation omitted or not available for reasons other than those above; when feasible, the contraction should be followed by a date-time group (UTC) to indicate the estimated time when observations will again be available.

ROBEPS - Radar operating below performance standards.

ARNO - A-scope or A/R indicator inoperative.

RHINO - Radar cannot be operated in the RHI mode. Height data are unavailable.

The complete observation as it is transmitted on teletypewriter circuits looks like this:

ABC 1933 AREA 6TRW+/NC 339/165 15/125 159/130 215/115  
269/115 A2325 MT 370 AT 351/75 TOP 340 AT 179/80

If this observation is broken down into its parts, it can be seen how the data are encoded.

ABC - Radar station's call sign or identifier.

1933 - Time in Universal Time Co-ordinated, 1933 UTC.

AREA - Echo configuration, an area of echoes.

6TRW+/NC - This group contains data on the areal coverage, precipitation type, intensity, and intensity trend.

The "6" indicates that 6/10 of the area is covered by echoes. The precipitation type is identified as thundershowers by the letters "TRW". The symbol "+" shows that the intensity is strong. The solidus (/) separates the intensity from the intensity trend. The letters "NC" indicate that the echoes are unchanged in intensity.

339/165 15/125 159/130 215/115 269/115 -

This series of five direction-distance groups locates the echoes. Each group locates one point. In this case, the area is outlined by the points.

A2325 - Movement group; the letter "A" indicates that the movement of the entire area is being reported. The area is moving from 230° at 25 kt.

MT 370 AT 351/75 -

## ATTACHMENT 4 A, p. 6

Highest echo top; the highest echo top is 37 000 ft. It is located at 351° and 75 nautical miles from the radar.

TOP 340 AT 179/180 -

This remark is the report of an echo top that is lower than the highest top. This top is 34,000 ft. and is located at 179° and 80 nautical miles from the radar.

### 10. Plotting a radar observation

Many users of radar data will want to plot the observations and this is a relatively straightforward procedure. Using the SD section of the observation, the area containing the echoes can be outlined. Echo tops can also be located and plotted. Some remarks are encoded with direction-distance groups. These remarks can be easily located and plotted. The other data in the SD section are reported without locations and can be plotted wherever desired.

ABC 1933 AREA 6TRW+/NC 339/165 15/125 159/130 215/115 269/115 A2325  
MT 370 AT 351/75 TOP 340 AT 179/80

This example of a radar observation (also given on page 4A.5) is shown plotted in Figure 1 below.

ATTACHMENT 4 A, p. 7

**Figure 1** - The radar observation plotted: the range circles are at 125 and 180 nautical miles.

## CHAPTER 5

### SATELLITE SURVEILLANCE OF TROPICAL AND SUBTROPICAL CYCLONES

#### 5.1 Meteorological satellites operated by the USA

##### (a) Geostationary Operational Environment Satellites (GOES)

In the two GOES environment, the satellites are located at 75°W (GOES-8) and at 135°W (GOES-9) on a permanent basis.

GOES-8 is the first in the series of Next-generation satellites and its capabilities are much improved over those of GOES-7\*. These include improved resolution in all infrared modes. The VIS resolution of 1km and IR of 4km will provide for better tracking and detection of severe storms/flash floods. Sounders (resolution 8km) operate full-time on 19 channels, capable of 2500 hourly soundings. Imaging and soundings are carried out simultaneously, as opposed to GOES-7. Rapid scan capability allows for "small picture" viewing of severe storms every 7 ½ minutes, if required. During rapid scan operations, there will be a noticeable decrease in the standard sector images, affecting mainly the southern hemisphere. In addition, the number of full disk IR soundings will be reduced. Occasionally, super rapid scans of every 1 minute of hurricanes or severe storms for research purposes are conducted for several 7-8 minute windows between successive northern hemisphere scans. The specifications and principal GOES products from the two satellites are shown in Attachment 5 A.

All products are delivered in real-time to all national centers (including the Tropical Prediction Center/National Hurricane Center), the Satellite Analysis Branch (SAB) of the National Environmental Satellite Data and Information Service (NESDIS), and to Weather Service Forecast Offices.

- (b) The NOAA (National Oceanic and Atmospheric Administration) polar-orbiting satellites provide global visible and IR pictures with 1.1 km (0.5 mile) resolution twice a day which are centrally received, processed and disseminated. In addition, any nation with receiving capability (either APT or HRPT) can obtain images within the local viewpoint of the satellite.
- (c) The Defence Meteorological Satellite Program (DMSP) polar-orbiting satellites provide Special Sensor Microwave/Imager (SSM/I) data of surface wind speed and rainfall rate over the oceans.

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\* GOES-7, located at 101°W, is on standby status.

5-2

***GOES-East and GOES-West  
COVERAGE***

2000 Edition





## 5.2 Tropical Analysis and Forecast Branch Products

### (a) Support concept

GOES imagery in support of the hurricane warning services provided by direct downlink to RSMC Miami - Tropical Prediction/Hurricane Center is distributed by the Central Data Distribution Facility at Marlow Heights, Maryland, to Honolulu and Washington.

### (b) Station contact

TPC/NHC satellite meteorologists can be contacted as follows:

(i) Miami - 24 hours a day at (305) 229-4425.

### (c) Satellite Products: Issuance Times and Geographic Areas

#### **Satellite Tropical Disturbance Summary**

<u>Heading</u>	<u>Issuance time</u>	<u>Oceanic area</u>	<u>Type of data</u>
TCPW11 PHNL	1000Z	Central Pacific (100°E to 175°W)	IR Night
TCPW10 PHNL	2200Z	Central Pacific (100°E to 175°W)	VIS/IR Day
TCPA11 PHNL	1000Z	Central Pacific (175°W to 140°W)	IR Night
TCPA10 PHNL	2200Z	Central Pacific (175°W to 140°W)	VIS/IR Day

#### **Tropical Weather Discussion**

<u>Heading</u>	<u>Issuance times</u>	<u>Oceanic area</u>
AXNT20 KNHC	0005Z, 0605Z, 1205Z, 1805Z	Gulf of Mexico, Caribbean Sea, and Atlantic South of 32°N to equator
AXPZ20 KNHC	0135Z, 0735Z, 1335Z, 1935Z	Pacific South of 32°N to equator and east of 140°W

### **Tropical Disturbance Rainfall Estimate**

<u>Heading</u>	<u>Issuance times</u>	<u>Oceanic area</u>
TCCA21 KNHC	6 Hourly as needed	Caribbean East of 67°W
TCCA22 KNHC	6 Hourly as needed	Caribbean between 67°W and a 22°N 81°W - 9°N 77°W line
TCCA23 KNHC	6 Hourly as needed	Caribbean West of 22°N 81°W - 9°N 77°W line and Mexico (Atlantic and Pacific Coasts)

#### 5.3 Tropical Numerical Guidance Interpretation Message

The National Centers for Environmental Prediction Tropical Desk in Washington issues a Tropical Numerical Guidance Interpretation Message once a day about 1900 UTC under the header FACA20 KWBC. The message includes a description of the initial model analysis, model comparison and a prognostic discussion.

#### 5.4 NESDIS Satellite Analysis Branch

The SAB operates 24 hours a day to provide GOES and NOAA satellite data support to the National Weather Service forecast offices and the National Centers for Environmental Prediction (NCEP). Summarized information on IMAGERY available from various U.S. satellites is given in Attachment 5A.

#### 5.5 Meteorological satellite operated by the European Space Agency - METEOSAT

The METEOSAT satellites are geostationary satellites providing imagery similar to those from GOES satellites.

The area of coverage includes the eastern and central Atlantic, and the information is of particular use in the detection of the formation and in monitoring of tropical perturbations (see Attachment 5 A for the status of the METEOSAT satellites).

ATTACHMENT 5A

**SATELLITES AND SATELLITE DATA AVAILABILITY**

Satellite	<b>GOES - 10 - 135°W</b>	<b>GOES 8 - 75°W</b>
	<ul style="list-style-type: none"> <li>• Earth Location Accuracy - 2-4 km</li> <li>• IR Resolution - 4 km</li> <li>• Sounder Resolution - 8 km</li> <li>• Simultaneous Imaging/sounding</li> </ul>	<ul style="list-style-type: none"> <li>• Earth Location Accuracy - 2-4 km</li> <li>• IR Resolution - 4 km</li> <li>• Sounder Resolution - 8 km</li> <li>• Simultaneous Imaging/Sounding</li> </ul>
Data type	<b>IMAGER</b>	<b>IMAGER</b>
Features	<ol style="list-style-type: none"> <li>1. 8 visible detectors (1 channel) and 7 SWIR-TIR detectors for 4 channels: 3.7, 6.7, 10.7 and 12 µm</li> <li>2. 1 km resolution visible and 4 km IR, except 8 km for 6.7 µm band (water vapor)</li> <li>3. Full disk IR</li> <li>4. Movie loops</li> <li>5. Wind analysis</li> </ol>	<ol style="list-style-type: none"> <li>1. 8 visible detectors (1 channel) and 7 SWIR-TIR detectors for 4 channels: 3.7, 6.7, 10.7 and 12 µm</li> <li>2. 1 km resolution visible and 4 km IR, except 8Km for 6.7 µm band(water vapour)</li> <li>3. Full disk IR</li> <li>4. Movie loops</li> <li>5. Wind analysis</li> </ol>
Time of Images	<ul style="list-style-type: none"> <li>- Gridded images, defined sectors - every 15 minutes;</li> <li>- Full disk every 3-hours</li> </ul>	<ul style="list-style-type: none"> <li>- Gridded images, defined sectors - every 15 minutes;</li> <li>- full disk every 3-hours</li> </ul>
Rapid scan	"Small Picture" view of a severe storm every 7 ½ minutes	"Small Picture" view of a severe storm every 7 ½ minutes

  

Satellite	<b>TIROS-N (NOAA series)</b>	<b>DMSP</b>
Data type	GAC and LAC (stored) APT (direct) TOVS HRPT (direct)	LF/TS LF/TF
Features	<ol style="list-style-type: none"> <li>1. Mapped digitalized data (cloud-cover imagery)</li> <li>2. Sea-surface temperature analysis</li> <li>3. Moisture analysis</li> <li>4. Soundings</li> </ol>	<ol style="list-style-type: none"> <li>1. Unmapped imagery (all data types)</li> <li>2. Mapped imagery (LS/TS data only)</li> </ol>
Time of Images	0600/1800 0240/1440	0700/1900 1133/2333

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GAC -	Global area coverage (recorded reduced resolution data for central processing) (2 km)	LF -	Light fine (visual scanning radiometer 0.3 naut.ml)
LAC -	Local area coverage (recorded high resolution data, limited amount) (1.1 km)	TF -	Thermal fine (infra-red scanning radiometer 0.3 naut. ml.)
TOVS -	TIROS operational vertical sounder	LS -	Light smooth (visual scanning radiometer 1.5 naut.mls.)
HRPT -	High-resolution picture transmission (1.1 km)	TS -	Thermal smooth (visual scanning radiometer 1.5 naut. mls.)
APT -	Automatic picture transmission (4 km)		
AVHRR	Advanced very high resolution radiometer		
VISSR -	Visible infra-red spin-scan radiometer		

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Information on operational status of space-based sub-system

1. Status of geostationary satellites

- a. GOES-8:  
The first in the GOES-NEXT satellite series, launched April 13, 1994. Operational March 1, 1995 at 75°W, the GOES-East position.
- b. GOES-9:  
Launched May 23 1995 and is stored at 105°W on standby status.
- c. GOES 10 was launched in April 1997 and is operational at 105°W.
- d. METEOSAT-7 is currently the operational satellite at the nominal position.

ATTACHMENT 5 A, p. 3

2. Status of NOAA polar orbiting satellites (updated 31 May 1998)

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NOAA Satellite	Status	Launched (D/M/Y)	Ascent/ Descent	HRPT	Frequencies		
					APT	BCN	
NOAA-10	deactivated	17.09.86	morning descending	1698(LSB)	137.50(VTX1)	136.77(BTX1)	
NOAA-11	standby	24.09.88	afternoon ascending	1707(HSB)	137.62(VTX2)	137.77(BTX2)	
NOAA-12	Operational	14.05.91	morning descending	1698(LSB)	137.50(VTX1)	136.77(BTX1)	
NOAA-14	Operational	14.11.94	afternoon ascending	1707(HSB)	137.62(VTX2)	137.77(BTX2)	
NOAA-15	Check out	13.05.98	morning descending	1698(LSB)	137.50(VTX1)	136.77(BTX1)	

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3. Latest detailed information on the status reports on the operational meteorological satellite systems would be available from a homepage at:

<http://www.wmo.ch/hinsman/satsun.html>

## CHAPTER 6

### AIRCRAFT RECONNAISSANCE

#### 6.1 General

The tropical cyclone reconnaissance system of the USA will normally be prepared to generate up to five reconnaissance aircraft sorties per day in the Atlantic. Notification of requirements must generally be levied by RSMC Miami - Hurricane Center early enough to allow 16 hours plus en route flying time to ensure that the aircraft will reach the area on time.

The USA has acquired a Gulfstream jet aircraft for determining the environmental conditions on the periphery of tropical cyclones that threaten landfall. The environmental conditions will be determined with GPS dropwindsondes. The flight pattern will be tailored to the storm situation on a case-by-case basis.

To assure the uninterrupted flow of operational reconnaissance data, all Member countries hosting or conducting research or operational flights into tropical cyclones in the RA IV Region will co-ordinate such activities. The RSMC Miami - Hurricane Center will serve as the focus for this co-ordination. Whenever possible, this co-ordination will be accomplished in advance by telephone. All other means of contact will be utilized, including inflight aircraft to aircraft radio/voice contacts, to assure proper co-ordination.

#### 6.2 Aircraft reconnaissance data

##### 6.2.1 Parameter requirements

Data needs in order of priority are:

- (a) Geographical position of vortex centre (surface centre, if known);
- (b) Central sea-level pressure (by dropsonde or extrapolation from within 1,500 ft. of sea surface);
- (c) Minimum 700 hPa height (if available);
- (d) Wind-profile data (surface and flight level);
- (e) Temperature (flight level);
- (f) Sea-surface temperature;
- (g) Dewpoint temperature (flight level);
- (h) Height of eye wall.

### 6.2.2 Meteorological instrument capabilities

Required aircraft reconnaissance data instrument capabilities are as follows:

- (a) Data positions - within 18.5 km (10 naut. mls.);
- (b) Sea-level pressure -  $\pm 2$  hPa;
- (c) Pressure heights -  $\pm 10$  m;
- (d) Temperatures (including dewpoint and sea-surface temperatures (SST)) -  $\pm 0.5^\circ$ ;
- (e) Winds - speed  $\pm 9$  km h<sup>-1</sup> ( $\pm 5$  kn); direction  $\pm 10^\circ$ .

### 6.3 Mission identifier

Each reconnaissance report will include the mission identifier as the opening text of the message.

Regular weather and hurricane reconnaissance messages will include the five digit agency/aircraft indicator followed by the 5 digit assigned mission-system indicator. Elements of the mission identifier are:

Agency - aircraft indicator - mission indicator

Agency - aircraft number	# of missions this system (two digits)	TD # or XX if not at least a TD (two digits)	Alpha letter showing area A-Atlantic E-East Pacific C-Central Pacific	Storm name or words CYCLONE or DISTURB
--------------------------	--	--	--	--

AF plus last three digits of tail #

NOAA plus last digit of registration #

#### Examples:

AF985 01XXA DISTURB (1st mission on a disturbance in the Atlantic) AF987 0503E CYCLONE (5th mission, depression #3, in the Eastern Pacific) NOAA2 0701C Agnes (7th mission on TD #1 which was named Agnes, Central Pacific)

### 6.4 Observation numbering and content

- (a) The first weather observation will have appended as remarks the ICAO four-letter departure station identifier, time of departure and estimated time of arrival (ETA) at the co-ordinates or storm. It will be transmitted as soon as possible after take-off.

AF966 0308 EMMY OB 1  
 97779 TEXT...DPTD KBIX AT 102100Z ETA  
 31.5N 75.0W AT 110015Z;

- (b) All observations on tropical cyclone missions requested by Hurricane Centres will be numbered sequentially from the first to the last.

## 6.5 Aerial reconnaissance weather encoding and reporting

### 6.5.1 Horizontal and vertical observations

Horizontal meteorological observations and vertical observations will be coded and transmitted in RECCO code and TEMP DROP code, respectively. En route RECCO observations will be taken and transmitted at least hourly until the aircraft is within 370 km (200 naut. mls.) of the centre of the storm at which time observation frequency will become at least every 30 minutes.

### 6.5.2 Vortex data

All observed vortex fix information will be included in the detailed vortex data message (see Attachment 6A) prepared and transmitted for all scheduled fixes and in all detailed vortex data messages prepared and transmitted on an "as required" basis for intermediate non-scheduled fixes. An abbreviated vortex data message (Attachment 6A, items A-H) may be sent in lieu of the detailed message for intermediate fixes. These messages should be transmitted as soon as possible.

### 6.5.3 Supplementary vortex data

Penetration and collection of supplementary vortex data on operational flight patterns will normally start at 700 hPa at a radius of 148 km (80 naut. mls.) from the centre as determined by the flight meteorologist. The supplementary vortex data required are as shown in Attachment 6B.

### 6.5.4 Coded reports

Other than vortex data and supplementary vortex data messages, teletype aerial reconnaissance observation messages will have the following format:

9xxx9 GGggi<sub>d</sub> YQL<sub>a</sub>L<sub>a</sub>L<sub>a</sub> L<sub>o</sub>L<sub>o</sub>L<sub>o</sub>Bf<sub>c</sub> h<sub>a</sub>h<sub>a</sub>h<sub>a</sub>d<sub>t</sub>d<sub>a</sub> dddff TTT<sub>d</sub>T<sub>d</sub>w m<sub>w</sub>jHHH

4ddff and 9V<sub>i</sub>T<sub>w</sub>T<sub>w</sub>T<sub>w</sub> 95559 GGggi<sub>d</sub> YQL<sub>a</sub>L<sub>a</sub>L<sub>a</sub> L<sub>o</sub>L<sub>o</sub>L<sub>o</sub>Bf<sub>c</sub> dddff TTT<sub>d</sub>T<sub>d</sub>w

m<sub>w</sub>jHHH 4ddff plus 9V<sub>i</sub>T<sub>w</sub>T<sub>w</sub>T<sub>w</sub>

#### Symbol identification

9xxx9 - RECCO indicator group specifying type of observation

xxx = 222 - Basic observation without radar data

555 - Intermediate observation



777	-	Basic observation with radar data
GGgg	-	Time of observation (hours and minutes -UTC)
i <sub>d</sub>	-	Humidity indicator (0-no humidity; 4-°C dewpoint)
Y	-	Day of week (Sun-1)
Q	-	Octant of the globe (0- 0° - 90°W N.H.) (1-90° - 180°W N.H.)
L <sub>a</sub> L <sub>a</sub> L <sub>a</sub>	-	Latitude degrees and tenths
L <sub>o</sub> L <sub>o</sub> L <sub>o</sub>	-	Longitude degrees and tenths
B	-	Turbulence (range 0 (none) to 9 (frequent, severe))
fc	-	Cloud amount (range 0 (less than 1/8) to 9 (in clouds all the time))
h <sub>a</sub> h <sub>a</sub> h <sub>a</sub>	-	Absolute altitude of aircraft (decametres)
d <sub>t</sub>	-	Type of wind (range 0 (spot wind) to 9 (averaged over more than 740 km (400 naut. mls.))
d <sub>a</sub>	-	Reliability of wind (range 0 (90 % to 100 % reliable) to 7 (no reliability) and 8 (no wind))
dd	-	Wind direction at flight level (tens of degrees true)
fff	-	Wind speed at flight level (knots)
TT	-	Temperature (whole degrees C; 50 added to temperature for negative temperatures)
T <sub>d</sub> T <sub>d</sub>	-	Dewpoint temperature (whole degrees C), (when // with i <sub>d</sub> ;=4 indicates relative humidity less than 10 %)
w	-	Present weather (0 (clear), 4 (thick dust or haze), 5 (drizzle), 6 (rain), 8 (showers), 9 (thunderstorms))
m <sub>w</sub>	-	Remarks on weather (range 0 (light intermittent) to 5 (heavy continuous) and 6 (with rain))
j	-	Index to level ((0 (sea-level pressure in whole hectopascals (hPa), thousands omitted: 1 - 1,000 hPa surface height in geopotential metres, 500 added to HHH if negative; 2 - 850 hPa and 3 - 700 hPa height in gpm, thousands omitted; 4 - 500 hPa, 5 - 400 hPa and 6 - 300 hPa height in geopotential decametres; 7 - 250 hPa height in geopotential decametres, tens of thousands omitted; 8 - D - value in geopotential decametres, 500 added to HHH if negative; 9 - no absolute altitude

available)

- 4 - Group indicator for surface wind direction and speed
  - $V_i$  - In-flight visibility (1 (0 to 1.8 km) (0 to 1 naut. ml.); 2 (greater than 1.8 km) (1 naut. ml.), but not exceeding 5.5 km (3 naut. mls.); 3 (greater than 5.5 km (3 naut. mls.))
  - $T_w T_w T_w$  - Sea-surface temperature (degrees and tenths °C)
-

ATTACHMENT 6A

**ABBREVIATED/DETAILED VORTEX DATA MESSAGE**

ATTACHMENT 6B

**SUPPLEMENTARY VORTEX DATA MESSAGE**

ATTACHMENT 6C

**OPERATIONAL HURRICANE RECONNAISSANCE FLIGHT PATTERN**



## CHAPTER 7

### SURFACE AND UPPER-AIR OBSERVATIONS

#### 7.1 General

In addition to regularly scheduled surface and upper-air observations, additional observations are required at key locations when a tropical cyclone is an imminent threat to Members. These requests for additional observations are normally initiated by the RSMC Miami - Hurricane Center. The frequency of special observations depends on the individual tropical cyclone situation. Additional observations may require 24-hour staffing of a station.

#### 7.2 Surface observations

Additional surface observations at one- three- or six-hourly intervals may be requested from implemented stations in Region IV. A list of key stations is given in Attachment 7 A.

#### 7.3 Upper-air observations

Additional upper-air observations at six hourly intervals may be requested from implemented stations in Region IV. A list of key stations is given in Attachment 7 B.

#### 7.4 Moored buoys

Information on the operational status of moored buoys may be required. This information is provided for those located in the North Atlantic Ocean, Caribbean Sea and Gulf of Mexico in Attachment 7 C.

#### 7.5 Request format

Requests will normally be made to the relevant NMC using any available means such as telex, telefax, GTS or AFTN but may also be made directly to the station. Examples of forms used to request additional surface and/or upper-air observations via teletype message are shown below:

MWCGYMYX  
ATTN MR ROULSTONE  
REQUEST ADDITIONAL ONE/THREE/SIX HOURLY SURFACE OBSERVATIONS  
AND SIX  
HOURLY RAOBS BEGINNING  /  Z UNTIL FURTHER NOTICE.  
BEST REGARDS.  
SHEETS

MHTGYMYX  
WOULD APPRECIATE ADDITIONAL OBSERVATIONS AT  
ONE/THREE/SIX HOURLY INTERVALS BEGINNING  /  Z FROM 701 706 708  
711.  
BEST REGARDS.

SHEETS

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ATTACHMENT 7A

**STATIONS FROM WHICH ADDITIONAL SURFACE OBSERVATIONS  
MAY BE REQUESTED DURING TROPICAL CYCLONES**

Country	Station name	Block and station number	Int. location indicators for addressed messages
Antigua	Coolidge Field (Aux. AFB)	78861	TAPA
	V.C. Bird Airport	78862	TAPA
Bahamas	West End, Grand Bahama	78061	MYGW
	Freeport, Grand Bahama	78062	MYGF
	Green Turtle Cay, Abaco	78066	
	Alice Town, Bimini	78070	MYBS
	Nassau, New Providence	78073	MYNN
	Dunmore Town, Harbour Island, Eleuthera	78077	MYER
	Kemps Bay, Andros	78086	
	The Bight, Cat Island	78087	
	Cockburn Town, San Salvador	78088	MYSM
	George Town, Exuma	78092	MYEG
	Clarence Town, Long Island	78095	
	Duncan Town, Ragged Island	78101	
	Church Grove, Crooked Island	78104	
	Abraham Bay, Mayaguana	78109	MYMM
Matthew Town, Inagua	78121	MYIG	
Barbados	Grantley Adams	78954	TBPB
Belize	Philip Goldson Int'l Airport	78583	MZBZ
Canada	Halifax International, NS	71395	CYHZ
	Sable Island, NS	71600	CWSA
	Shearwater, NS	71601	CYAW
	Sydney, NS	71707	CYQY
	Yarmouth, NS	71603	CYQI
	Fredericton, NB	71700	CYFC
	Gagetown, NB	71701	CYCX
	Moncton, NB	71705	CYQM
	Saint John, NB	71609	CYSJ

Country	Station name	Block and station number	Int. location indicators for addressed messages
Canada	Charlottetown, PEI	71706	CYYG
(continued)	Burgeo, Nfld	71194	CWBD
	St. John's/Torbay, Nfld	71801	CYYT
	Stephenville, Nfld	71815	CYJT
Cayman Island	Grand Cayman Owen Roberts Intl.	78384	MWCR
Colombia	San Andres (Isla)	80001	SKSP
	Providencia (Isla)	80002	SKPV
	Admirante Padilla (11°N 72°W)	80035	SKRH
Costa Rica	San Jose/Juan Santamaria Puerto Limon	78762 78767	MROC MRLM
Cuba	Cabo de San Antonio	78310	
	Santa Lucia	78312	
	Isabel Rubio	78313	
	Pinar del Rio	78315	
	Paso Real de San Diego	78317	
	Bahia Honda	78318	
	Güira de Melena	78320	
	La Fé	78321	
	Batabano	78322	
	Punta del Este	78324	
	Casablanca	78325	
	Union de Reyes	78327	
	Colon	78332	
	Playa Giron	78333	
	Sagua la Grande	78338	
	Cayo Coco	78339	
	Bainoa	78340	
	Yabu	78343	
	Cienfuegos	78344	
	Ciego de Avila	78346	
	Caibarién	78348	

Country	Station name	Block and station number	Int. location indicators for addressed messages
Cuba	Sancti Spiritus	78349	
(continued)	Sta. Cruz del Sur	78351	
	Nuevitas	78353	
	Camaguey	78355	
	Victoria de Las Tunas	78357	
	Puerto Padre	78358	
	Manzanillo	78359	
	Cabo Cruz	78360	
	Contramaestre	78363	
	Santiago de Cuba	78364	
	Punta Lucrecia	78365	
	Gran Piedra	78366	
	Guantánamo	78367 *	
	Guantánamo	78368	
	Punta Maisi	78369	
	Santiago de Las Vegas	78373	
Dominica	Melville Hall	78905	TDPD
	Roseau	78907	TDPR
Dominican Republic	Monte Cristi	78451	MDMC
	Puerto Plata Int'l Airport	78457	MDPP
	Santiago	78460	MDST
	Arroyo Barril	78466	MDAB
	Sabana de la Mar	78467	MDSM
	San Juan de la Maguana	78470	MDSJ
	Bayaguana	78473	
	Punta Cana Int'l Airport	78478	MDPC
	Jimani	78480	
	Barahona	78482	MDBH
	Herrera Airport	78484	MDHE
	Las Americas Int'l Airport	78485	MDLA
	Santo Domingo	78486	MDSD
El Salvador	Puerto Acajutla	78650	MSAC
	Ilopango	78663	MSSS

\* Operated by the USA

Country	Station name	Block and station number	Int. location indicators for addressed messages
France..			
Guadeloupe	Gustavia*	78894	
	Le Raizet	78897	TFFR
Martinique	Caravelle *	78922	
	Le Lamentin	78925	TFFF
Grenada	Pt. Salines	78958	TGPY
Guatemala	Flores	78615	MGFL
	Huehuetenango *	78627	MGHG
	Puerto Barrios	78637	MGPB
	Guatemala	78641	MGGT
	San Jose	78647	MGSJ
Haiti	Cap Haitien	78409	
	Port-au-Prince	78439	MTPP
	Cayes	78447	MTCH
Honduras	Islas del Cisne *	78501	MHIC
	Amapala	78700	MHAM
	Guanaja	78701	MHNJ
	Roatan	78703	MHRO
	La Ceiba/Goloson	78705	MHLC
	Tela	78706	MHTE
	Yoro	78707	MHYR
	La Mesa/San Pedro Sula	78708	MHLM
	Puerto Lempira	78711	MHPL
	Catacamas	78714	MHCA
	Santa Rosa de Copan	78717	MHSR
	Nueva Ocotepeque	78718	MHNO
	La Esperanza	78719	MHLE
	Tegucigalpa	78720	MHTG
	Choluteca	78724	MHCH
Jamaica	Montego Bay	78388	MKJS
	Kingston	78397	MKJP
	Morant Point	78399	

\* Automated Weather Station

Country	Station name	Block and station number	Int. location indicators for addressed messages
Mexico (on the Pacific)	San Felipe, B.C.	76055	
	Isla Guadalupe, B.C.	76151	
	Santa Rosalia, B.C.S.	76253	
	Loreto, B.C.S.	76305	
	Empalme, Son.	76256	
	La Paz, B.C.	76405	
	Mazatlan, Sin.	76458	
	Manzanillo, Col.	76654	
	Isla Socorro, Col.	76723	
	Acapulco, Gro.	76805	
	Salina Cruz, Oax.	76833	
Tapachula, Chis.	76904		
Mexico (on the Gulf of Mexico)	Isla Perez, Yuc.*	76490	
	Tampico, Tamps.	76548	
	Arenas, Yuc.*	76580	
	Tuxpan, Ver.	76640	
	Merida, Yuc.	76644	
	Veracruz, Ver.	76692	
	Campeche, Camp.	76695	
Coatzacoalcos, Ver.	76741		
Mexico (on the Caribbean)	Cozumel, Q. Roo	76648	
	Chetumal, Q. Roo	76750	
(continental locations)	Monterrey, N.L.	76394	
	Felipe Carrillo Puerto, Q. Roo	76698	
	Mexico, D.F.	76679	
Neth. Antilles and Aruba	Juliana Airport, St. Maarten	78866	TNCM
	Roosevelt Airport, St. Eustatius	78873	TNCE
	Queen Beatrix Airport, Aruba	78982	TNCA
	Hato Airport, Curaçao	78988	TNCC
	Flamingo Airport, Bonaire	78990	TNCB

\* Automated Weather Station

Country	Station name	Block and station number	Int. location indicators for addressed messages
Nicaragua	Puerto Cabezas	78730	MNPC
	Bluefields	78745	MNBL
Panama	Tocumen	78792	MPTO
	David	78793	MPDA
	Howard AFB**/**	78806	MPHO
St. Kitts	Basseterre	78857	
	Golden Rock Airport	78858	TKPK
St. Lucia	George F. L. Charles	78947	TLPC
	Hewanorra International Airport	78948	TLPL
St Vincent	Arnos Vale	78951	TVSV
Trinidad and Tobago	Scarborough/Crown Point Airport	78962	TTCP
	Piarco	78970	TTPP
Turks and Caicos Islands	Grand Turk, Auxiliary AFB	78118	MBJT
	Grand Turk	78119	
USA Puerto Rico	Mainland coastal stations*		
	San Juan	78526	TJSJ
	Ponce		TJPS
	Mayaguez		TJMZ
	Aguadilla	78535	TJBQ
Ceiba (Rossevelt Road/Navy)	TJNR		
U.S. Virgin Islands	Saint Thomas		TIST
	Saint Croix		TISX
Venezuela	Aves Island	80400	

\* Operated by the USA until May 1999

\*\* Will take additional observations on request

ATTACHMENT 7B

**STATIONS FROM WHICH ADDITIONAL UPPER-AIR OBSERVATIONS  
MAY BE REQUESTED DURING TROPICAL CYCLONES**

Country	Station name	Block and station number	Int. location indicators for addressed messages
Antigua	Coolidge Field (Aux. AFB)*	78861	TAPA
Bahamas	Nassau	78073	MYNN
Barbados	Grantley Adams	78954	TBPB
Belize	Philip Goldson Int'l Airport	78583	MZBZ
Burmuda	International Airport		TXKF
Canada	Sable Island, NS	71600	CWSA
	Gagetown, NB	71701	CYCX
	St. John's/Torbay, Nfld.	71801	CYYT
	Stephenville, Nfld.	71815	CZJT
	Yarmouth, NS	71603	CYQI
Cayman Islands	Georgetown, Grand Cayman	78384	MWCR
Colombia	San Andres (Isla)	80001	SKSP
	Riohacha/Admirante Padilla	80035	SKRH
Costa Rica	San Jose/Juan Santamaria	78762	MROC
Cuba	Guantanamo*	78367	MUGM
	Camaguey	78355	
	Casa Blanca	78325	
Dominican Republic	Santo Domingo	78486	MDSB
France:			
Guadeloupe	Gustavia(St. Barthelemy)**	78894	TFFR
	Le Raizet	78897	
Martinique	Le Lamentin**	78925	TFFF

\* Operated by USA

\*\* Pilot balloon only

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Country	Station name	Block and station number	Int. location indicators for addressed messages
Haiti	Port-au-Prince	78439	MTPP
Honduras	Tegucigalpa	78720	MHTG
Jamaica	Kingston	78397	MKJP
Mexico	Isla Guadalupe, B.C.*	76151	
	Empalme, Son.*	76256	
	Monterrey, N.L.	76394	
	Mazatlan, Sin.*	76458	
	Guadalajara, Jal.	76612	
	Merida, Yuc.	76644	
	Manzanillo, Col.*	76654	
	Mexico City, D.F.	76679	MMMX
	Veracruz, Ver.	76692	
Isla Socorro, Col.*	76723		
Neth. Antilles	Hato Airport, Curacao	78988	TNCC
	Juliana Airport, St. Maarten	78866	TNCM
Nicaragua	Puerto Cabezas	78730	MNPC
Panama	Howard AFB**	78806	MPHO
Trinidad and Tobago	Port of Spain	78970	TTPP
Turks and Caicos Islands	Turks Island	78118	MKJT
USA	Rawinsonde stations within 300 miles of the coast		

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\* Stations on the Pacific coast

\*\* Operated by USA until May 1999



ATTACHMENT 7C

**INFORMATION ON OPERATIONAL STATUS OF  
AUTOMATIC MARINE STATIONS - MOORED BUOYS**

**Legend - Observed or technical parameters**

<u>Column</u>	<u>Parameters</u>	<u>Column</u>	<u>Parameters</u>
1	Wind direction and speed	5	Sea-surface temperature
2	Air temperature	6	Wave period and height
3	Air pressure	7	Wave spectra
4	Pressure tendency	8	Peak wind gust

1. Canada

Data from moored buoys are collected via geostationary satellites. Meteorological reports from moored buoys using FM 13-IX SHIP code are distributed on the GTS from the Direct Readout Station located in Vancouver, B.C.

North-west Atlantic Ocean:

WMO buoy	ARGOS	Position		Observed or technical parameters							
Identifier	Identifier	Latitude	Longitude	1	2	3	4	5	6	7	8
44137	05579	41°45'N	60°55'W	X	X	X	X	X	X	X	X
44138	05577	44°15'N	53°37'W	X	X	X	X	X	X	X	X
44139	03448	44°12'N	57°30'W	X	X	X	X	X	X	X	X
44140	05576	43°50'N	51°30'W	X	X	X	X	X	X	X	X
44141	03449	42°04'N	56°09'W	X	X	X	X	X	X	X	X
44142	05578	42°30'N	64°00'W	X	X	X	X	X	X	X	X
44251	09234	47°26'N	53°23'W	X	X	X	X	X	X	X	X
44255	09233	47°17'N	57°21'W	X	X	X	X	X	X	X	X

2. France

Data from the moored buoys are available on the GTS in BUOY code from CLS/ARGOS with the same heading. The wave spectra is not available in the BUOY code, but is available in WAVEOB code. Buoy 41096 is sensitive to southbound swells, while 41097 is sensitive to Atlantic swells.

## Eastern Caribbean Islands:

WMO buoy Identifier	ARGOS Identifier	Position:		Observed or technical parameters							
		Latitude	Longitude	1	2	3	4	5	6	7	8
41096	05833	16.4 N	60.9 W	.	.	.	.	X	X	X	.
41097	05832	14.9 N	60.9 W	.	.	.	.	X	X	X	.
41100		16° 56'N	57° 55'W	X	X	X	X	X	X	X	X
41101		14° 37'N	56° 15'W	X	X	X	X	X	X	X	X

3. United States of America

Up-to-date list of U.S.A. Ocean Data Acquisition System (ODAS) is available at the web site of the National Data Buoy Centre of the National Oceanic and Atmospheric Administration (NOAA) [www.ndbc.noaa.gov](http://www.ndbc.noaa.gov). Data from moored buoys and platforms are collected by geostationary meteorological satellites and reports are distributed on the GTS in SHIP code

WMO buoy Identifier	ARGOS Identifier	Position:		Observed or technical parameters							
		Latitude	Longitude	1	2	3	4	5	6	7	8
41001**		34.7 N	72.6 W	.	.	.	.	.	.	.	.
41002**		32.3 N	75.2 W	X	X	X	X	X	X	X	X
41004		32.5 N	79.1 W	X	X	X	X	X	X	X	X
41009		28.5 N	80.2 W	X	X	X	X	X	X	X	X
41010		28.9 N	78.5 W	X	X	X	X	X	X	X	X
42001**		25.9 N	89.7 W	X	X	X	X	X	X	X	X
42002**		25.9 N	93.6 W	X	X	X	X	X	X	X	X
42003**		25.9 N	85.9 W	X	X	X	X	X	.	.	.
42007		30.1 N	88.8 W	X	X	X	X	X	.	.	.
42019		27.9 N	95.4 W	X	X	X	X	X	X	X	X
42020		26.9 N	96.7 W	X	X	X	X	X	X	X	X
42035		29.2 N	94.4 W	X	X	X	X	X	X	X	X
42036		28.5 N	84.5 W	X	X	X	X	X	X	X	X
42037		24.5 N	81.4 W	X	X	X	X	X	X	X	X
42039		28.8N	86.0W								
42040		29.2N	88.3W								
44004**		38.5 N	70.7 W	X	X	X	X	X	X	X	X
44005**		42.9 N	68.9 W	X	X	X	X	X	X	X	X
44007		43.5 N	70.1 W	X	X	X	X	X	X	X	X
44008		40.5 N	69.4 W	X	X	X	X	X	X	X	X
44009		38.5 N	74.7 W	X	X	X	X	X	X	X	X
44011**		41.1 N	66.6 W	X	X	X	X	X	X	X	X
44013		42.4 N	70.7 W	X	X	X	X	X	X	X	X
44014		36.6 N	74.8 W	X	X	X	X	X	X	X	X
44025		40.3 N	73.2 W	X	X	X	X	X	X	X	X

\*\* Primarily for National Weather Service (NWS) support; however, all stations report data to NWS.

ATTACHMENT 7 C, p. 3

## CHAPTER 8

### COMMUNICATIONS

#### 8.1 General

The RMTN (Regional Meteorological telecommunication Network) will be the basic communication system for the interchange of warnings, forecasts and observations among members. The RMTN is a multipoint system via satellite utilizing two - way very small aperture terminal (VSAT) antenna and microcomputer - based system called the STAR4 (Satellite Telecommunication and Analysis for Region IV). It will carry GTS data and products along with the world Area Forecast System (WAFS) products in GRIB (gridded binary), fax, and alpha - numeric data formats. The user terminals include the necessary software application to handle binary information. The telecommunication arrangements for the meteorological centers not equipped with a VSAT (Anguilla, Dominica, Montserrat, Saint Kitts, Saint Vincent, and Tortola) will utilize most STAR4s to retrieve messages. Anguilla Montserrat, Saint Kitts and Totola will dial into Antigua's STAR4. The Barbados Star4 will be a host for St. Vincent and Dominica. Other international circuits from specified centers equipped with a VSAT earth - station may be used.

A list containing telephone numbers of national Meteorological Service and homes of key officials is given in attachment 8A.

#### 8.2 Procedures to be followed

WMO communications headings, station location identifiers, and international block and station index numbers will be used to send surface and upper-air observations.

#### 8.3 Tropical cyclone warning headings

Tropical cyclone warning headings to be used by Members are listed in Attachment 8B. Headings to be used by the USA for tropical/subtropical cyclone releases are listed in Attachments 8 C and 8D.

Radar report headings to be used by Members are listed in Attachment 8 E.

## ATTACHMENT 8 A / ADJUNTO 8 A

**LIST OF TELEPHONE NUMBERS OF NATIONAL METEOROLOGICAL  
SERVICES AND KEY OFFICIALS / LISTA DE LOS NUMEROS DE TELEFONO  
DE LOS SERVICIOS METEOROLOGICOS NACIONALES Y DE LOS  
PRINCIPALES FUNCIONARIOS**

	<b>Office No/No de la Oficina</b>	<b>Home/no del Domicilio Particular</b>
<u>ANGUILLA / ANGUILA</u>		
Remington Lake, Airport Manager (Met. Office)	Tel: 1-264-497-2384 Fax: 1-264-497-5928	1-264-497-4537
Marlene Lewis, Deputy Manager		
<u>ANTIGUA AND BARBUDA / ANTIGUA Y BARBUDA</u>		
Meteorological Services	1-268-462-4606 Tel & Fax	
V.C. Bird International Airport	1-268-462-3229	
P.O. Box 1051, St. John's Antigua	Telex: 2090 TELCO Alternate Fax: 1-268-462-0642 E-mail: metoff@ candw.ag	
Patrick Jeremiah, Director	1-268-462-4606/3229 E-mail: <a href="mailto:birdj@candw.ag">birdj@candw.ag</a> Fax: 1-268-462-5622	1-268-461-5500
Philbert Mason, Senior Forecaster	1-268-462-3229	1-268-461-2224
Duty Forecaster	1-268-462-3229	
Star IV computer	1-268-462-9379	
<u>BAHAMAS / BAHAMAS</u>		
Meteorological Department	1-242-356-3734/6/8	
P.O. Box N-8330	Fax: 1-242-356-3739	
Nassau International Airport Nassau, Bahamas	Telex: METEO BAHAMAS	
K. L. Lightbourne, Director	1-242-356-3734/6/8 E-mail: <a href="mailto:kl.met@batelnet.bs">kl.met@batelnet.bs</a>	1-242-326-2350
A. W. Rolle, Deputy Director	1-242-356-3734/6/8 Email: <a href="mailto:awr.met@batelnet.bs">awr.met@batelnet.bs</a>	1-242-327-5665
J.W. Simmons	1-242-356-3734/6/8	1-242-323-7588
Chief Climate Officer	E-mail: <a href="mailto:jws.met@batelnet.bs">jws.met@batelnet.bs</a>	

ATTACHMENT 7 C, p. 6

T. M. Basden, Chief MET. Officer	1-242-356-3734/6/8	1-242-328-0910
	E-mail: <a href="mailto:tmb.met@batelnet.bs">tmb.met@batelnet.bs</a>	
B.A. Dean, Chief Met Officer 1-	242-377-7178	
	E-mail: <a href="mailto:awr.met@batelnet.bs">awr.met@batelnet.bs</a>	
Forecast Office	1-242-377-7178	
Nassau International Airport	1-242-377-704	
	1-242-377-3327	
	1-242-377-3328	
	Fax: 1-242-377-5275	
STAR IV Computer	1-242-377-5103	

ATTACHMENT 7 C, p. 7

ATTACHMENT 8 A / ADJUNTO 8 A, p. 2

	<b>Office No/No de la Oficina</b>	<b>Home/no del Domicilio Particular</b>
<u>BARBADOS / BARBADOS</u>		
Meteorological Services Grantley Adams Int'l Airport Christ Church	1-246-428-9834 Fax: 1-246-428-1676 email: <a href="mailto:dirmet@sunbeach.net">dirmet@sunbeach.net</a>	
C. R. Layne, Director	1-246-428-0910	1-246-423-6738
L. D. Fields, Deputy Director	1-246-418-0818	1-246-424-3217
Duty Forecaster	1-246-428-9834	
STAR 4 Computer	1-246-420-7015	
Caribbean Institute for Meteorology and Hydrology P.O. Box 130, Bridgetown	1-246-425-1362  1-246-425-1365 Fax: 1-246-424-4733	
Colin Depradine, Principal	1-246-425-1365 Email: <a href="mailto:cdepradine@cimh.edu.bb">cdepradine@cimh.edu.bb</a>	1-246-421-6035
Horace Burton	1-246-425-1362	

BELIZE / BELICE

Meteorological Services (Rawinsonde & Duty Forecaster) P.O. Box 717 Belize City	501-25-2011/54 Telex: 371-211 Civil Air 164 Fax: 501-25-2101	
C. Fuller, Director	501-25-2012 E-mail: <a href="mailto:cfuller@btl.net">cfuller@btl.net</a>	501-25-2550
J. Hulse, Deputy Director	501-25-2012 E-mail: <a href="mailto:ozone@btl.net">ozone@btl.net</a>	501-25-2077

BERMUDA / BERMUDA

ATTACHMENT 7 C, p. 8

Bermuda Weather Service

Roger Williams (Director)

1441-293-5078

1441-297-0331

P.O. Box GE 123

Fax: 1441-293-6658

Fax:14412971214

St. George's GE BX E-mail: [rogerw@jbl.bm](mailto:rogerw@jbl.bm)

Bermuda

Forecast Office

1441-293-6659

1441-293-5339



ATTACHMENT 7 C, p. 9

ATTACHMENT 8 A / ADJUNTO 8 A, p. 3

	<b>Office No/No de la Oficina Particular</b>	<b>Home/no del Domicilio</b>
<u>CANADA / CANADA</u>		
Environment Canada Atmospheric Environment Branch 16 <sup>th</sup> Floor Queen Square 45 Alderney Dr. Dartmouth, Nova Scotia, B2Y 2N6 W.S. Appleby Regional Director, Atlantic Region	1-902-426-9120 / 7357 Cell: 1-902-456-9153 Fax: 1-902-426-1126 E-mail: <a href="mailto:bill.appleby@ec.gc.ca">bill.appleby@ec.gc.ca</a>	1-902-826-7638  Fax: 1-902-490-0757
Canadian Hurricane Centre M. McCulloch, Manager	1-902-426-9200 E-mail: <a href="mailto:martha.m.mcculloch@ec.gc.ca">martha.m.mcculloch@ec.gc.ca</a>	1-902-865-5629
P. Bowyer Program Manager, Hurricanes	1-902-426-9181  E-mail: <a href="mailto:peter.bowyer@ec.gc.ca">peter.bowyer@ec.gc.ca</a>	1-902-864-7872
Shift Supervisor Meteorologist	1-902-426-4813 Fax: 1-902-426-4873	
<u>CAYMAN ISLANDS / ISLAS CAIMAN</u>		
National Weather Service Beacon House P.O. Box 277GT Grand Cayman Cayman Islands	E-mail: <a href="mailto:nwsgcm@candw.ky">nwsgcm@candw.ky</a>	
Administration	1-345-949-7811 ext 276 (Director) 1-345-949-7811 Ext 240 (Forecast Office) Fax: 1-345-949-0761	
Forecast Office	1-345-949-4528	
Fred Sambula	Tel/Fax 1-345-945-5773	1-345-949-4629

ATTACHMENT 7 C, p. 10

Head of Met Services

John Tibbits (Chief Met Officer)

Duty officer

Tel/Fax 1-345-945-5773

(unlisted)

	<b>Office No/No de la Oficina</b>	<b>Home/no del Domicilio Particular</b>
<b><u>COLOMBIA / COLOMBIA</u></b>		
P. Leyva, Director General Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM), Diag 97 / 17-60 Apartado Aéreo 20032 Santafé de Bogotá, D.C. ZP1	57-1-635-4842 Fax: 57-1-635-6019	
Humberto Gonzalez, Jefe  Servicio de Informacion Ambiental	57-1-635-6295 Fax: 57-1-635-6223 E-mail: <a href="mailto:heto@ideam.gov.co">heto@ideam.gov.co</a> 57-1-413-5403	
Oficina meteorología aeronautica Leonardo Rivera Pérez Coordinador Alertas Ambientales Aeropuerto Sesquicentenario – IDEAM San Andrés Isla (Radiosonda)	57-1-413-8792 (24 horas/hours) E-mail: <a href="mailto:leonr@ideam.gov.co">leonr@ideam.gov.co</a> Fax: 57-1-635-6019 Fax: 57-81-123194	
<b><u>COSTA RICA / COSTA RICA</u></b>		
Instituto Meteorológico Nacional Apartado Postal 7-3350 1000 San José	506-258-1140 Fax: 506-223-1837	
Met. Sinóptica y Aeronautica  Oficina Radiosonda	506-222-5616 ext 133 or 115/506-441-2398 (24 hours)	
Eladio Zárate, Director General	506-258-1140 506-222-5616 ext 108	506-272-1668
E-mail: <a href="mailto:ezarate@meteo.imn.ac.cr">ezarate@meteo.imn.ac.cr</a> Guillermo Vega, Subdirector E-mail: <a href="mailto:gvega@meteo.imn.ac.cr">gvega@meteo.imn.ac.cr</a> Werner Stolz, Meteorol.Sinóptica E-mail: <a href="mailto:wstolz@meteo.imn.ac.cr">wstolz@meteo.imn.ac.cr</a>	506-222-5616 ext 105 506-222-5616 ext 115	506-441-7106 506-297-1160

ATTACHMENT 7 C, p. 12

	<b>Office No/No de la Oficina Particular</b>	<b>Home/no del Domicilio</b>
<u>CUBA / CUBA</u>		
Instituto de Meteorología Apartado Postal 17032 C.P. 11700 Habana – 17 Ciudad Habana	Telex: 512610 Telex: 512618 Telex: 512619 Fax: 537-33-8010	
Tomás Gutiérrez Pérez, Director	537-670711 E-mail: <a href="mailto:tomasg@met.inf.cu">tomasg@met.inf.cu</a>	
José Rubiera, Jefe, Centro Nacional de Pronósticos	537-670712 537-670708* * (unlisted sin listar) Fax: 537-670708; 537-33-8010 E-mail: <a href="mailto:pron@met.inf.cu">pron@met.inf.cu</a> ; <a href="mailto:rubiera@columbus.cu">rubiera@columbus.cu</a>	537-40-6672
<u>DOMINICA / DOMINICA</u>		
Permanent Secretary National Disaster Co-ordination Prime Minister's Office Min. of Com and Works	767-448-2401 ext 3204/3447 1-767-448-2883 Fax: 1-767-448-4807	1-767-448-2401 ext 3296
Melville Hall Met. Office, Cane Field, Roseau	Tel: 1-767-445-7101 (Airport Manager) Fax: 1-767-449-2020 ( “ “ ) Tel: 1-767-449-1990	
<u>DOMINICAN REPUBLIC / REPUBLICA DOMINICANA</u>		
Oficina Nacional de Meteorología Apartado de Correos No. 1153 Santo Domingo, D.N.	1-809-597-9752 1-809-592-0611 Fax: 1-809-594-8844 E-mail: <a href="mailto:dir.met@codetel.net.do">dir.met@codetel.net.do</a>	
Iriq. Jose Maria Duquela Director Nacional	1-809-592-2637 E-mail: <a href="mailto:arredondo@codetel.net.do">arredondo@codetel.net.do</a>	1-809-597-9842
Jose Placido Cabrerai Sub-Director Nacional	1-809-591-2637 E-mail: <a href="mailto:jplacdio@codetel.net.do">jplacdio@codetel.net.do</a>	1-809-788-1127 ext 229

ATTACHMENT 7 C, p. 14

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Directora Departamento  
Hugo Segura  
Director Departamento

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1-809-596-9168  
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1-809-597-9752  
1-809-472-2654

**Office No/No  
de la Oficina**

**Home/no del  
Domicilio  
Particular**

EL SALVADOR / EL SALVADOR

Servicio Meteorológico e Hidrológico  
Apartado Postal 2265, Ctro. Gob.  
Dirección General de Recursos Naturales Renovables  
San Salvador

Ricardo Zimmermann, Director 503-294-4750

Fax: 503-294-4750

E-mail: [hidrometeo@salnet.net](mailto:hidrometeo@salnet.net)

Lorena Soriano, Jefe  
Area de Meteorología  
Oficina STAR 4

503-294-0566, Ext 43

503-295-0626

Fax: 503-295-0304

FRANCE / FRANCIA

FRENCH WEST INDIES / ANTILLES OCCIDENTALES FRANÇAISES

Direction Interrégionale de Météo-France  
aux Antilles-Guyane  
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Martinique

596 63 99 66

Maurice Merlet, Directeur

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596-63 40 79

Fax: 596 63 99 55

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E-mail: [maurice.merlet@meteo.fr](mailto:maurice.merlet@meteo.fr)

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E-mail: [philippe.chapelet@meteo.fr](mailto:philippe.chapelet@meteo.fr)

Max Reyal, Adjoint Exploitation

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596-57-26 93

E-mail: [max.reyal@meteo.fr](mailto:max.reyal@meteo.fr)

MARTINIQUE / MARTINIQUE

ATTACHMENT 7 C, p. 16

Centre Météorologique du Lamentin 596-57 23 23  
596-51 83 04 (liste rouge/unlisted)  
Fax: 596-51 29 40  
J.N. Degrace, Chef du centre de prévision 596-57 23 29 596-51 57 68  
E-mail: [jean-noel.degrace@meteo.fr](mailto:jean-noel.degrace@meteo.fr)



ATTACHMENT 7 C, p. 17

ATTACHMENT 8 A / ADJUNTO 8 A, p. 7

	<b>Office No/No de la Oficina Particular</b>	<b>Home/no del Domicilio</b>
<u>GUADELOUPE / GUADALUPE</u>		
Centre Météorologique du Raizet	590-89 60 79 Fax: 590-89 60 76	
R. Mazurie, Chef du centre de prévision	590-89 60 78 E-mail: <a href="mailto:roland.mazurie@meteo.fr">roland.mazurie@meteo.fr</a>	590-83 36 69
<u>GUATEMALA / GUATEMALA</u>		
E. Sánchez, Director, INSIVUMEH	502-331-5944 502-331-4986 Fax: 502-331-5005 E-mail: <a href="mailto:insivume@ops.org.gt">insivume@ops.org.gt</a>	502-251-6234
F. Garavito, Oficina de Predicción	502-331-4897 Fax: 502-331-5005 E-mail: <a href="mailto:insivume@ops.org.gt">insivume@ops.org.gt</a>	502-634-4502
<u>GUYANA / GUYANA</u>		
Chief Hydrometeorological Officer, Georgetown		
S. M. Khan – Aeronautical Section	592-2-59550	592-2-03279
Fax: 592-2-61460		
Special Meteorologists		
G. Persaud – Agromet. Section	592-2-72463	
K. Simon – Climate Section	592-2-59303	
<u>HAITI / HAITI</u>		
Centre Météorologique National	509-46-0333	
Aéroport international, Port-au-Prince	Fax: 509-46-0998	
Ronald Semelfort, Directeur		
Y. Chery, Directeur, Ressources en eau	509-22-4057	
C.J. Jeune, Directeur, Ressources naturelles	509-22-1867	

## ATTACHMENT 8 A / ADJUNTO 8 A, p. 8

	<b>Office No/No de la Oficina Particular</b>	<b>Home/no del Domicilio</b>
<u>HONDURAS / HONDURAS</u>		
Servicio Meteorológico Nacional Aeropuerto Toncontin Tegucigalpa.	Fax: 504-233-8075  E-mail: <a href="mailto:meteohond@sigmonet.hn">meteohond@sigmonet.hn</a>	504-237-6646
Hector Flores, Director	504-233-8075 - telfax	504-237-6646
Herson Homer Sierra S., Jefe, Depto. Sinóptica, Oficina de Pronósticos (cellular) (Forecasting Office)	504-233-1114 504-233-1111	504-246-0514 504-995-9524
Estaciones meteorológicas		
Choluteca	504-8820027	
La Mesa	504-5562130	
Tela	504-4482025	
La Ceiba	504-4420670	
<u>JAMAICA / JAMAICA</u>		
Meteorological Division P.O. Box 103 Kingston 10	1-876-929-3700 1-876-929-3694 1-876-929-3706 1-876-929-7268 Fax: 1-876-960-8989 E-mail: <a href="mailto:metja@infochan.com">metja@infochan.com</a>	
Sylvia M. McGill, Director	1-876-960-8990*	1-876-927-3785
National Meteorological Centre (Forecasting Office 24 hours)	1-876-924-8040* 1-876-924-8404	
Norman Manley International Airport	Fax: 1-876-924-8670	
(a) Rawinsonde Station Manley International Airport	1-876-924-8256	
(b) Synoptic Station Sangster International Airport Montego Bay (24 hours)	1-876-952-0181	
* unlisted		

ATTACHMENT 7 C, p. 19

**Office No/No  
de la Oficina  
Particular**

**Home/no del  
Domicilio**

MEXICO / MEXICO

Ing. Carlos Espinosa G. Gerente del S.M.N. 525-626-8650/51  
Fax: 525-626-8695

Centro Nacional de Prevision del Tiempo 525-626-8733/38  
Fax: 525-626-8715

Centro de Telecommunications 525-626-8605  
Meteorologicas Fax: 525-626-8606

SENEAM – SCT – CAPMA 525-726-1670  
525-726-1654

MONTSERRAT / MONTSERRAT

Meteorological Office – Airport / Met. Office  
Norman Cassell, Airport Manager 1-664-491-6218  
Email: [airport@candw.ag](mailto:airport@candw.ag) Fax: 1-664-491-3475  
Fax: 1-664-491-7688

NETHERLANDS ANTILLES AND ARUBA / ANTILLAS NEERLANDESAS Y ARUBA

Meteorological Service Fax: 599-9-8683999/8692699  
Seru mahuma z/n, Curacao 599-9-8393360  
599-9-8393361  
599-9-8393376  
E-mail: [cur-met@meteo.an](mailto:cur-met@meteo.an)

J. Dania, Director 599-9-8393367 599-9-7372282  
Email: [adania@meteo.an](mailto:adania@meteo.an) 599-9-8680053 cell: 599-9-5615554

P. L. Trapenberg, Deputy Director 599-9-8393364 599-9-7371733  
Meteorological Service

Juliana Airport, St. Maarten  
A. F. James, Senior Meteorologist 599-5-452024 599-5-4683005  
599-5-454226 Cell: 599-5-95945  
Fax: 599-5-452996  
Fax: 599-5-452998  
Email: [james@meteo.an](mailto:james@meteo.an)

**Office No/No  
de la Oficina**

**Home/no del  
Domicilio  
Particular**

NICARAGUA / NICARAGUA

Ing. Claudio Gutiérrez Huete 505-249-2757  
Director Ejecutivo 505-249-2759  
Instituto Nicaraguense de Fax: 505-249-1890  
Estudios Terroitoriales E-mail: [ineter.disup@netport.com.ni](mailto:ineter.disup@netport.com.ni)  
INETER

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PANAMA / PANAMA

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E-mail: [hidromet@panama.phoenix.net](mailto:hidromet@panama.phoenix.net)

ST. KITTS / SAN CRISTOBAL

Meteorological Office, Basseterre  
Robert Warner Tel: 1-869-465-8472  
Email: [warnerson@caribsurf.com](mailto:warnerson@caribsurf.com) Fax: 1-869-465-8122

E-mail: [skbmeto@caribsurf.com](mailto:skbmeto@caribsurf.com)

ST. LUCIA / SAN LUCIA

Meteorological Service	1-758-468-4315	
Ministry of Communications Works, Transport & Public Utilities Castries	Fax: 1-758-453-2769 (0800-1630)	
H. Regis, Director	1-758-468-4315	1-758-452-1568
	Fax: 1-758-453-2769	
Forecast Office	1-758-454-6550	
Hewanorra International Airport	Fax: 1-758-454-9705	
Thomas Auguste, Meteorologist	1-758-454-6550	1-758-452-6620
Venantius Descartes, Senior Forecaster	1-758-454-6550	1-758-454-6629



<b>Office No/No de la Oficina Particular</b>	<b>Home/no del Domicilio</b>
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CARIBBEAN METEOROLOGICAL ORGANIZATION / ORGANIZACIÓN  
METEOROLOGICA DEL CARIBE

P.O. Box 461, Port-of-Spain

Tyrone Sutherland

Co-ordinating Director

1-868-623-3634

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E-mail: [suthcmo@tsst.net.tt](mailto:suthcmo@tsst.net.tt)

TURKS & CAICOS ISLANDS / ISLAS TURCAS Y CAICOS

Mr. Alpheus Gardiner, Permanent

Secretary, Ministry of Works & Utilities

1-809-946-1122 / 1322 / 8227

Fax: 1-809-946-2740

E-mail: [hurrican@caribsurf.com](mailto:hurrican@caribsurf.com)

UNITED STATES OF AMERICA / ESTADOS UNIDOS DE AMERICA

National Hurricane Center/Centro

Nacional de Huracanes

11691 S.W. 17th Street

Miami, Florida, 33165-2149

1-305-229-4419\*

Fax: 1-305-553-1901

Max Mayfield, Director

Ed Rappaport, Deputy Director

1-305-229-4402\*

E-mail: [mayfield@noaa.gov](mailto:mayfield@noaa.gov)

1-305-229-4412\*

E-mail [ed@nhc.noaa.gov](mailto:ed@nhc.noaa.gov)

1-305-234-5389\*

PUERTO RICO / PUERTO RICO USA

Weather Service Forecast Office

Road 190 #4000

Carolina, P.R. 00979

1-787-253-4504\*

1-787-253-4501\*

Fax: 1-787-253-7802

Israel Matos, Meteorologist-in-Charge

Rafael Mojica, Warning and Coordination  
Meteorologist

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1-787-253-4586 ext 222

[israel.matos@noaa.gov](mailto:israel.matos@noaa.gov)

1-787-253-4586 ext 223

1-787-263-7984

1-787-757-7969

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**Home/no del**



**de la Oficina  
Particular**

**Domicilio**

VENEZUELA / VENEZUELA

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Alfredo Pinero Díaz (Cap. FGTA) Jefe del Departamento Meteorología Marina de la Armada (ARV) Dirección de Hidrografía y Navegación La Planicie, 23 de Enero, Apartado No. 6745, Caracas	INTER +58+212-555-67-57 Fax: INTER +58+212-483-58-78 Home: INTER +58+212-461-67-51
(IFRC) International Federation of the Red Cross Winston F. Panton P.O. Box 1549 Belize City, Belize	+501-231990 +501-231990 Email: WFPan41@hotmail.com

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**TROPICAL CYCLONE WARNING HEADINGS/  
ENCABEZAMIENTO DE LOS AVISOS DE CICLON**

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	Tropical depression heading/Encabezamiento de depresión tropical o de huracán	Tropical storm or hurricane heading/ Encabezamiento de tormenta tropical o de huracán
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Antigua WOCA31 TAPA      WHCA31 TAPA

Bahamas      WOBA31 MYNN      WHBA31 MYNN

Barbados      WOCA31 TBPB      MHCA31 TBPB

Belize/Belice      WOCA31 MZBZ      WHCA31 MZBZ

Canada/Canadá      WWCN1-4 CWHX  
WPCN3-4 CWHX  
WWCN1-6 CYQX  
WWCN1-2 CWVR  
WPCN3-4 CWVR

Costa Rica      WOCA31 MRSJ      WHCA31 MRSJ

Cuba      WOCA31 MUHV      WHCA31 MUHV

Dominican Republic/  
República Dominicana      WOCA31 MDSD      WHCA31 MDSD

France (Martinique)/  
Francia (Martinica)      WOMR31 TFFF      WHMR31 TFFF

France (Guadeloupe)/  
Francia (Guadalupe)      WOMF31 TFFR      WHMF31 TFFR

Guatemala      WOCA31 MGGT      WHCA31 MGGT

Honduras      WOCA31 MHTG      MHCA31 MHTG

Jamaica      WOCA31 MKJP      WHCA31 MKJP

Mexico/México      WOMX1 MMMX      WHMX1 MMMX

WOMX2 MMMX      WHMX2 MMMX

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	Tropical depression heading/Encabezamiento	Tropical storm or hurricane heading/Encabezamiento de
Country/País	depresión tropical	tormenta tropical o de huracán

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Nicaragua      WOCA31 MNMG      WHCA31 MNMG

Panama          WOCA31 MPTO      WHCA31 MPTO

Trinidad and Tobago/  
Trinidad y Tabago      WOCA31 TTPP      WHCA31 TTPP

United States/Estados Unidos:

Miami, Fl.      WTNT31-35 KNHC      WTNT31-35 KNHC  
(Atlantic, Caribbean, Gulf of Mexico/Atlántico, Caribe, Golfo de México)

Miami, Fl.      WTPT31-35 KNHC      WTPT31-35 KNHC  
(Eastern North Pacific/Pacífico Nororiental)

Honolulu, HI./Honolulu, HI.      WTPA31-35 PHNL      WTPA31-35 PHNL

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ATTACHMENT 8C

USA HEADINGS FOR TROPICAL CYCLONE RELEASES

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Public	Forecast/Advisory	Public	
Tropical Cyclone	Tropical Cyclone	Suspicious Area	

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Miami, FL    WTNT31-35 KNHC    WTNT21-25 KNHC    WONT41 KNHC

(Atlantic, Caribbean, Gulf of Mexico)

Miami, FL    WTPZ31-35 KNHC    WTPZ21-25 KNHC    WOPZ41 KNHC

(Eastern North Pacific)

Honolulu, HI    WTPA31-35 PHNL    WTPA21-25 PHNL    WOPA41 PHNL

Miami, FL    WTNT71-75 KNHC (Strike probabilities)

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**Note:** US advisory headings range from 1 to 5 and are re-cycled with the sixth, eleventh, and sixteenth tropical cyclone.

ATTACHMENT 8 D

**USA HEADINGS FOR ADDITIONAL TROPICAL/SUBTROPICAL  
METEOROLOGICAL RELEASES**

1. SUBTROPICAL STORM FORECASTS/ADVISORIES

WWNT21-25 KNHC (NORTH ATLANTIC)

WWPZ21-25 KNHC (EASTERN NORTH PACIFIC)

2. SUBTROPICAL STORM PUBLIC ADVISORIES

WWNT31-35 KNHC (NORTH ATLANTIC)

WWPZ31-35 KNHC (EASTERN NORTH PACIFIC)

3. TROPICAL CYCLONE DISCUSSION

WTNT41-45 KNHC (NORTH ATLANTIC)

WTPZ41-45 KNHC (EASTERN NORTH PACIFIC)

4. TROPICAL CYCLONE POSITION ESTIMATE

WTNT51 KNHC (NORTH ATLANTIC)

WTPZ51 KNHC (EASTERN NORTH PACIFIC)

5. TROPICAL CYCLONES UPDATE

WTNT61 KNHC (NORTH ATLANTIC)

WTPZ61 KNHC (EASTERN NORTH PACIFIC)

6. TROPICAL WEATHER OUTLOOK

ABNT20 KNHC (NORTH ATLANTIC)

ABPZ20 KNHC (EASTERN NORTH PACIFIC)

7. TROPICAL WEATHER SUMMARY

ABNT30 KNHC (NORTH ATLANTIC)

ABPZ30 KNHC (EASTERN NORTH PACIFIC)

8. TROPICAL WEATHER DISCUSSION

AXNT20 KNHC (NORTH ATLANTIC)

AXPZ20 KNHC (EASTERN NORTH PACIFIC)

9. SATELLITE - DERIVED RAINFALL

TCCA21 KNHC (EASTERN CARIBBEAN)

TCCA22 KNHC (CENTRAL CARIBBEAN)

TCCA23 KNHC (WESTERN CARIBBEAN)

10. TROPICAL NUMERICAL GUIDANCE MESSAGE

(TROPICAL NORTH ATLANTIC/CARIBBEAN)

FACA20 KWBC

ATTACHMENT 8 E / ADJUNTO 8 E

**RADAR REPORT HEADINGS \***

<b>Country</b>	<b>Heading</b>	
Bahamas	SDBA1	MYNN
Barbados	SDCA1	TBPB
Belize	SDCA	MZBZ
Canada	SDCN1	CWHX
SDCN1	CYYT	
SDCN1	CWMK	
Cuba	SDCU	MUHA
Dominican Republic	SDCA1	MDSB
France (Guadeloupe)	SDCA1	TFFR
France (Martinique)	SDCA1	TFFF
French Guiana (Rochambeau)	SDCA1	SOCA
Jamaica	SDCA	MKJP
Netherlands Antilles (Curacao)	SDCA1	TNCC
Netherland Antilles (St. Maarten)	SDCA1	TNCM
Panama	SDCA1	MPHO
Trinidad and Tobago	SDCA1	TTPT
USA	SDUS1	RWRB
SDUS1	RWRA	

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**LIST OF WEB SITES OF NATIONAL METEOROLOGICAL SERVICES  
LISTA DE WEB SITES DE LOS SERVICIOS METEOROLOGICOS**

**BAHAMAS /BAHAMAS**

[www.weather.bahamas.s/bs](http://www.weather.bahamas.s/bs)

**BELIZE / BELICE**

Meteorological Services [www.met.bze.gov.bz](http://www.met.bze.gov.bz)

**BERMUDA / BERMUDA**

Bermuda Weather Service [www.weather.bm](http://www.weather.bm)

**CANADA / CANADA**

Environment Canada [www.ns.ec.gc.ca](http://www.ns.ec.gc.ca)

Canadian Hurricane Centre [www.ns.ec.gc.ca/weather/hurricane/](http://www.ns.ec.gc.ca/weather/hurricane/)

**COLOMBIA / COLOMBIA**

Meteorología y Estudios Ambientales [www.ideam.gov.co](http://www.ideam.gov.co)

**COSTA RICA / COSTA RICA**

Instituto Meteorológico Nacional [www.meteoro.imn.ac.cr](http://www.meteoro.imn.ac.cr)

**CUBA / CUBA**

Instituto de Meteorología [www.met.inf.cu](http://www.met.inf.cu)

**FRANCE / FRANCIA** [www.meteo.fr](http://www.meteo.fr)  
[www.meteo.gp](http://www.meteo.gp)

**MEXICO / MEXICO**

Servicio Meteorológico Nacional <http://smn.cna.gob.mx>

**UNITED STATES OF AMERICA / ESTADOS UNIDOS DE AMERICA**

National Hurricane Centre / [www.nhc.noaa.gov](http://www.nhc.noaa.gov)  
Nacional de Huracanes

PUERTO RICO / PUERTO RICO USA

Weather Service Forecast Office [www.upr.clu.edu/nws](http://www.upr.clu.edu/nws)

VENEZUELA / VENEZUELA

Servicio de Meteorología (FAV) [www.semefav.home.ml.ve](http://www.semefav.home.ml.ve)

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## ATTACHMENT 8 B / ADJUNTO 8 B

**TROPICAL CYCLONE WARNING HEADINGS/  
ENCABEZAMIENTO DE LOS AVISOS DE CICLON**

Country/País	Tropical depression heading/Encabezamiento depresión tropical	Tropical storm or hurricane heading/ Encabezamiento de tormenta tropical o de huracán
Antigua	WOCA31 TAPA	WHCA31 TAPA
Bahamas	WOBA31 MYNN	WHBA31 MYNN
Barbados	WOCA31 TBPB	MHCA31 TBPB
Belize/Belice	WOCA31 MZBZ	WHCA31 MZBZ
Canada/Canadá		WWCN1-4 CWHX WPCN3-4 CWHX WWCN1-6 CYQX WWCN1-2 CWVR WPCN3-4 CWVR
Costa Rica	WOCA31 MRSJ	WHCA31 MRSJ
Cuba	WOCA31 MUHV	WHCA31 MUHV
Dominican Republic/ República Dominicana	WOCA31 MDSD	WHCA31 MDSD
France (Martinique)/ Francia (Martinica)	WOMR31 TFFF	WHMR31 TFFF
France (Guadeloupe)/ Francia (Guadalupe)	WOMF31 TFFR	WHMF31 TFFR
Guatemala	WOCA31 MGGT	WHCA31 MGGT
Honduras	WOCA31 MHTG	MHCA31 MHTG
Jamaica	WOCA31 MKJP	WHCA31 MKJP
Mexico/México	WOMX1 MMMX	WHMX1 MMMX
	WOMX2 MMMX	WHMX2 MMMX



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Country/País	Tropical depression heading/Encabezamiento depresión tropical	Tropical storm or hurricane heading/ Encabezamiento de tormenta tropical o de huracán
Nicaragua	WOCA31 MNMG	WHCA31 MNMG
Panama	WOCA31 MPTO	WHCA31 MPTO
Trinidad and Tobago/ Trinidad y Tabago	WOCA31 TTPP	WHCA31 TTPP

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ATTACHMENT 8C

USA HEADINGS FOR TROPICAL CYCLONE RELEASES

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	Public Tropical Cyclone	Forecast/Advisory Tropical Cyclone	Tropical Cyclone Discussion
Miami, FL	WTNT31-35 KNHC	WTNT21-25 KNHC	WTNT41-45 KNHC
	(Atlantic, Caribbean, Gulf of Mexico)		
Miami, FL	WTPZ31-35 KNHC	WTPZ21-25 KNHC	WTPZ41-45 KNHC
	(Eastern North Pacific)		
Honolulu, HI	WTPA31-35 PHNL	WTPA21-25 PHNL	
Miami, FL	WTNT71-75 KNHC (Strike probabilities for Atlantic, Caribbean and Gulf of Mexico)		

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NOTE: US advisory headings range from 1 to 5 and are re-cycled with the sixth, eleventh, and sixteenth tropical cyclone.

ATTACHMENT 8D

**USA HEADINGS FOR ADDITIONAL TROPICAL/  
SUBTROPICAL METEOROLOGICAL RELEASES**

1. SPECIAL DISTURBANCE STATEMENT
  
2. TROPICAL CYCLONE POSITION ESTIMATE  
WTNT51 KNHC (NORTH ATLANTIC)  
WTPZ51 KNHC (EASTERN NORTH PACIFIC)
  
3. TROPICAL CYCLONES UPDATE  
WTNT61 KNHC (NORTH ATLANTIC)  
WTPZ61 KNHC (EASTERN NORTH PACIFIC)
  
4. TROPICAL WEATHER OUTLOOK  
ABNT20 KNHC (NORTH ATLANTIC)  
ABPZ20 KNHC (EASTERN NORTH PACIFIC)
  
5. TROPICAL WEATHER SUMMARY  
ABNT30 KNHC (NORTH ATLANTIC)  
ABPZ30 KNHC (EASTERN NORTH PACIFIC)
  
6. TROPICAL WEATHER DISCUSSION  
AXNT20 KNHC (NORTH ATLANTIC)  
AXPZ20 KNHC (EASTERN NORTH PACIFIC)
  
7. SATELLITE - DERIVED RAINFALL  
TCCA21 KNHC (EASTERN CARIBBEAN)  
TCCA22 KNHC (CENTRAL CARIBBEAN)  
TCCA23 KNHC (WESTERN CARIBBEAN)
  
8. TROPICAL NUMERICAL GUIDANCE MESSAGE  
(TROPICAL NORTH ATLANTIC/CARIBBEAN)  
FACA20 KWBC

**RADAR REPORT HEADINGS**

<u>Country</u>		<u>Heading</u>
Bahamas	SDBA1	MYNN
Barbados	SDCA1	TBPB
Belize	SDCA	MZBZ
Canada	SDCN1	CWHX
	SDCN1	CYYT
	SDCN1	CWMK
Cuba	SDCU	MUHA
Dominican Republic	SDCA1	MDSO
France (Guadeloupe)	SDCA1	TFFR
France (Martinique)	SDCA1	TFFF
French Guiana (Rochambeau)	SDCA1	SOCA
Jamaica	SDCA	MKJP
Netherlands Antilles (Curacao)	SDCA1	TNCC
Netherland Antilles (St. Maarten)	SDCA1	TNCM
Panama	SDCA1	MPHO
Trinidad and Tobago	SDCA1	TTPT
USA	SDUS1	RWRB
	SDUS1	RWRA

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ATTACHMENT 8 F / ADJUNTO 8 F

**LIST OF WEB SITES OF NATIONAL METEOROLOGICAL SERVICES  
LISTA DE WEB SITES DE LOS SERVICIOS METEOROLOGICOS**

BAHAMAS/BAHAMAS

Meteorological Services [www.bahamasweather.org](http://www.bahamasweather.org)

BELIZE / BELICE

Meteorological Services [www.gatewayone.com/belize](http://www.gatewayone.com/belize)

CAYMAN ISLANDS/ISLAS CAIMAN

Meteorological Services [www.gov.ky](http://www.gov.ky)

BERMUDA / BERMUDA

Bermuda Weather Service [www.weather.bm](http://www.weather.bm)  
[www.bermudaweather.org](http://www.bermudaweather.org)

CANADA / CANADA

Canadian Hurricane Centre  
Meteorological Service of Canada [www.ns.ec.gc.ca/weather/hurricane/](http://www.ns.ec.gc.ca/weather/hurricane/)

COLOMBIA / COLOMBIA

Instituto de Hidrologia,  
Meteorología y Estudios Ambientales [www.ideam.gov.co](http://www.ideam.gov.co)

COSTA RICA / COSTA RICA

Instituto Meteorológico Nacional [www.imn.ac.cr](http://www.imn.ac.cr)

CUBA / CUBA

Instituto de Meteorología [www.met.inf.cu](http://www.met.inf.cu)

FRANCE / FRANCIA

Météo France [www.meteo.fr](http://www.meteo.fr)  
[www.meteo.gp](http://www.meteo.gp)

for access for NMS's to radar imagery ask for password from webmaster

MEXICO / MEXICO

Servicio Meteorológico Nacional

<http://smn.cna.gob.mx>

NETHERLANDS ANTILLES AND ARUBA / ANTILLAS NEERLANDESAS Y ARUBA

Meteorological Service

[www.meteo.an](http://www.meteo.an)

NICARAGUA/NICARAGUA

Meteorological Services

[www.ineter.gov.ni](http://www.ineter.gov.ni)

UNITED STATES OF AMERICA / ESTADOS UNIDOS DE AMERICA

National Hurricane Centre /  
Nacional de Huracanes

[www.nhc.noaa.gov](http://www.nhc.noaa.gov)

PUERTO RICO / PUERTO RICO USA

Weather Service Forecast Office

[www.srh.noaa.gov](http://www.srh.noaa.gov)  
[www.upr.clu.edu/nws](http://www.upr.clu.edu/nws)

VENEZUELA / VENEZUELA

Servicio de Meteorología (FAV)

[www.geocities.com/sermetfav](http://www.geocities.com/sermetfav)



## CHAPTER 9

### TROPICAL CYCLONE NAMES

The lists in Table I and Table II contain the names to be used during 1999-2004 to identify the named tropical cyclones of the Caribbean Sea, the Gulf of Mexico, the North Atlantic Ocean and the eastern North Pacific, respectively. These lists of names will be rotated forward beyond 2004 so that the 1998 names will be used again in 2004. However, if a tropical cyclone acquires special notoriety because of its strength, deaths, damage or other special reasons, its name may be withdrawn at the request of any Member and the agreement at the session of the RA IV Hurricane Committee. In such a case, the RA IV Hurricane Committee will select a replacement for the withdrawn name. Whenever more storms develop in a given year than the number of names in the relevant list, the Greek alphabet (Alpha, Beta, etc.) will be used to name the subsequent systems.

A tropical cyclone which passes from one basin to another will retain its name.

**TABLE I**

**Names to be used for named tropical cyclones in the Caribbean  
Sea, the Gulf of Mexico and the North Atlantic Ocean**

<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>
Allison	Arthur	Ana	Alex	Arlene	Alberto
Barry	Bertha	Bill	Bonnie	Bret	Beryl
Chantal	Cristobal	Claudette	Charley	Cindy	Chris
Dean	Dolly	Danny	Danielle	Dennis	Debby
Erin	Edouard	Erika	Earl	Emily	Ernesto
Felix	Fay	Fabian	Frances	Franklin	Florence
Gabrielle	Gustav	Grace	Gaston	Gert	Gordon
Humberto	Hanna	Henri	Hermine	Harvey	Helene
Iris	Isidore	Isabel	Ivan	Irene	Isaac
Jerry	Josephine	Juan	Jeanne	Jose	Joyce
Karen	Kyle	Kate	Karl	Katrina	Kirk
Lorenzo	Lili	Larry	Lisa	Lee	Leslie
Michelle	Marco	Mindy	Matthew	Maria	Michael
Noel	Nana	Nicolas	Nicole	Nate	Nadine
Olga	Omar	Odette	Otto	Ophelia	Oscar
Pablo	Paloma	Peter	Paula	Philippe	Patty
Rebekah	Rene	Rose	Richard	Rita	Rafael
Sebastien	Sally	Sam	Shary	Stan	Sandy
Tanya	Teddy	Teresa	Tomas	Tammy	Tony
Van	Vicky	Victor	Virginie	Vince	Valerie
Wendy	Wilfred	Wanda	Walter	Wilma	William

**TABLE II****Names to be used for named tropical cyclones  
in the eastern North Pacific Ocean**

<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>
Adolph	Alma	Andres	Agatha	Adrian	Aletta
Barbara	Boris	Blanca	Blas	Beatriz	Bud
Cosme	Cristina	Carlos	Celia	Calvin	Carlotta
Dalila	Douglas	Delores	Darby	Dora	Daniel
Erick	Elida	Enrique	Estelle	Eugene	Emilia
Flossie	Fausto	Felicia	Frank	Fernanda	Fabio
Gil	Genevieve	Guillermo	Georgette	Greg	Gilma
Henriette	Hernan	Hilda	Howard	Hilary	Hector
Ivo	Iselle	Ignacio	Isis	Irwin	Ileana
Juliette	Julio	Jimena	Javier	Jova	John
Kiko	Kenna	Kevin	Kay	Kenneth	Kristy
Lorena	Lowell	Linda	Lester	Lidia	Lane
Manuel	Marie	Marty	Madeline	Max	Miriam
Narda	Norbert	Nora	Newton	Norma	Norman
Octave	Odile	Olaf	Orlene	Otis	Olivia
Priscilla	Polo	Patricia	Paine	Pilar	Paul
Raymond	Rachel	Rick	Roslyn	Ramon	Rosa
Sonia	Simon	Sandra	Seymour	Selma	Sergio
Tico	Trudy	Terry	Tina	Todd	Tara
Velma	Vance	Vivian	Virgil	Veronica	Vincente
Wallis	Winnie	Waldo	Winifred	Wiley	Willa

Other names available:

2000, 2002, etc.Xavier  
Yolande  
Zeke2001, 2003 etc.Xina  
York  
Zelda

**TABLE III****Names of Atlantic Storms Retired into Hurricane History**

<u>Name</u>	<u>Year/Key</u>	<u>Location(s) affected</u>
Agnes	1972 +*	Florida, Northeast USA
Alicia	1983 *	North Texas
Allen	1980 *	Antilles, Mexico, South Texas
Andrew	1992 *	Bahamas, South Florida and Louisiana
Anita	1977	Mexico
Audrey	1957 +*	Louisiana, North Texas
Betsy	1965 +*	Bahamas, Southeast Florida, Southeast Louisiana
Beulah	1967 *	Antilles, Mexico, South Texas
Bob	1991 *	North Carolina and Northeast U.S.
Camille	1969 +*	Louisiana, Mississippi and Alabama
Carla	1961 +*	Texas
Carmen	1974	Mexico, Central Louisiana
Carol <sup>1</sup>	1954 +*	Northeast U.S.
Celia	1970 *	South Texas
César	1996	Costa Rica, Nicaragua
Cleo	1964 *	Lesser Antilles, Haiti, Cuba, Southeast Florida
Connie	1955 +	North Carolina
David	1979 *	Lesser Antilles, Hispaniola, Bahamas, Florida and Eastern U.S.
Diana	1990	Mexico
Diane	1955 +*	Mid-Atlantic U.S. & Northeast U.S.
Donna	1960 +*	Bahamas, Florida and Eastern U.S.
Dora	1964 *	Northeast Florida
Elena	1985 *	Mississippi, Alabama, Western Florida
Eloise	1975 *	Antilles, Northwest Florida, Alabama
Fran	1996	
Fifi	1974	Belize, Guatemala, Honduras, El Salvador
Flora	1963	Haiti, Cuba, Tobago
Floyd	1999	
Frederic	1979 *	Alabama and Mississippi
Georges	1998	U.S Virgin Is., Puerto Rico, Dominican Republic, Haiti, Cuba, Florida, Mississippi
Gilbert	1988	Lesser Antilles, Jamaica, Yucatan Peninsula, Mexico, El Salvador
Gloria	1985 *	North Carolina, Northeast U.S.
Greta	1978	Belize
Hattie	1961	Belize, Guatemala
Hazel	1954 +*	Antilles, North and South Carolina, Southern Ontario
Hilda	1964 +*	Louisiana
Hortense	1996	Puerto Rico, Dominican Republic, Nova Scotia
Hugo	1989 *	Antilles, Guadeloupe, Virgin Islands, Puerto Rico, South Carolina
Ione	1955 *	North Carolina
Inez	1966	Lesser Antilles, Hispaniola, Cuba, Florida Keys, Mexico
Janet	1955	Lesser Antilles, Belize, Mexico, Costa Rica
Joan	1988	Curaçao, Venezuela, Colombia, Costa Rica, Nicaragua < crossed into the Pacific and became Miriam >

<u>Name</u>	<u>Year/Key</u>	<u>Location(s) affected</u>
Keith	2000	Belize and Mexico
Klaus	1990	Martinique
Lenny	1999	
Luis	1995	Lesser Antilles
Marilyn	1995	Lesser Antilles, Puerto Rico
Mitch	1998	Cayman Is, Colombia, Honduras, Nicaragua, Guatemala, Belize, Costa Rica, Mexico, Florida
Opal	1995	Central America, Mexico, Florida
Roxanne	1995	Mexico

Key: + within the list of top 36 most deadly US hurricanes  
\* within the list of top 31 most costly US hurricanes in 1990 US dollars

(Note: Key data available through to 1992 for storms which affected the USA. Some of the most deadly and costly hurricanes occurred before storms were named)

<sup>1</sup> The name "Carol" was used again to denote a hurricane in the mid-Atlantic Ocean in 1965. However, because the name does not appear after that time, it is assumed that the name was retired retrospectively for the damages caused by the 1954 storm of the same name.

**TABLE IV****Names of Eastern North Pacific Ocean Storms Retired into Hurricane History**

Eastern Pacific naming began in 1960 apparently with two lists of twenty female names. The scheme began with A (Annette) and continued until mid 1962 without starting over. The year 1961 began with Iva, and 1962 began with Valerie. The years 1963-65 completed the second alphabet and then the second alphabet was unexplainedly started over again in early 1965 after the last two names from the same alphabet had started the season. Interestingly in 1963, two named systems apparently merged, or appeared to merge, so their names were also merged and Jennifer and Katherine became Jen-Kath. In 1966 a scheme using four alphabetical lists of female names was instituted where one of the four, in turn, was started at the beginning of each year. This continued until 1978 when alternating male and female names were used. Prior to 1978, only two names were retired, Hazel and Adele, and it is not clear why either was retired.

In 1978, when alternating male and female names were first used, there were initially four lists, and so a list beginning with Aletta was used in 1978 and again in 1982. At that time two additional lists were added, so in 1983 and 1984, the new lists were used. Thereafter, until today, each list is reused every six years.

Several names have been retired, some for practical reasons such as an pronunciation ambiguity or a “socially unacceptable” meaning in one of the languages and others because they represented a significant human disaster. I assume any name was retired if it appeared in a sequence one or more times, and was subsequently missing when the other names in the sequence were reused.

<u>Name</u>	<u>Year</u>
Adele	1970
Fefa	1991
Fico	1978
Hazel	1965
Ismael	1995
Iva	1988
Knut	1987
Pauline	1997

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## CHAPTER 10

### ARCHIVAL OF TROPICAL CYCLONE DATA

In accordance with the directive of the WMO Executive Council (EC-XLV), Geneva, July 1993) an international format for the archiving of tropical cyclone data is to be used by all RSMCs with activity specialization in tropical cyclones.

In the international format given in Attachment 10A, the Dvorak T-number (Position 35-36) and Dvorak CL-number (position 37-38) will be the ones determined at the centre submitting the data, in the case of the RA IV Hurricane Committee, by RSMC Miami-Hurricane Center.

Complete historic data using this format will be made available for research applications. RSMC Miami will provide such data, to the Director of the National Climatic Data Center (NCDC), USA.

The Tropical Cyclone Programme (TCP) Division of the WMO Secretariat has the responsibility for the maintenance of the format, including assignment of the source codes to appropriate organizations, and authorizing additions and changes.

## ATTACHMENT 10A

### GLOBAL TROPICAL CYCLONE TRACK AND INTENSITY DATA SET - REPORT FORMAT

Position	Content
1- 9	Cyclone identification code composed by 2 digit numbers in order within the cyclone season, area code and year code. 01SWI2000 shows the 1st system observed in South-West Indian Ocean basin during the 2000/2001 season. Area codes are as follows: ARB = Arabian Sea ATL = Atlantic Ocean AUB = Australian Region (Brisbane) AUD = Australian Region (Darwin) AUP = Australian Region (Perth) BOB = Bay of Bengal CNP = Central North Pacific Ocean ENP = Eastern North Pacific Ocean ZEA = New Zealand Region SWI = South-West Indian Ocean SWP = South-West Pacific Ocean WNP = Western North Pacific Ocean and South China Sea
10-19	Storm Name
20-23	Year
24-25	Month (01-12)
26-27	Day (01-31)
28-29	Hour- universal time (at least every 6 hourly position -00Z,06Z,12Z and 18Z)
30	Latitude indicator: 1=North latitude; 2=South latitude
31-33	Latitude (degrees and tenths)
34-35	Check sum (sum of all digits in the latitude)
36	Longitude indicator: 1=West longitude; 2=East longitude
37-40	Longitude (degrees and tenths)
41-42	Check sum (sum of all digits in the longitude)
43	position confidence* 1 = good (<30nm; <55km) 2 = fair (30-60nm; 55-110 km) 3 = poor (>60nm; >110km) 9 = unknown
Note*	Confidence in the center position: Degree of confidence in the center position of a tropical cyclone expressed as the radius of the smallest circle within which the center may be located by the analysis. " <b>position good</b> " implies a radius of less than 30 nm, 55 km; "position fair", a radius of 30 to 60 nm, 55 to 110km; and "position poor", radius of greater than 60 nm, 110km.
44-45	Dvorak T-number (99 for no report)
46-47	Dvorak CI-number (99 for no report)
48-50	Maximum average wind speed (whole values) (999 for no report).
51	Units 1=kt, 2=m/s, 3=km per hour.
52-53	Time interval for averaging wind speed (minutes for measured or derived wind speed, 99 if unknown or estimated).
54-56	Maximum Wind Gust (999 for no report)
57	Gust Period (seconds, 9 for unknown)
58	Quality code for wind reports: 1=Aircraft or Dropsonde observation 2=Over water observation (e.g. buoy) 3=Over land observation

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	4=Dvorak estimate
	5=Other
59-62	Central pressure (nearest hectopascal) (9999 if unknown or unavailable)
63	Quality code for pressure report (same code as for winds)
64	Units of length: 1=nm, 2=km
65-67	Radius of maximum winds (999 for no report)
68	Quality code for RMW: <ul style="list-style-type: none"> <li>1=Aircraft observation</li> <li>2=Radar with well-defined eye</li> <li>3=Satellite with well-defined eye</li> <li>4=Radar or satellite, poorly-defined eye</li> <li>5=Other estimate</li> </ul>
69-71	Threshold value for wind speed (gale force preferred, 999 for no report)
72-75	Radius in Sector 1: 315°-45°
76-79	Radius in Sector 2: 45°-135°
80-83	Radius in Sector 3: 135°-225°
84-87	Radius in Sector 4: 225°-315°
88	Quality code for wind threshold <ul style="list-style-type: none"> <li>1=Aircraft observations</li> <li>2=Surface observations</li> <li>3=Estimate from outer closed isobar</li> <li>4=Other estimate</li> </ul>
89-91	Second threshold value for wind speed (999 for no report)
92-95	Radius in Sector 1: 315°-45°
96-99	Radius in Sector 2: 45°-135°
100-103	Radius in Sector 3: 135°-225°
104-107	Radius in Sector 4: 225°-315°
108	Quality code for wind threshold (code as for row 88)
109-110	Cyclone type: <ul style="list-style-type: none"> <li>01= tropics; disturbance ( no closed isobars)</li> <li>02= &lt;34 knot winds, &lt;17m/s winds and at least one closed isobar</li> <li>03= 34-63 knots, 17-32m/s</li> <li>04= &gt;63 knots, &gt;32m/s</li> <li>05= extratropical</li> <li>06= dissipating</li> <li>07= subtropical cyclone (nonfrontal, low pressure system that comprises initially baroclinic circulation developing over subtropical water)</li> <li>08= overland</li> <li>09= unknown</li> </ul>
111-112	Source code (2 - digit code to represent the country or organization that provided the data to NCDC USA. WMO Secretariat is authorized to assign number to additional participating centers, organizations) <ul style="list-style-type: none"> <li>01 RSMC Miami-Hurricane Center</li> <li>02 RSMC Tokyo-Typhoon Center</li> <li>03 RSMC-tropical cyclones New Delhi</li> <li>04 RSMC La Reunion-Tropical Cyclone Centre</li> <li>05 Australian Bureau of Meteorology</li> <li>06 Meteorological Service of New Zealand Ltd.</li> <li>07 RSMC Nadi-Tropical Cyclone Centre</li> <li>08** Joint Typhoon Warning Center, Honolulu</li> <li>09** Madagascar Meteorological Service</li> <li>10** Mauritius Meteorological Service</li> <li>11** Meteorological Service, New Caledonia</li> <li>12 Central Pacific Hurricane Center, Honolulu</li> </ul>

Note\*\* No longer used

**Headings** 1-19 Cyclone identification code and name; 20-29 Date time group;  
 30-43 Best track positions;  
 44-110 Intensity, Size and Type;  
 111-112 Source code.