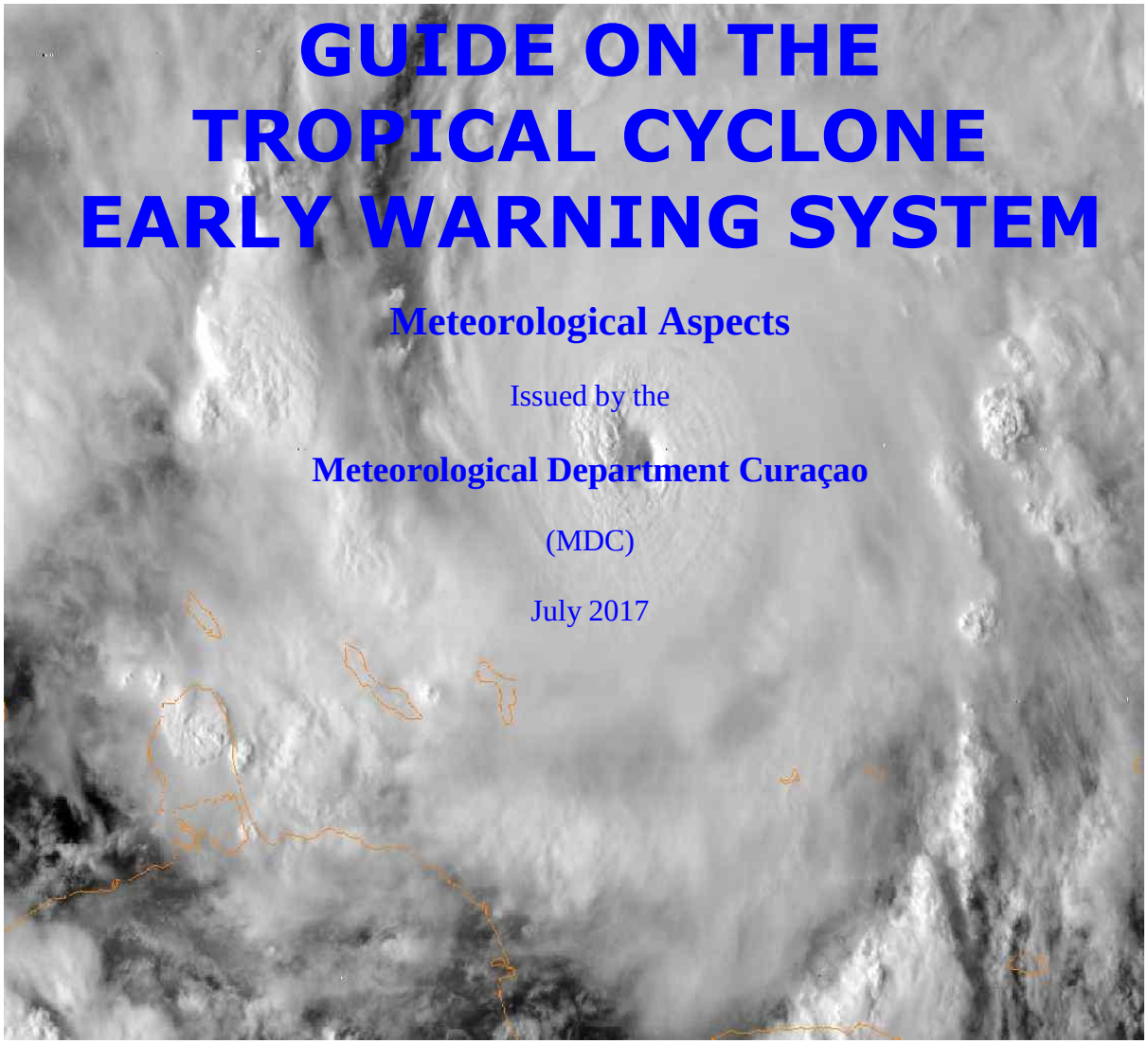

GUIDE ON THE TROPICAL CYCLONE EARLY WARNING SYSTEM

Meteorological Aspects

Issued by the

Meteorological Department Curaçao

(MDC)

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Contents

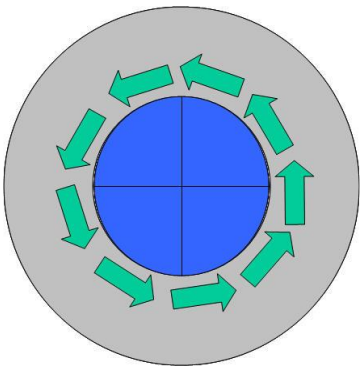
I. Tropical Cyclones Basic Knowledge

General

Tropical cyclones are low pressure areas with organized deep convection and a closed surface wind circulation around a well-defined center, which develop over warm tropical oceans. They appear over many parts of the tropical oceans, but the following information pertains specifically to tropical cyclones developing over the "Atlantic Basin", the area covering the North Atlantic Ocean, the Caribbean Sea and the Gulf of Mexico.

Wind Circulation

In northern-hemispheric tropical cyclones the air rotates counter-clockwise around the center of the cyclone. The presence of such a circulation at sea level is a sure sign of the existence of a tropical cyclone.



Tropical Cyclone Classification.

Based on the maximum sustained wind speed near the center, tropical cyclones are classified in three different types: tropical depressions, tropical storms and hurricanes.

	Maximum Wind Speed		
Class	**Knots**	**Km/hr**	**Miles/hr**
Tropical Depression	*33 or less*	*62 or less*	*38 or less*
Tropical Storm	*34 – 64*	*63 - 118*	*39 - 73*
Hurricane	*64 or higher*	*119 or higher*	*74 or higher*

The Saffir-Simpson Scale.

Furthermore, hurricanes are subdivided into five categories according to the Saffir-Simpson Scale.

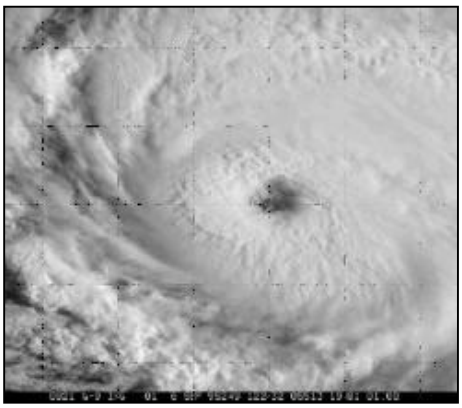
Category 1 and 2 are known as "minor hurricanes, category 3 and higher as "major hurricanes."

Saffir-Simpson Scale

Cate-gory	*Maximum Windspeed*		
	Knots	*Km/hr*	*Miles/hr*
1	*64-82*	*119-153*	*74-95*
2	*83-96*	*154-177*	*96-110*
3	*97-112*	*178-209*	*111-130*
4	*113-134*	*210-249*	*131-155*
5	*134+*	*250+*	*156+*

The Eye

The eye is the circular area of comparatively light winds that encompasses the center of a hurricane. The eye is either completely or partially surrounded by the eyewall cloud. The average diameter of the eye of an Atlantic hurricane is about 20 miles, but much smaller or larger diameters occur. The calm during the passage of the eye is only temporarily; when the eye has passed your location, winds will blow from the opposite direction and increase in intensity again.



Eye of Hurricane Luis, September 6, 1995.

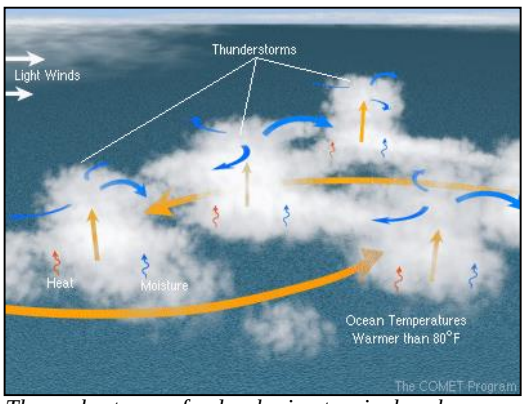
Naming

Since 1953, Atlantic tropical storms have been named from lists originated by the National Hurricane Center. They are now maintained and updated by the Regional Association IV Hurricane Committee of the World Meteorological Organization (WMO). The original name lists featured only women's names. In 1979, men's names were introduced and they alternate with the women's names. Six lists are used in rotation. Thus, the 2017 list will be used again in 2023.

Atlantic Basin Names

2017	2018	2019	2020	2021	2022
Arlene	Alberto	Andrea	Arthur	Ana	Alex
Bret	Beryl	Barry	Bertha	Bill	Bonnie
Cindy	Chris	Chantal	Cristobal	Claudette	Colin
Don	Debby	Dorian	Dolly	Danny	Danielle
Emily	Ernesto	Erin	Edouard	Elsa	Earl
Franklin	Florence	Fernand	Fay	Fred	Fiona
Gert	Gordon	Gabrielle	Gonzalo	Grace	Gaston
Harvey	Helene	Humberto	Hanna	Henri	Hermine
Irma	Isaac	Imelda	Isaias	Ida	Ian
Jose	Joyce	Jerry	Josephine	Julian	Julia
Katia	Kirk	Karen	Kyle	Kate	Karl
Lee	Leslie	Lorenzo	Laura	Larry	Lisa
Maria	Michael	Melissa	Marco	Mindy	Martin
Nate	Nadine	Nestor	Nana	Nicholas	Nicole
Ophelia	Oscar	Olga	Omar	Odette	Owen
Philippe	Patty	Pablo	Paulette	Peter	Paula
Rina	Rafael	Rebekah	Rene	Rose	Richard
Sean	Sara	Sebastien	Sally	Sam	Shary
Tammy	Tony	Tanya	Teddy	Teresa	Tobías
Vince	Valerie	Van	Vicky	Victor	Virginie
Whitney	William	Wendy	Wilfred	Wanda	Walter

A change in the list occurs when a storm causes a great number of deaths and significant destruction that the future use of its name on a different storm would be inappropriate for reasons of sensitivity. At the annual meeting of the Regional Association IV Hurricane Committee, the name is replaced.
Several names have been changed since the lists were created. For example, the deadliest Atlantic tropical cyclones in 2007, Dean, Felix and Noel were replaced in 2013 by respectively, Dorian, Fernand and Nestor. On the 2014 list, Gonzalo, Isaias and Paulette have respectively replaced Gustav, Ike and Paloma, which became notorious over parts of the Atlantic Basin during 2008. There are no new names in 2015 but in 2016, Igor of 2010 is replaced by Ian and Tomás by Tobías. Notorious (super) hurricane Sandy of 2012 will be replaced by Sara in 2018 and the retired Ingrid of 2013 will be replaced in 2019 by Imelda. All 2014 names will return in 2020, but the notorious Erika of 2015 will be replaced by Elsa and Joaquin by Julian. Matthew and Otto in 2016 will be replaced in 2022 by respectively Martin and Owen.



The early stages of a developing tropical cyclone

In the event that more than 21 named tropical cyclones occur in the Atlantic basin in a season, as happened in 2005, additional storms will take names from the Greek alphabet: Alpha, Beta, Gamma, Delta and so on. If a storm forms in the off-season, it will take the next name in the list based on the current calendar date. For example, if a tropical cyclone formed on

December 28th, it would take the name from the previous season's list of names. If a storm formed in January, as occurred with Alex in 2016, it would be named from the subsequent season's list of names.

Tropical Cyclone Genesis

In the Atlantic Basin most tropical cyclones, especially the major hurricanes, develop from **tropical waves**. A tropical wave is an area with cloudiness and showers that propagates from east to west. Annually, on average, an amount of 65 tropical waves moves through the Caribbean Area, mainly between the months of May and November.

A tropical wave is not a tropical cyclone since a closed circulation is not present near sea level. Near gale to gale force winds, which may be observed during the passage of a tropical wave, are caused by squalls in or near heavy showers rather than by an organized storm wind circulation.

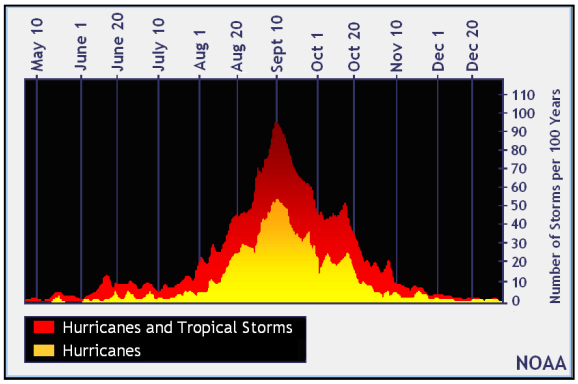
Cape Verde Cyclones

These are tropical cyclones which develop east of the Caribbean Area over the tropical Atlantic Ocean, mainly in the period between mid-August and mid-October.

The Cape Verde cyclones almost always develop from tropical waves which emerge off Western Africa. These tropical cyclones in general pose the largest threat to the islands in the Caribbean. During their long trip over the warm waters of the Atlantic Ocean, they have the opportunity to grow to mature hurricanes.

Hurricane Season and Frequency

The hurricane season in the Atlantic Basin officially starts on June 1 and ends on November 30; a great majority of tropical cyclones in this region develop during this period. Occasionally, a tropical cyclone will develop either before or after the season, as for instance happened recently with Hurricane Alex on January 14, 2016 and Tropical Storm Arlene on April 19 this year. Other examples were the tropical storms Odette and Peter in December 2003, tropical storm Zeta in late December 2005, early January 2006 and tropical storm Olga in December 2007.



Yearly tropical cyclone activity from month to month with peak on September 10

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II. The Tropical Cyclone Early Warning System

II.1 Standard Procedures

As part of the regional cooperation for the Caribbean Area, North and Central America, the U.S. National Hurricane Center is appointed by the WMO to coordinate the tropical cyclone early warning system for this region. The National Hurricane Center (NHC) provides the official bulletins containing the current location, forecast track and intensity of tropical cyclones. In coordination with the nations in this region, watches and warnings will be issued. The bulletins of the NHC provide mainly general information.

To provide meteorological information on the **local effects** of tropical cyclones that (may) form a threat to Curaçao, the MDC issues the following information:

- When a tropical disturbance has a formation chance of 40% or more to become a tropical cyclone within the next five days and it appears to also have the potential to become a threat to Curaçao, this system will be mentioned in the **Significant tropical weather systems** section of the regular weather forecast bulletin. Besides that, tropical cyclones anywhere over the Atlantic Basin will always be mentioned in that section of the forecast bulletin.
- **Tropical Cyclone Bulletins** (containing watches, advisories, warnings and especially a forecast of the expected local conditions)
- **Track Charts**

The Meteorological Department issues two types of Track Charts: A **Basic Briefing Display Chart** and a **Wind Swath Chart**.

The Basic Briefing Display Charts contain the following information:

1. Latest position of the system's center
2. Forecast track of the tropical cyclone
3. Areas of Watches and Warnings

The Wind Swath Charts contain:

1. Latest position of the system's center
2. Its forecast track
3. Color coded areas with wind speeds in excess of respectively 34, 50 and 64 knots

- The MDC will inform the Curaçao Disaster Coordinator with regard to the issuance of the ***first*** Cyclone Message by phone.
- The meteorological information as presented in the Tropical Cyclone Bulletins (TCBs) and Track Charts is based on the latest storm data and forecasts models, as made available by the National Hurricane Center in Miami every 6 hours at specific times: 0900 UTC, 1500 UTC, 2100 UTC and 0300 UTC, if necessary supplemented by intermediate updates. UTC stands for Universal Time Coordinated and is equal to Greenwich Mean Time (GMT), which is local time + four (4) hours in the eastern Caribbean.

II.2 Outline of the Tropical Cyclone Early Warning System

A five-phase Tropical Cyclone Warning System is used by the MDC and each phase is represented by a specific color. These will be respectively yellow, orange, pink, red and violet. The color green will represent normal (safe) weather conditions.
The MDC has the responsibility of initiating this early warning system by the issuing Information, Watch, Advisory or Warning Messages to the emergency and disaster management authorities and organizations and also the general public on Curaçao. See the table with the phase definitions below.

II.3 Description of Phases

Tropical Cyclone Bulletin (TCB) Types

	Information *TCB* --- *Be Alert!* --- TC poses a threat to the community in the upcoming 48 to 72 hours.
	Watch *TCB* ---*Prepare Yourself!* --- TC wind conditions are expected in the next 48 hours.
	Advisory *TCB* --- *Protect Yourself!* --- TC winds do not pose a threat, but heavy rain or rough seas do, within the next 24 hours.
	Warning *TCB* --- *Protect Yourself!* --- TC wind conditions are expected in the next 36 hours.
	Strike *TCB* --- *Seek Cover!* --- TC wind conditions are expected in the next 6 hours.

II.3.1 The Information Phase

This phase will be initiated when there is still too much uncertainty whether or not an existing or developing tropical cyclone will affect Curaçao with tropical storm or hurricane winds within the next 72 hours. During the Information Phase, TCBs will be issued once or twice a day.

There are several scenarios in which the Information Phase can be initiated:

- A tropical cyclone is still quite some distance away, but because of its forecast track and intensity it *may* become significant to Curaçao.
- When an active tropical disturbance is quite close to Curaçao and shows a strong potential to develop into a tropical cyclone. The Information Phase is therefore a means of increasing awareness of the authorities and to advise them to await future bulletins, without the general public having to take preventive measures as yet, unless the local authorities advise otherwise.

MDC initiates the Information phase by issuing Cyclone Bulletin no.1, titled "Information Message No. 1."

Example:

TROPICAL CYCLONE BULLETIN NO 1
INFORMATION MESSAGE NO 1
DATE: AUGUST 24, 2017 TIME: 5:00 PM

II.3.2 The Watch Phase

In coordination with the National Hurricane Center (NHC) in Miami the Watch Phase is initiated when the forecast track and intensity of a tropical cyclone are such, that the possibility exists for either tropical storm force or hurricane force winds to affect Curaçao within 48 hours.

The Watch Phase is initiated locally when the MDC issues a Tropical Cyclone Bulletin, containing "WATCH MESSAGE NO 1". During the Watch phase, Tropical Cyclone Bulletins will be issued 3-4 times a day.

Example:

TROPICAL CYCLONE BULLETIN NO 4
WATCH MESSAGE NO 1
DATE: AUGUST 26, 2017 TIME: 12:00 PM (noon)
....HURRICANE WATCH IN EFFECT FOR CURAÇAO....

Definitions:

***Tropical Storm Watch*:** Tropical storm conditions are possible within the next 48 hours, possibly causing sustained winds between 63 km/h (34 knots) to 118 km/h (63 knots).

***Hurricane Watch*:** Hurricane conditions are possible within the next 48 hours, possibly causing sustained winds greater than 119 km/h (64 knots).

II.3.3 The Advisory Phase

Sometimes, expected weather and sea conditions don't meet the criteria to introduce neither a watch nor warning phase.

- The Advisory TCB may then be issued in the event that the impact of the TC does not meet the wind criteria to issue a watch or warning, but still poses a threat of heavy rainfall and/or rough sea conditions within the next 24 hours.
- The center of a hurricane or tropical storm may pass sufficiently far away from the islands, keeping the islands outside the area of hurricane or tropical storm force winds. However, the islands might still be affected by rough seas, heavy rainfall and strong wind gusts.

II.3.4 The Warning Phase

In coordination with the NHC in Miami the warning phase is initiated when the forecast track and intensity of a tropical cyclone are such, that the either tropical storm force or hurricane force winds are expected to affect the islands within the next 36 hours.

The warning phase is initiated locally when the MDC issues a Tropical Cyclone Bulletin containing "WARNING MESSAGE NO 1". During the warning phase, Tropical Cyclone Bulletins will be issued at least 4 times a day.

Example:

CYCLONE BULLETIN NO 9
WARNING MESSAGE NO 1
DATE: AUGUST 28, 2017 TIME: 8:00 AM
....HURRICANE WARNING IN EFFECT FOR CURAÇAO....

Definitions

***Tropical Storm Warning*:** Tropical storm conditions are expected within the next 36 hours, causing sustained winds between 63 km/h (34 knots) to 118 km/h (63 knots).

***Hurricane Warning*:** Hurricane conditions are expected within the next 36 hours, causing sustained winds greater than 119 km/h (64 knots) and/or dangerously high water and exceptionally high waves.

II.3.5 The Strike Warning Phase

A Strike Warning is issued by the MDC when the island is expected to experience tropical storm force or hurricane force winds within the next six to nine hours. All relevant preparatory measures should be completed rapidly.

Definitions

***Strike Warning*:** Tropical storm or hurricane conditions are expected within the next six to nine hours. The Strike Warning will be issued as part of the Warning Message.

Example:

CYCLONE BULLETIN NO 15
WARNING MESSAGE NO 6
DATE: AUGUST 30, 2017 TIME: 8:00 AM
STRIKE WARNING FOR CURAÇAO....

II.4 Special Cyclone Update

In case a sudden development takes place between the issuance of two bulletins, a Special Cyclone Update shall be issued.

II.5 Center Location with Radar

In case a tropical cyclone is located within the reach of the weather radar in Curaçao, a Special Cyclone Update will be issued containing an image of the system and the coordinates of its center. It shall be transmitted by e-mail to the hurricane specialists at the NHC in Miami, local authorities and to other persons of interest.

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III. Distribution of Tropical Cyclone Information to Users

III.1 Standard Procedures

- When the first Tropical Cyclone Bulletin has been issued, the Curaçao disaster coordinator will be contacted by phone to inform him/her of a potential threat by a tropical cyclone.
- The Tropical Cyclone Bulletins and Track Charts are distributed by e-mail and are also posted on our web site, while certain key authorities may also receive these messages by fax, if necessary. All users should update their e-mail addresses, cell phone and fax numbers as used by the MDC, before the official start of the hurricane season (1 June).
- The meteorological information, as presented in the Tropical Cyclone Bulletins and Track Charts, is based mainly on the latest storm data and forecasts models as made available by the National Hurricane Center in Miami every 6 hours at specific times: 0900 UTC, 1500 UTC, 2100 UTC and 0300 UTC, if necessary, supplemented by intermediate updates.
- Radar Center Location images will be passed on to the National Hurricane Center, authorities and other interests. This information will be posted on the web site of the MDC (http://www.meteo.cw). Headlines with links to our bulletins, brief updates and other useful information will also be posted on our Facebook page at: http://www.facebook.com/meteorological.department.curacao/
- The MDC Curaçao Weather app will also display all the latest available information so that the users will be informed immediately about any significant developments.

III.2 Using the Meteorological Information

For the meteorological information to be useful and effective, it is of the utmost importance that:

- The messages are received by the proper authority within the shortest time possible.
- The user is able to interpret the messages correctly and then determine a meaningful scenario for his specific use, taking into account the known limitations of tropical cyclone forecasting.

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IV. Tropical Cyclones in Curaçao

Frequency Curaçao

Based on the statistical analysis of historical data by the National Hurricane Center in Miami, return periods have been calculated for Curaçao:

1. Passage of a severe tropical storm within 75 nautical miles: once in 25 years;
2. Passage of a category one hurricane within 75 nautical miles: once in 46 years;
3. Passage of a category two hurricane within 75 nautical miles: once in 100 years;
4. Passage of a category three hurricane within 75 nautical miles: once in 170 years;

See graph in Attachment 4.

Speed of Development of Emergency Situations

Hurricanes and strong tropical storms reaching the eastern Caribbean Area are in general of the "Cape Verde" type. The location where these systems develop and their forward speed often are such that it will take several days before the islands are affected. Geo-stationary weather satellites continuously observe the area which allows the meteorologists to monitor tropical cyclone development on a 24-hour a day basis.

Sometimes however, a tropical storm may develop very close to our island. Storm conditions will then develop rather suddenly which results in a warning period of only a few hours (Cesar in July 1996). Although the associated storm effects in such cases will be limited, action may have to be taken rapidly, in particular for certain vulnerable areas and sectors.

Effects on communities

The effects that a tropical storm or hurricane has on our community depends on the intensity, track and forward speed of the system. The hazards associated with the passage of tropical cyclones are caused by three phenomena: sea conditions (high waves and storm surge), wind and rainfall.

Duration and Intensity of Storm or Hurricane Conditions

The duration and intensity of storm/hurricane conditions depend on:

- The forward speed of the tropical storm/hurricane; the slower the movement, the longer conditions will persist;
- The diameter of the area with storm/hurricane winds;
- The size of the rainfall region;
- The distance at which the center of the storm/hurricane passes the island, the closer the center to the island, the more intense the effects of the storm/hurricane will be. In general, with westward moving hurricanes, the most intense effects are felt when the eye passes just south of the island.

Uncertainties

The large amount of information which nowadays is at the disposition of meteorologists and disaster managers, has to be evaluated and used carefully. The inaccuracy of the forecasts for longer periods (>36 hours) is considerable and they should be used carefully.

Center Position

The accuracy, with which the position of the cyclone center in each case can be determined, is one of the most important factors influencing the reliability of the forecasts.

There are three methods to fix the position the center of storms and hurricanes:

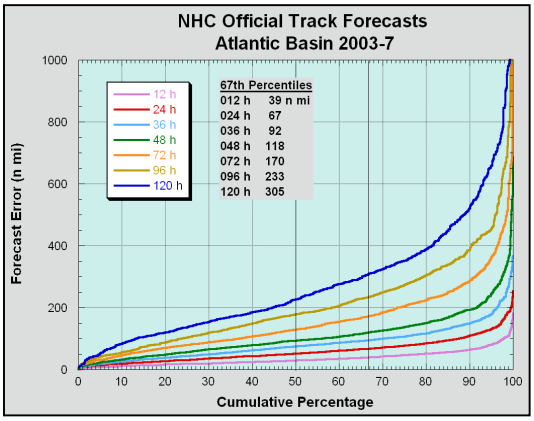
1. satellite imagery
2. hurricane reconnaissance aircraft
3. weather radar

The fixing of center positions is carried out by hurricane specialists at the National Hurricane Center (NHC) in Miami. The accuracy of the center's location depends on the method used and how well the center is organized. As the center or eye becomes better defined, it becomes easier to make a more accurate fix of the center's position.

Center positions' fixes based on satellite imagery during daytime (*visible* images) have an accuracy of 6 to 30 miles, depending on the organization of the system.
At night, forecasters have to rely on *Infrared* satellite imagery when the system is located too far away from a weather radar. The Infrared satellite analysis gives the least accurate position fix; the error in fixing the position of a poorly organized system's center can be more than 30 miles.
When reconnaissance aircraft (hurricane hunters) penetrate the storm during daytime, they can make very accurate position fixes of the center of tropical storms and hurricanes.

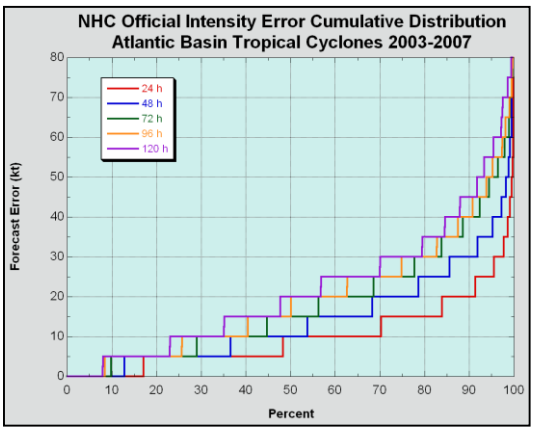
Forecast Position/Track

The accuracy of the cyclone track forecasts decreases as the moment of the forecast lies further in the future. The average error in track forecasts of the NHC over the period 2003-2007 can be seen in the graph to the right.
These numbers again show that with forecast periods greater than 36 hours, the accuracy of the forecast track becomes so poor that these forecasts have to be handled very carefully.



Intensity

The intensity of storms and hurricanes is based on the speed of the maximum sustained winds (1-minute averages) around the center and the air pressure in the center. The wind speed measured or estimated from hurricane reconnaissance flights is very accurate while wind speed measurement using satellite imagery is much less accurate. The accuracy of intensity forecasts decreases rapidly as the forecast period becomes longer.



V. Glossary of Terms

Message:
Official information issued by the Meteorological Department Curaçao (MDC) describing all tropical cyclone watches and warnings in effect along with details concerning tropical cyclone locations, intensity and movement, and precautions that should be taken. There are four types of bulletins:

- ☐ Information Bulletins
- ☐ Watch Bulletins
- ☐ Advisory Bulletins
- ☐ Warning Bulletins

Cyclone Center:
Generally speaking, the vertical axis of a tropical cyclone is usually defined by the location of minimum wind or minimum pressure. The cyclone center position can vary with altitude. In Bulletins, refers to the center position at the surface.

Tropical Cyclone Bulletin:
A message issued by the Meteorological Department Curaçao (MDC), containing the latest information on a tropical cyclone (depression, tropical storm or hurricane) or a developing tropical cyclone (strong tropical wave).

A Tropical Cyclone Bulletin contains one of the following specific types of information:

- ❑ Information Message
- ❑ Watch Message
- ❑ Advisory Message
- ❑ Warning/Strike Message
- ❑ Special Cyclone Update
- ❑ Center Location with Radar

Direct Hit:
A close approach of a tropical cyclone to a particular location. For locations on the left-hand side of a tropical cyclone's track (looking in the direction of motion), a direct hit occurs when the cyclone passes within a distance equal to the cyclone's radius of maximum wind.
For locations on the right-hand side of the track, a direct hit occurs when the cyclone passes to within a distance equal to twice the radius of maximum wind.

Eye:
The roughly circular area of comparatively light winds that encompasses the center of a severe tropical cyclone. The eye is either completely or partially surrounded by the eyewall cloud.

Eyewall/Wall Cloud:
An organized band or ring of cumulonimbus clouds that surrounds the eye, or light-wind center of a tropical cyclone. Eyewall and wall cloud are used synonymously.

Explosive Deepening:
A decrease in the minimum sea-level pressure of a tropical cyclone of 2.5 hPa/hr for at least 12 hours or 5 hPa/hr for at least six hours.

Gale Warning:
A warning of 1-minute sustained surface winds in the range 34 knots (63 km/hr) to 47 knots (87 km/hr) inclusive, either predicted or occurring and not directly associated with tropical cyclones.

High Wind Warning:
A high wind warning is defined as 1-minute average surface winds of 35 knots (64 km/hr) or greater lasting for 1 hour or longer, or winds gusting to 50 knots (93 km/hour) or greater regardless of duration that are either expected or observed over land.

Hurricane:
A tropical cyclone, in which the maximum sustained surface wind speed (using the U.S. 1-minute average) is 64 knots (119 km/hour) or more.

Hurricane Season:
The portion of the year that has a relatively high incidence of hurricanes. The hurricane season in the Atlantic, Caribbean, and Gulf of Mexico runs from June 1 to November 30.

Hurricane Watch:
Hurricane conditions are possible within the next 48 hours, possibly causing sustained winds greater than 64 knots/119 km per hour.

Hurricane Warning:
Hurricane conditions are expected within the next 36 hours, causing sustained winds greater than 64 knots/119 km per hour and/or dangerously high water and exceptionally high waves.

Information Bulletin:
A message issued by the MDC prior to possible issuance of watches or warnings initiating the first stage of the local disaster prevention preparedness (Information phase).

Initial Position:
The observed position of the center of the cyclone on a certain date and time. It is the starting point of a forecast track.

Leading Edge Band:
The first band with thunderstorms at the front edge of the tropical cyclone weather area.

Maximum Sustained Winds:
The maximum wind speeds measured as a one-minute average. Maximum sustained winds are indicative for the classification of the tropical cyclone.

Named Storms:
A collective name for tropical storms and hurricanes. Tropical Depressions don’t resort under this term since these get no name but a number.

Present Movement:
The best estimate of the movement of the center of a tropical cyclone at a given time and given position. This estimate does not reflect the short-period, small scale oscillations of the cyclone center.

Radius of Maximum Winds:
The distance from the center of a tropical cyclone to the location of the cyclone's maximum winds. In well-developed hurricanes, the radius of maximum winds is generally found at the inner edge of the eyewall.

Rapid Deepening (or Rapid Intensification):
A decrease in the minimum sea-level pressure of a tropical cyclone of 1.75 hPa/hr or 42 hPa for 24 hours.

Storm Surge:
An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the cyclone.

Storm Tide:
The actual sea water level resulting from the astronomic tide combined with the storm surge.

Strike Warning:
A Strike Warning will be issued when the effects of Tropical Storm or Hurricane force winds are imminent, generally within 6-9 hours. It is part of the Warning Phase.

Small Craft Warning:
This warning is issued when conditions over open waters and/or coastal waters are expected to deteriorate in such a manner, that it is advisable for small vessels not to leave port, to moor these vessels securely and, where possible, to pull them on shore.

Storm Track:
The track followed by the cyclone; on a chart it is the line connecting the observed center positions. Because this is often a very irregular curve, an average (smoothed) track is used for operational purposes.

Tropical Depression:
A tropical cyclone, in which the maximum sustained surface wind speed (1-minute average) is 33 knots (62 km/hour) or less.

Tropical Disturbance:
A discrete tropical weather system of apparently organized convection (generally 100 to 300 nautical miles in diameter) originating in the tropics or subtropics, having a non-frontal migratory character, and maintaining its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field.

Track Map or Track Chart:
A map that displays the initial position, forecast track and the potential track area of the cyclone. Areas where *watches* or *warnings* are in effect are indicated on this map.

Tropical Storm:
A tropical cyclone, in which the maximum sustained surface wind speed (1-minute average) ranges from 34 knots (63 km/hr) to 63 knots (118 km/hr).

Tropical Storm, Minor:
A tropical storm with maximum sustained winds of 34 to 40 knots, wind force 8; wave height over the open waters is 2 meters.

Tropical Storm, Moderate:
Tropical storm with maximum sustained winds of 41 to 47 knots, wind force 9; wave height over the open waters of about 9 feet (3 meters).

Tropical Storm, Severe:
Tropical storm with maximum sustained winds of 48 to 63 knots; wind force 10 to 11; wave height over the open waters of 12-15 feet (4 to 5 meters).

Tropical Storm Watch: Tropical Storm conditions are possible within the next 48 hours, possibly causing sustained winds between 34 to 63 knots (63 to 118 km/hour).

Tropical Storm Warning: Tropical Storm conditions are expected within the next 36 hours, causing sustained winds between 34 knots/63 km per hour to 63 knots/118 km per hour.

Watch Bulletin:
A message that is issued by the MDC when a Tropical Storm Watch or Hurricane Watch is in effect. The WATCH phase of the Tropical Cyclone Warning System is initiated by the issuance of Watch Message no.1.

Warning Bulletin:
A message that is issued by the MDC when a Tropical Storm Warning or Hurricane Warning is in effect. The WARNING phase of the Tropical Cyclone Warning System is initiated by the issuance of Warning Message no.1.

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Attachment 1…..Beaufort Scale of Wind

Beaufort Scale. Velocity equivalent at 10 meters over an open flat surface; wave heights over the open sea, figures in brackets indicate probable maximum wave height.

No.	Knots	Mph	Description	Effects at Sea	Effects on Land	Wave Height (m)	Wave Height (ft)
0	0	0	Calm	Sea like a mirror	Smoke rises vertically	---	---
1	1 - 3	1 - 3	Light Air	Ripples, but no foam crests	Smoke drifts in the wind	0.1 (0.1)	¼
2	4 - 6	4 - 7	Light Breeze	Small wavelets	Leaves rustle. Wind felt on face	0.2 (0.3)	½ (1)
3	7 - 10	8 - 12	Gentle Breeze	Large wavelets, crests not breaking	Small twigs in constant motion. Light flags extended	0.6 (1)	2 (3)
4	11 - 16	13-18	Moderate Wind	Numerous white caps	Dust, leaves and loose paper raised. Small branches move.	1 (1.5)	2 (3)
5	17-21	19-24	Fresh Wind	Many whitecaps, some spray	Small trees sway	2 (2.5)	3.5 (5)
6	22-27	25-31	Strong Wind	Larger waves form. Whitecaps everywhere. More spray	Large branches move. Whistling in phone wires. Difficult to use umbrellas	3 (4)	9.5 (13)
7	28-33	32-38	Very Strong Wind	White foam from breaking waves begins to be blown in streaks	Whole trees in motion	4 (5.5)	13.5 (19)
8	34-40	39-46	Gale	Edges of wave crests begin to break into spindrift	Twigs break off trees. Difficult to walk	5.5 (7.5)	18 (25)
9	41-47	47-54	Severe Gale	High waves. Sea begins to roll. Spray may reduce visibility.	Chimney pots and slates removed.	7 (10)	23 (32)
10	48-55	55-63	Storm	Very high waves with overhanging crests. Blowing foam gives sea a white appearance.	Trees uprooted. Structural damage.	9 (12.5)	29 (41)
11	56-63	64-72	Severe Storm	Exceptionally high waves	Widespread damage	11.5 (16)	37 (52)
12	> 63	> 73	Hurricane force	Air filled with foam. Sea completely white. Visibility greatly reduced	Widespread damage. Very rarely experienced on land	14 (-)	45

Attachment 2A…Wind conversion table for Knots

KTS	mph	kph	m/s	KTS	mph	kph	m/s	KTS	mph	kph	m/s	KTS	mph	kph	m/s
0	0	0	0	**48**	55	89	25	**96**	110	178	49	**144**	166	267	74
1	1	2	1	**49**	56	91	25	**97**	112	180	50	**145**	167	269	75
2	2	4	1	**50**	58	93	26	**98**	113	181	50	**146**	168	270	75
3	3	6	2	**51**	59	94	26	**99**	114	183	51	**147**	169	272	76
4	5	7	2	**52**	60	96	27	**100**	115	185	51	**148**	170	274	76
5	6	9	3	**53**	61	98	27	**101**	116	187	52	**149**	171	276	77
6	7	11	3	**54**	62	100	28	**102**	117	189	52	**150**	173	278	77
7	8	13	4	**55**	63	102	28	**103**	119	191	53	**151**	174	280	78
8	9	15	4	**56**	64	104	29	**104**	120	193	54	**152**	175	282	78
9	10	17	5	**57**	66	106	29	**105**	121	194	54	**153**	176	283	79
10	12	19	5	**58**	67	107	30	**106**	122	196	55	**154**	177	285	79
11	13	20	6	**59**	68	109	30	**107**	123	198	55	**155**	178	287	80
12	14	22	6	**60**	69	111	31	**108**	124	200	56	**156**	180	289	80
13	15	24	7	**61**	70	113	31	**109**	125	202	56	**157**	181	291	81
14	16	26	7	**62**	71	115	32	**110**	127	204	57	**158**	182	293	81
15	17	28	8	**63**	72	117	32	**111**	128	206	57	**159**	183	294	82
16	18	30	8	**64**	74	119	33	**112**	129	207	58	**160**	184	296	82
17	20	31	9	**65**	75	120	33	**113**	130	209	58	**161**	185	298	83
18	21	33	9	**66**	76	122	34	**114**	131	211	59	**162**	186	300	83
19	22	35	10	**67**	77	124	34	**115**	132	213	59	**163**	188	302	84
20	23	37	10	**68**	78	126	35	**116**	133	215	60	**164**	189	304	84
21	24	39	11	**69**	79	128	35	**117**	135	217	60	**165**	190	306	85
22	25	41	11	**70**	81	130	36	**118**	136	219	61	**166**	191	307	85
23	26	43	12	**71**	82	131	37	**119**	137	220	61	**167**	192	309	86
24	28	44	12	**72**	83	133	37	**120**	138	222	62	**168**	193	311	86
25	29	46	13	**73**	84	135	38	**121**	139	224	62	**169**	194	313	87
26	30	48	13	**74**	85	137	38	**122**	140	226	63	**170**	196	315	87
27	31	50	14	**75**	86	139	39	**123**	142	228	63	**171**	197	317	88
28	32	52	14	**76**	87	141	39	**124**	143	230	64	**172**	198	319	88
29	33	54	15	**77**	89	143	40	**125**	144	231	64	**173**	199	320	89
30	35	56	15	**78**	90	144	40	**126**	145	233	65	**174**	200	322	90
31	36	57	16	**79**	91	146	41	**127**	146	235	65	**175**	201	324	90
32	37	59	16	**80**	92	148	41	**128**	147	237	66	**176**	203	326	91
33	38	61	17	**81**	93	150	42	**129**	148	239	66	**177**	204	328	91
34	39	63	17	**82**	94	152	42	**130**	150	241	67	**178**	205	330	92
35	40	65	18	**83**	96	154	43	**131**	151	243	67	**179**	206	332	92
36	41	67	19	**84**	97	156	43	**132**	152	244	68	**180**	207	333	93
37	43	69	19	**85**	98	157	44	**133**	153	246	68	**181**	208	335	93
38	44	70	20	**86**	99	159	44	**134**	154	248	69	**182**	209	337	94
39	45	72	20	**87**	100	161	45	**135**	155	250	69	**183**	211	339	94
40	46	74	21	**88**	101	163	45	**136**	157	252	70	**184**	212	341	95
41	47	76	21	**89**	102	165	46	**137**	158	254	70	**185**	213	343	95
42	48	78	22	**90**	104	167	46	**138**	159	256	71	**186**	214	344	96
43	49	80	22	**91**	105	169	47	**139**	160	257	72	**187**	215	346	96
44	51	81	23	**92**	106	170	47	**140**	161	259	72	**188**	216	348	97
45	52	83	23	**93**	107	172	48	**141**	162	261	73	**189**	217	350	97
46	53	85	24	**94**	108	174	48	**142**	163	263	73	**190**	219	352	98
47	54	87	24	**95**	109	176	49	**143**	165	265	74	**191**	220	354	98

Attachment 2B…Wind conversion table for Miles per Hour

MPH	knots	kph	m/s	MPH	knots	kph	m/s	MPH	knots	kph	m/s	MPH	knots	kph	m/s
0	0	0	0	**48**	42	77	21	**96**	83	154	43	**144**	125	232	64
1	1	2	0	**49**	43	79	22	**97**	84	156	43	**145**	126	233	65
2	2	3	1	**50**	43	80	22	**98**	85	158	44	**146**	127	235	65
3	3	5	1	**51**	44	82	23	**99**	86	159	44	**147**	128	237	66
4	3	6	2	**52**	45	84	23	**100**	87	161	45	**148**	129	238	66
5	4	8	2	**53**	46	85	24	**101**	88	163	45	**149**	129	240	67
6	5	10	3	**54**	47	87	24	**102**	89	164	46	**150**	130	241	67
7	6	11	3	**55**	48	89	25	**103**	90	166	46	**151**	131	243	68
8	7	13	4	**56**	49	90	25	**104**	90	167	46	**152**	132	245	68
9	8	14	4	**57**	50	92	25	**105**	91	169	47	**153**	133	246	68
10	9	16	4	**58**	50	93	26	**106**	92	171	47	**154**	134	248	69
11	10	18	5	**59**	51	95	26	**107**	93	172	48	**155**	135	249	69
12	10	19	5	**60**	52	97	27	**108**	94	174	48	**156**	136	251	70
13	11	21	6	**61**	53	98	27	**109**	95	175	49	**157**	136	253	70
14	12	23	6	**62**	54	100	28	**110**	96	177	49	**158**	137	254	71
15	13	24	7	**63**	55	101	28	**111**	96	179	50	**159**	138	256	71
16	14	26	7	**64**	56	103	29	**112**	97	180	50	**160**	139	257	72
17	15	27	8	**65**	56	105	29	**113**	98	182	51	**161**	140	259	72
18	16	29	8	**66**	57	106	30	**114**	99	183	51	**162**	141	261	72
19	17	31	8	**67**	58	108	30	**115**	100	185	51	**163**	142	262	73
20	17	32	9	**68**	59	109	30	**116**	101	187	52	**164**	143	264	73
21	18	34	9	**69**	60	111	31	**117**	102	188	52	**165**	143	266	74
22	19	35	10	**70**	61	113	31	**118**	103	190	53	**166**	144	267	74
23	20	37	10	**71**	62	114	32	**119**	103	192	53	**167**	145	269	75
24	21	39	11	**72**	63	116	32	**120**	104	193	54	**168**	146	270	75
25	22	40	11	**73**	63	117	33	**121**	105	195	54	**169**	147	272	76
26	23	42	12	**74**	64	119	33	**122**	106	196	55	**170**	148	274	76
27	23	43	12	**75**	65	121	34	**123**	107	198	55	**171**	149	275	76
28	24	45	13	**76**	66	122	34	**124**	108	200	55	**172**	149	277	77
29	25	47	13	**77**	67	124	34	**125**	109	201	56	**173**	150	278	77
30	26	48	13	**78**	68	126	35	**126**	109	203	56	**174**	151	280	78
31	27	50	14	**79**	69	127	35	**127**	110	204	57	**175**	152	282	78
32	28	51	14	**80**	70	129	36	**128**	111	206	57	**176**	153	283	79
33	29	53	15	**81**	70	130	36	**129**	112	208	58	**177**	154	285	79
34	30	55	15	**82**	71	132	37	**130**	113	209	58	**178**	155	286	80
35	30	56	16	**83**	72	134	37	**131**	114	211	59	**179**	156	288	80
36	31	58	16	**84**	73	135	38	**132**	115	212	59	**180**	156	290	80
37	32	60	17	**85**	74	137	38	**133**	116	214	59	**181**	157	291	81
38	33	61	17	**86**	75	138	38	**134**	116	216	60	**182**	158	293	81
39	34	63	17	**87**	76	140	39	**135**	117	217	60	**183**	159	295	82
40	35	64	18	**88**	76	142	39	**136**	118	219	61	**184**	160	296	82
41	36	66	18	**89**	77	143	40	**137**	119	220	61	**185**	161	298	83
42	36	68	19	**90**	78	145	40	**138**	120	222	62	**186**	162	299	83
43	37	69	19	**91**	79	146	41	**139**	121	224	62	**187**	162	301	84
44	38	71	20	**92**	80	148	41	**140**	122	225	63	**188**	163	303	84
45	39	72	20	**93**	81	150	42	**141**	123	227	63	**189**	164	304	84
46	40	74	21	**94**	82	151	42	**142**	123	229	63	**190**	165	306	85
47	41	76	21	**95**	83	153	42	**143**	124	230	64	**191**	166	307	85

Attachment 3…..List of tropical cyclones (until December 31, 2016) passing within 100 nautical (or 115 statute) miles or 185 kilometers of 12.5N 69.0W

Year	date	hour (AST)	minimum distance (nautical miles)	storm intensity (km/hr)	name	remarks
1605	-----	-----	-	ts	-----	1)
1784	-----	-----	lt 25 S	hu	-----	2)
1807	Oct. 17	night	lt 25	ts	-----	3)
1831	June 24	09:00	35 N	hu	-----	4)
1876	Sep. 25	-----	-	ts	-----	5)
1877	Sep. 23	11:30	lt 25 S	hu	-----	6)
1886	Aug. 17	18:00	lt 25 NNE	160	-----	7)
1887	July 21	19:00	72 NE	160	-----	
1887	Dec. 9	12:00	lt 25 NNW	95	-----	
1892	Oct. 7	23:00	35 SSW	160	-----	8)
1895	Oct.17	01:00	81 N	190	-----	
1897	Oct. 11	04:00	72 N	80	-----	
1901	July 3	20:00	50 N	80	-----	
1909	July 14	19:00	91 NNE	65	-----	
1918	Aug. 2	15:00	76 NNE	80	-----	
1918	Aug. 23	17:00	67 NNE	130	-----	
1931	Sep. 7	-----	99 NNE	ts	-----	
1932	Nov. 2	08:00	48 N	160	-----	
1933	June 29	06:00	lt 25 NE	160	-----	
1933	Aug. 18	16:00	92 NNE	65	-----	
1941	Sep. 25	03:00	90 N	120	-----	
1954	Oct. 7	13:00	50 N	190	Hazel	9)
1955	Sep. 24	14:00	81 NNW	130	Janet	10)
1961	July 21	01:00	38 NNW	110	Anna	
1963	Oct. 1	00:00	99 NNE	175	Flora	
1969	Aug. 29	19:00	36 N	50	Francelia	
1971	Sep. 7	08:00	lt 25 NNW	110	Edith	
1971	Sep.16	02:00	lt 25 S	55	Irene	
1978	Aug.11	20:00	40 N	55	Cora	
1978	Sep. 14	14:00	lt 25 N	70	Greta	
1988	Oct. 16	13:00	lt 25 S	80	Joan	
1993	Aug. 8	07:00	60 S	70	Bret	
1996	Jul. 25	17:00	lt 30 SW	70	Cesar	
2004	Sep. 8	23:00	65 N	230	Ivan	
2005	Jul. 15	03:00	100 NE	210	Emily	
2007	Sep. 2	07:00	30 N	170	Felix	
2008	Oct. 14	14:00	77 N	80	Omar	
2010	Nov. 1	13:00	56 N	70	Tomás	
2016	Sep 30	00:00	97 N	130	Matthew	

REMARKS:

1 Based on the description of a disaster with a Spanish fleet near Cumaná, Venezuela. Ref. "Armada Española desde la unión de los reinos de Castilla y de Aragón", by Cesáres Fernandez Duro, Madrid, 1895, Vol.III, p. 487.

2 In the harbor of Willemstad, Curaçao, several full laden ships were swept ashore, others driven out to sea and lost. Other damages have been sustained to an immense value. A long range of warehouses was blown down and the goods buried under the ruins. Ref. "The Gentleman's Magazine", 1785, Vol. 57, p. 154.

3 In connection with the storm of June 24, 1831, reference is made to "the fatal night of October 17, 1807, when a hurricane past". No reports on damage available. Ref. "Curaçaosche Courant", June 1831.

4 Heavy storm and torrential rain with frequent thunder. Around 09:00 local time, the wind backed from NW to SW. No structural damage at Curaçao. HM brig "Sirene" lost at Kralendijk, Bonaire. Ref. "Curaçaosche Courant", June 1831. Known as the "Barbados-Yucatán hurricane".

5 Many houses of poor people were ruined, losses of live-stock in Aruba and Bonaire. Government buildings more or less damaged. Ref. "Colonial Report", 1877.

6 See text under "Hurricane climatology of the Netherlands Antilles - The Leeward islands". Ref. "Colonial Report", 1878.

7 Quays along harbor entrance heavily damaged, western part of Curaçao flooded, heavy trees were uprooted, stocks of salt were melted. In Bonaire, the Government pier was washed away and many ships lost, considerable damage to buildings and roads. At the north coast of Aruba, the German brig "Nero" was lost. Ref. "Colonial Report", 1887, "Curaçaosche Courant", August 20 and 27, 1886.

8 No damage reported in Curaçao, ship "Anita" lost near Bonaire. Strongest winds between 23:00 and 02:00 local time, lowest barometer reading 1013 mb (?). Ref. "Curaçaosche Courant", October 14, 1892.

9 Government pier in Bonaire damaged, flash floods in Curaçao and Aruba. In Aruba a bridge and several water dams destroyed. Wind speed about 30 knots with gusts to 50 knots. Ref. "Beurs- en Nieuwsberichten", October 7-14, 1954.

10 Some damage to quays along harbor entrance. Considerable damage to beach facilities at Piscadera Bay and Vaersen Bay. In Aruba, gusts to 50 mph, heavy trees uprooted but no significant damage. In Bonaire, piers and coastal boulevard damaged. Ref. "Beurs- en Nieuwsberichten" and "Amigoe di Curaçao" September 25, 1955.

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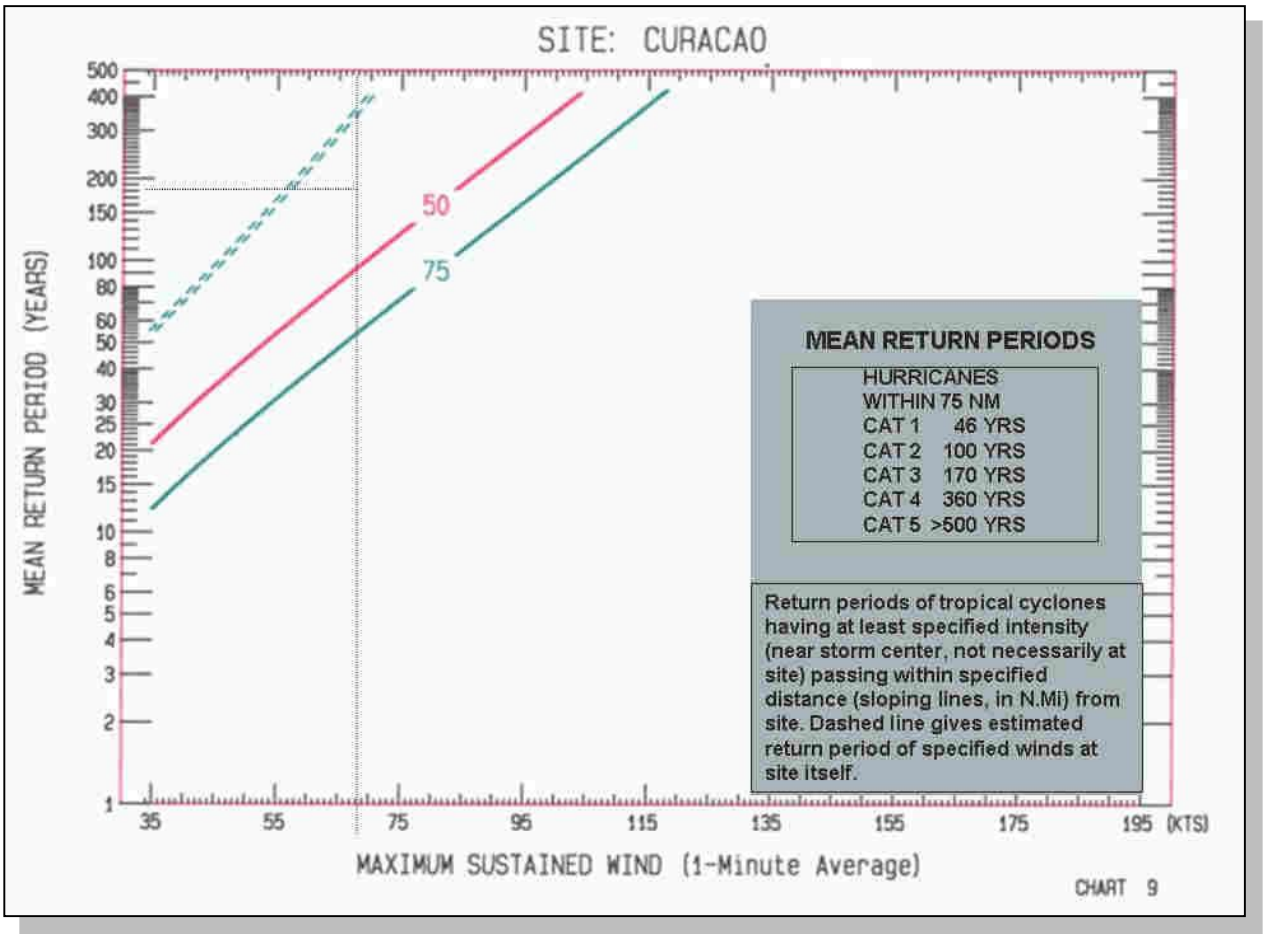
Attachment 4.....Return Periods Curaçao



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Attachment 5.....Meteorological Reports

Tropical Cyclone Bulletins

Bulletins are issued for the benefit of authorities, disaster management organizations and the general public, according to a five phase Tropical Cyclone Warning System.

PHASE	NAME Bulletin	FREQUENCY of Issuance
1. Information Phase	Information Message	Once to twice a day
2. Watch Phase	Watch Message	Every six hours
3. Advisory Phase	Advisory Message	Once to twice a day
4. Warning phase	Warning Message	Every six hours, if necessary, every three hours
5. Strike Phase	Warning Message	Every three hours

The start of each individual phase is initiated by the issuance of the respective Message no 1.

Special Cyclone Update

The purpose of this short message is to report information regarding significant developments, for example in case of a sudden increase or decrease in storm strength, change in track, rapid deterioration of inclement weather, etc.

Structure of the Bulletins

Contents of Bulletins:

A Message consists of the following sections:

* Heading
* Lead Statement (Title)
* Watches/warnings in Effect
* Effect on Local Conditions
* Brief Discussion (if necessary)
* Brief Advice to Local Authorities and General Public
* Latest and Forecast Positions
* Definitions
* Time of issuance of Next Message

- *All times in the Message are local times.*

Explanation and Remarks to the Sections of a Message

1. HEADING.

- TROPICAL CYCLONE BULLETIN NO....
  Here the reader is able to check whether all messages have been received; it is a sequential numbering, starting with number 1 for the first Tropical Cyclone Bulletin.
- Line 2 of the heading indicates the type of Message. There is the possibility of four different Message types: Information Message, Watch Message, Advisory Message and Warning

Message. Number 1 of each Message type indicates the start of a certain preparation phase (Information phase, Watch phase, Advisory Phase or Warning phase). The fifth phase, the STRIKE PHASE, is indicated by the term STRIKE WARNING in a WARNING Message.

The Message which initiates the start of the Information, Watch, Advisory and Warning phases always is numbered as Message No 1. After that, the Message numbers continue to add up until the first Message of the next phase. A user is thus able to recognize whether the phase just started or whether it has been going on for some time. Note that the Strike Phase is not initiated by the issuance of a Strike Message, but by a Warning Message that has the term "Strike Warning" in its heading.

- Line 3: Date and Time.

- Line 4 of the Heading is the LEAD STATEMENT. This is a statement that characterizes the latest developments or tendency.

2. CURRENT STORM DATA.
After the Heading, the latest observed storm data is listed based on official information from the NHC in Miami.

Explanation of terminology

* **WATCHES/WARNINGS:**
This is an enumeration of all special warnings which are in effect on the islands. For example, a so called Small Craft Warning.
When there are watches and/or warnings in effect, definitions of these will be given below the Forecast Center Positions section.

* **EFFECT ON LOCAL CONDITIONS**
In this section, the (expected) influence of the cyclone on local conditions is given in brief. Most of the time, this section will be included starting with the WATCH phase.
The expected **Winds**, **Seas** and **Rainfall** will be discussed in separate paragraphs.

A brief discussion will also be given below this section, about the latest developments of the tropical cyclone or about specific recent significant observations in the islands affected.

* **LATEST AND FORECAST CENTER POSITIONS:** In this section, the latest and one forecast position is given with indication of respectively date/local time, position, intensity and distance in respect to a certain island or city. The current and forecast intensity will be given according to the information displayed below for the intensity category.

- tropical depression
- weak tropical storm (34-40 kts; 39-46 mph; 8 Bft./Gale)
- moderate tropical storm (41-47 kts; 47-54 mph; 9 Bft./strong Gale)
- severe tropical storm (48-63 kts; 55-73 mph; 10-11 Bft./Storm)
- hurricane category 1 (64-83 kts; 74-95 mph; 12 Bft.)
- hurricane category 2 (84-96 kts; 96-110 mph; 12 Bft.)
- hurricane category 3 (97-112 kts; 111-130 mph; 12 Bft.)
- hurricane category 4 (113-134 kts; 131-155 mph; 12 Bft.)
- hurricane category 5 (>134 kts; >156 mph; 12 Bft.)

(Bft. = wind force according to Beaufort Scale):

A description of the Beaufort scale is found in Attachment 1.

* **NEXT BULLETIN**:
Day of the week, date and time of issuance of the next message.

* DISCONTINUATION OF PHASES:
Discontinuation of the phases happens by means of a Message or by means of a Special Cyclone Update.

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Examples of Bulletins

Example of *first* INFORMATION Message:

Meteorological Department Curaçao
TROPICAL CYCLONE BULLETIN NO 1
INFORMATION MESSAGE NO 1
Date: August 20, 2017 Time: 11:00 A.M.

FIRST MESSAGE ON HURRICANE DUMMY

WATCHES/WARNINGS IN EFFECT: None

EFFECT ON LOCAL CONDITIONS:
Winds: No strong winds expected through Monday.

Seas: Some swells may start to reach the coasts of Curaçao later on Monday or early Tuesday.

Rainfall: A couple of brief showers could occur late Monday evening through Sunday.

Local authorities and residents are advised to continue monitoring the further progress of this weather system.

LATEST AND FORECAST CENTER POSITIONS:

DATE/TIME	POSITION	INTENSITY	DISTANCE
20/11:00 A.M.	10.3N 52.2W	Category One Hurricane	1835 km east of Curaçao
22/8:00 P.M.	13.5N 68.5W	Category Four Hurricane	160 km north of Curaçao

This bulletin is to increase the awareness of the authorities and the general public and to await future bulletins.

NEXT MESSAGE:

Sunday, August 20, 6 P.M., unless developments warrant otherwise.

END

Example of Strike Warning during Hurricane Warning Phase

Meteorological Department Curaçao

TROPICAL CYCLONE BULLETIN NO. 15

WARNING MESSAGE NO. 6

Date: August 22, 2017 Time: 11:00 A.M.

STRIKE WARNING

...HURRICANE DUMMY APPROACHING CURAÇAO; STRIKE WARNING IN EFFECT...

WATCHES/WARNINGS: A Hurricane Warning, Small Craft Warning/High Winds Warning/Heavy Surf Warning and Heavy Rainfall Warning remain in effect until further notice.

EFFECT ON LOCAL CONDITIONS:

Winds: Winds over Curaçao are expected to increase further to category one strength (more than 120 kilometers per hour) from the northeast this afternoon and evening while sustained winds may reach category two strength (more than 140 kilometers per hour) on hills above 200 meters. These winds should continue to blow throughout the night while gradually shifting gradually toward the northwest and then southwest after midnight.

Seas: Seas are already very rough on our north coast with wave heights of more than 3 meters and these could increase up to 4 meters after midnight but then on our south coast. Low coastal areas could be seriously affected by a storm surge of possibly in excess of 2 meters and wave impact up to 200 meters or more inland in low-lying areas.

Rainfall: Heavy rainfall (100 to 200 mm) is expected during and after the passage of the center of Dummy. Expect significant flooding in especially flood prone areas.

The center of Dummy will pass very close to Curaçao later this afternoon or tonight. Strong northeasterly winds are already being reported at numerous locations in Curaçao.

Authorities and residents are advised to continue monitoring the further progress of this weather system and should by now have taken all necessary measures to safeguard life and property.

LATEST AND FORECAST POSITIONS:

DATE/TIME	POSITION	INTENSITY	DISTANCE
22/11:00 A.M.	12.3N 66.2W	Category Two Hurricane	300 km east of Curaçao
23/2:00 A.M.	12.6N 69.3W	Category Three Hurricane	70 km northwest of Curaçao

Definitions:

HURRICANE WARNING: A warning that one or both of the following dangerous effects of a hurricane are expected in a specific area in 36 hours or less: (a) average winds 118 km/h (64 knots) or higher; (b) dangerously high water or a combination of dangerously high water and exceptionally high waves.

Strike Warning:

A Strike Warning will be issued when the effects of Tropical Storm or Hurricane force winds are imminent, generally within 6-9 hours. It is part of the Warning Phase.

A **Small Craft Warning** announces that the sea will get very rough, mainly because of tropical storm or hurricane conditions.

NEXT MESSAGE: Tuesday, August 22, 3 P.M. unless developments warrant otherwise.

END

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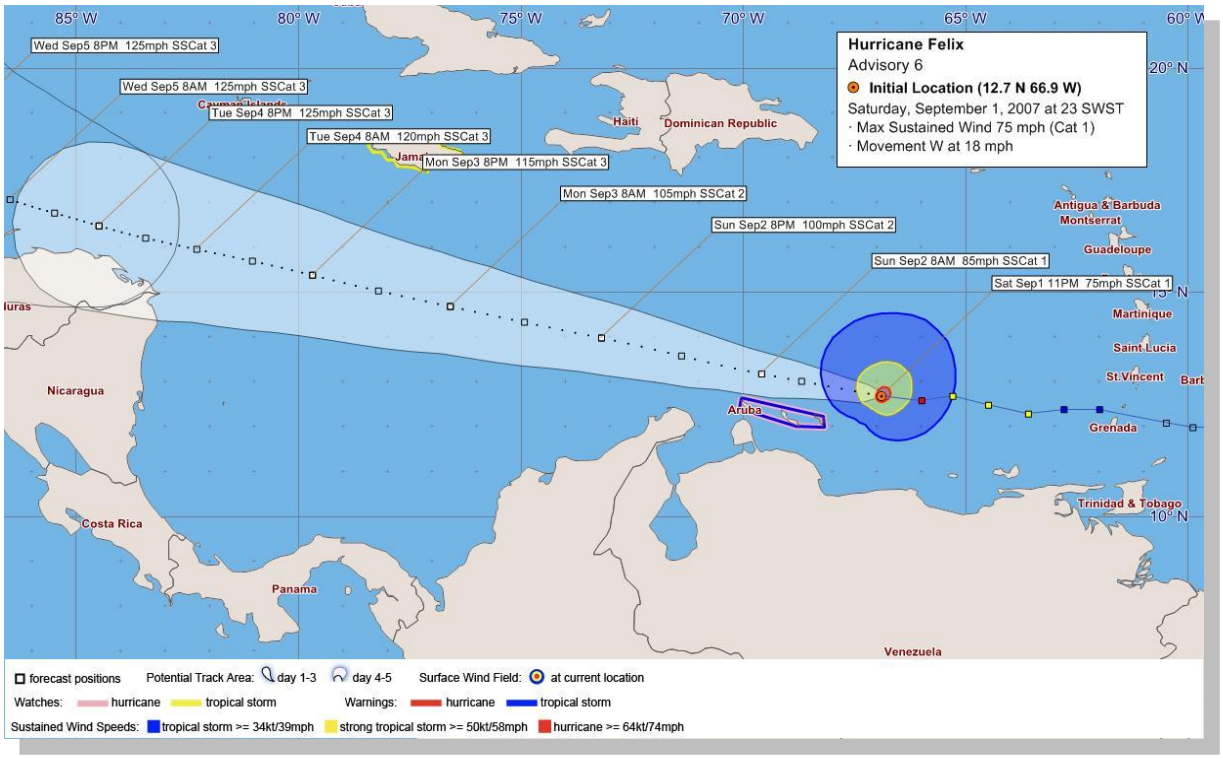
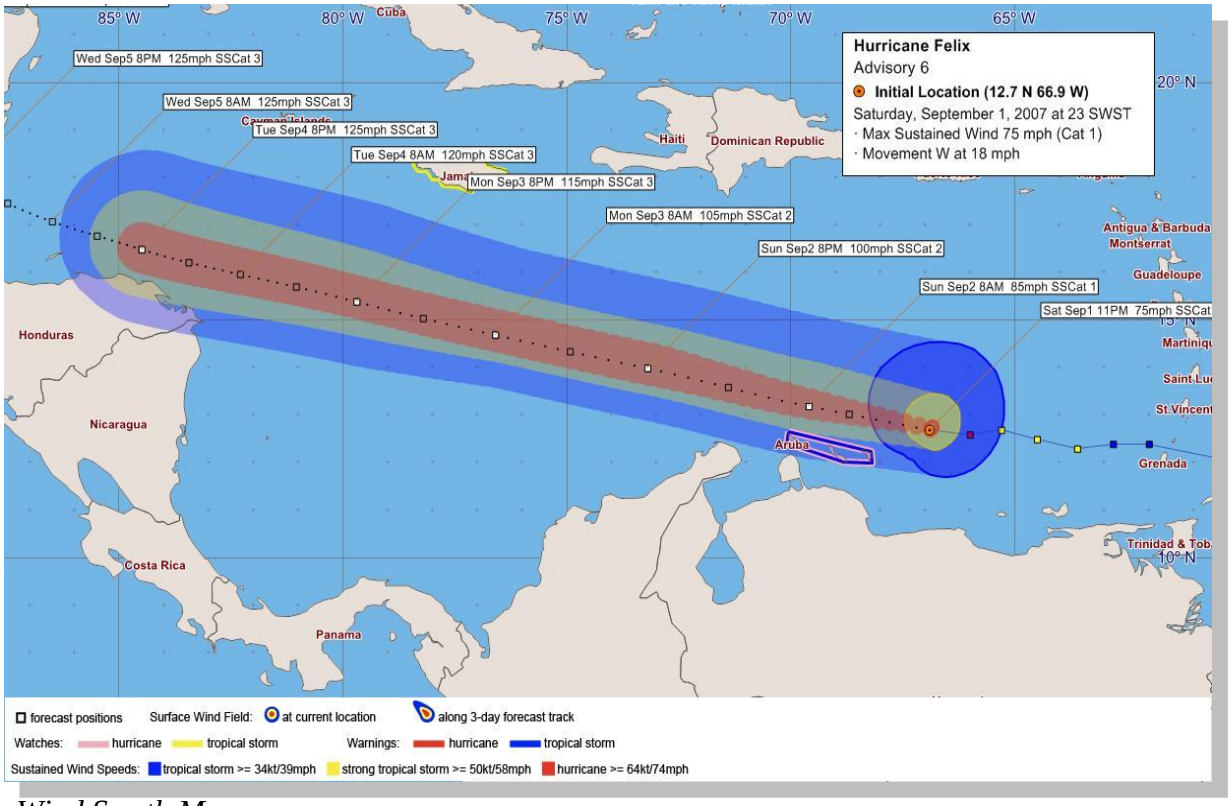
Examples of Track Maps



Basic Information Map



Wind Swath Map

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