Environment Canada Environnement Canada

Canada

2014 Hurricane Briefing Institute for Catastrophic Loss Reduction

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Canadian Hurricane Centre
Environment Canada

Contents

- Tropical Cyclones 101:
  - Lifecycle, climatology and associated hazards
- Summary of the 2013 Hurricane Season
- What went wrong with last year's forecast
- Outlook for the 2014 Hurricane Season
- Operational Response to Approaching Storms: Forecasting and Communications

What is a Tropical Cyclone?

- A relatively large and long-lasting low pressure system
- No fronts attached (unlike a winter storm)
- Forms over tropical or subtropical oceans
- Produces organized thunderstorm activity
- Has a closed surface wind circulation around a well-defined center

- Classified by maximum sustained surface wind speed

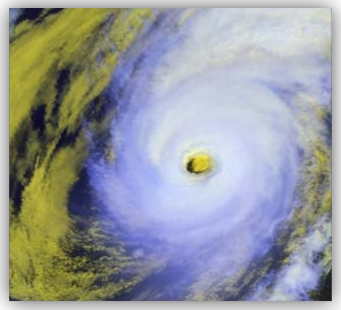
  Tropical depression: < 63 km/h

  Tropical storm: 63 - 117 km/h

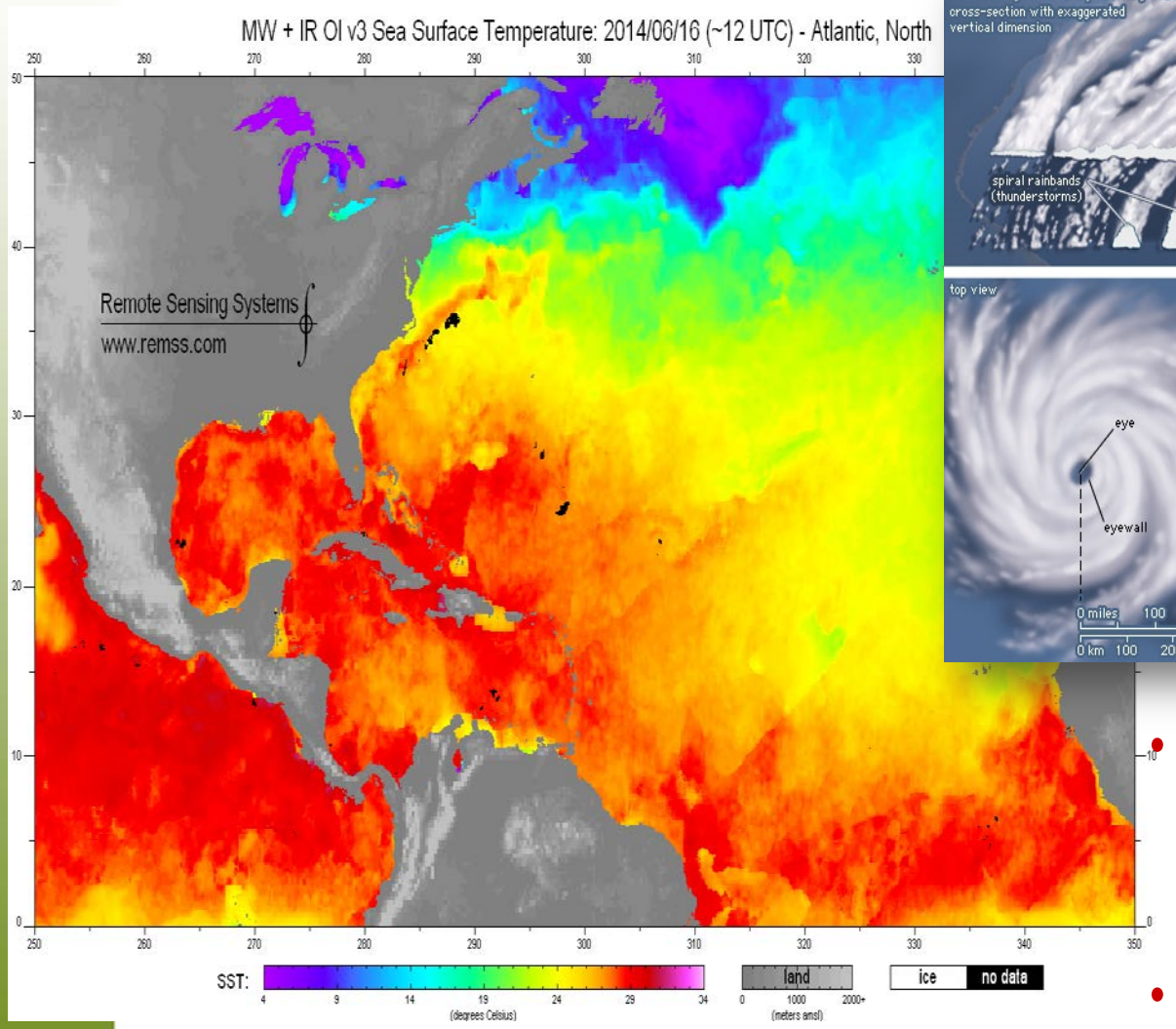
  Hurricane: 118 km/h or greater

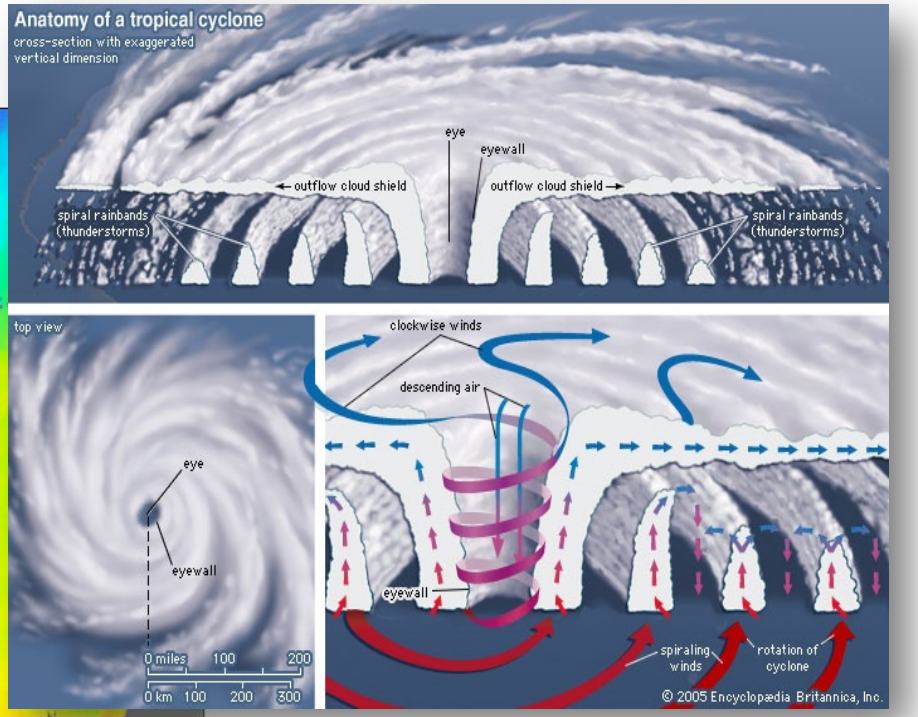
  Major hurricane: 178 km/h or greater

- Often storms will transform into a system that looks more like a winter storm



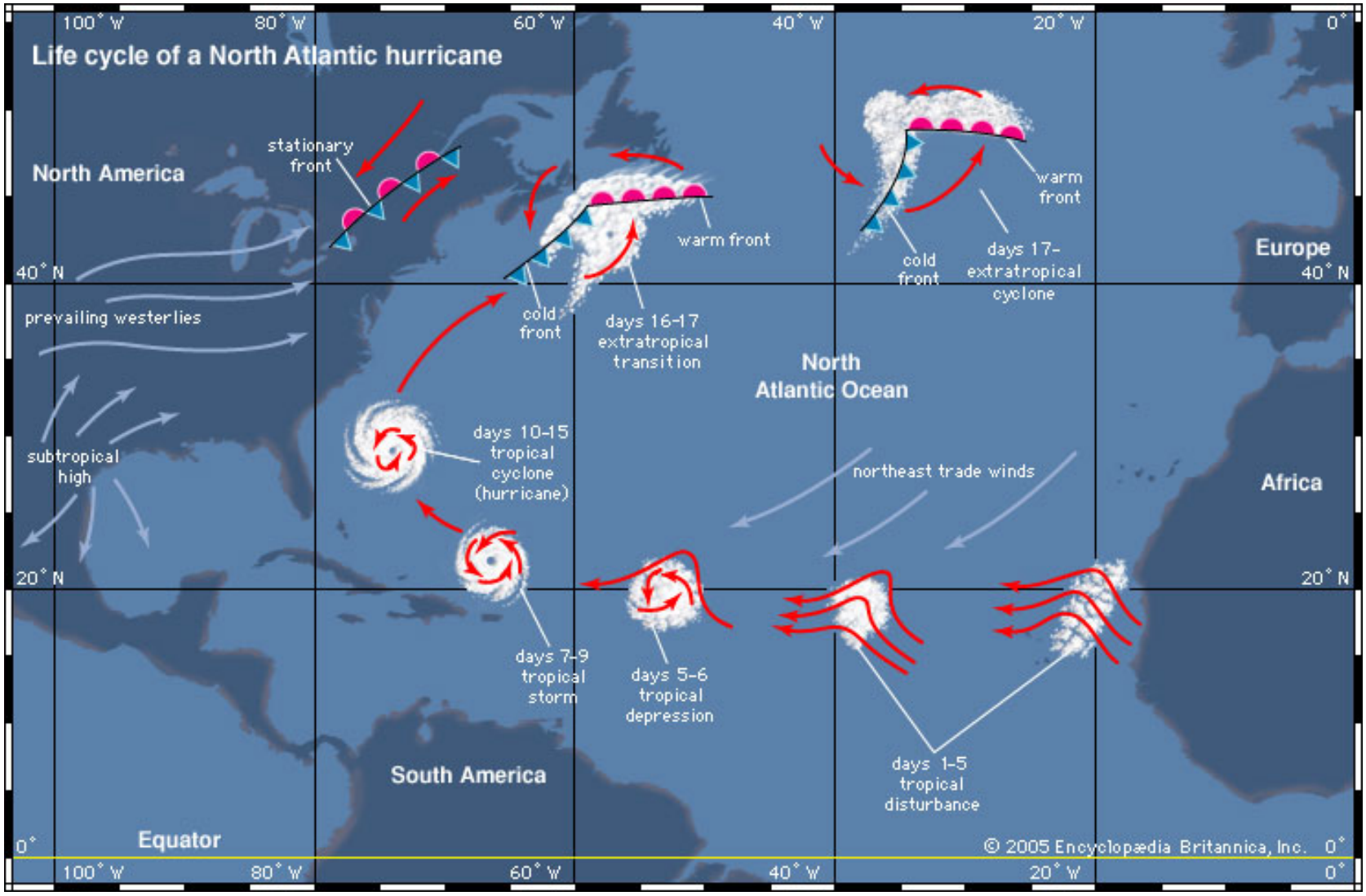
Why do they form?





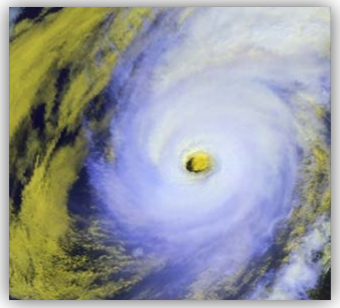
- Tropical Cyclones form due to a build-up of heat energy in the ocean
- Tropical cyclones regulate the planet's temperature

Typical life cycle of a hurricane

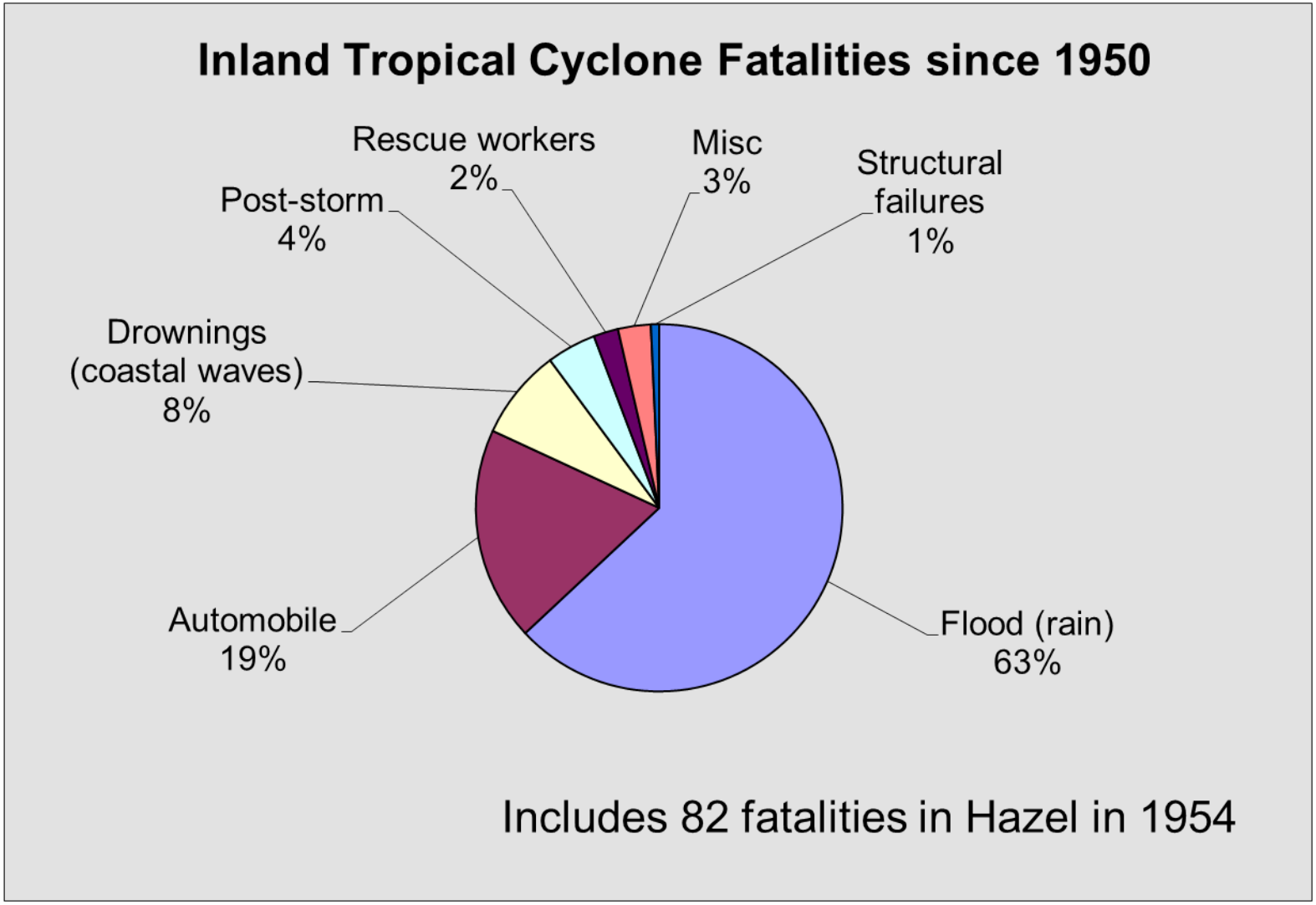


Questions #1

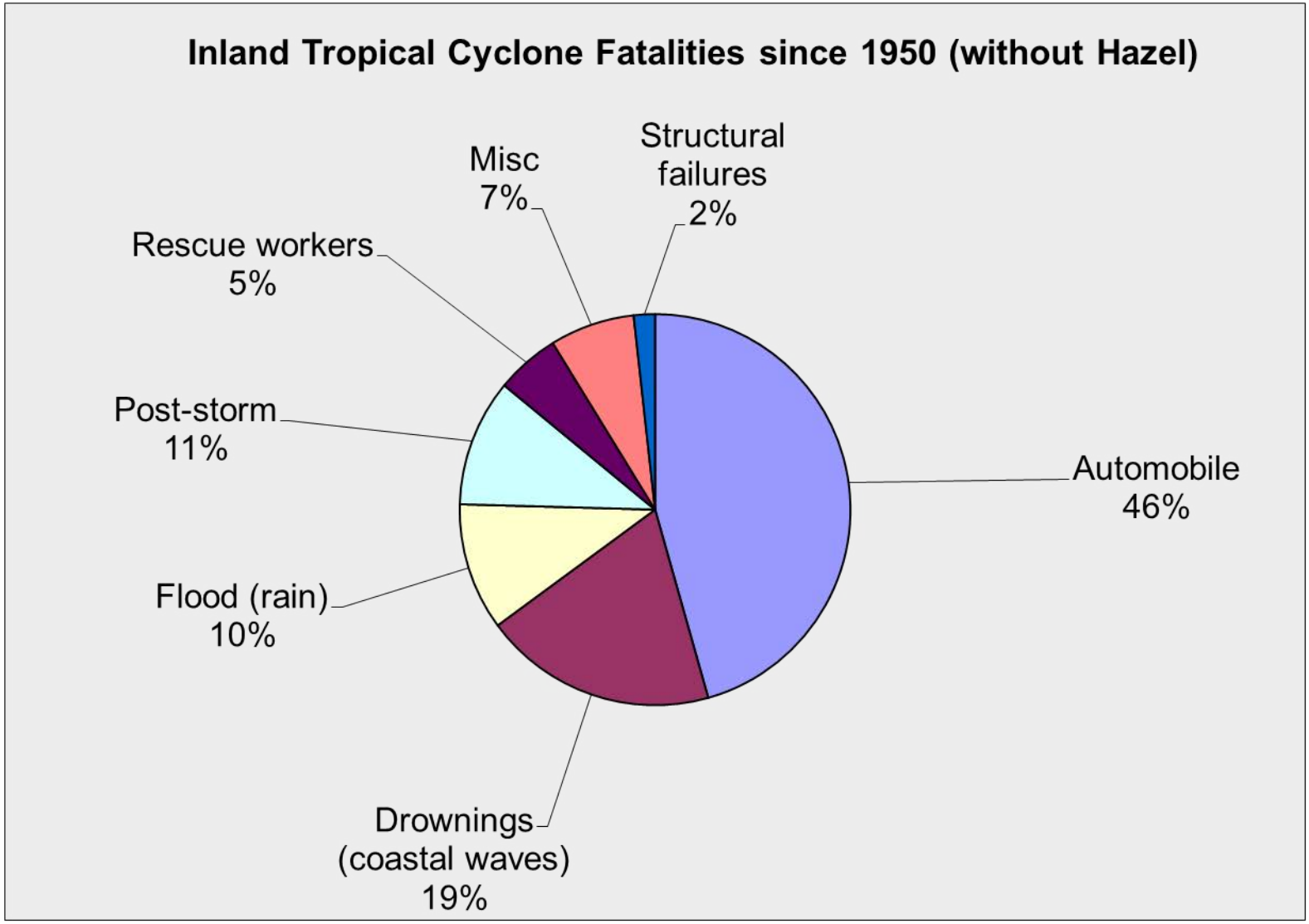





Tropical Cyclone Hazards



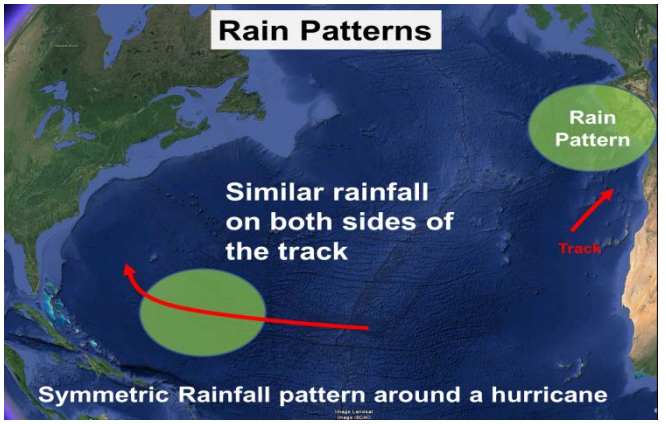
Tropical Cyclone Hazards

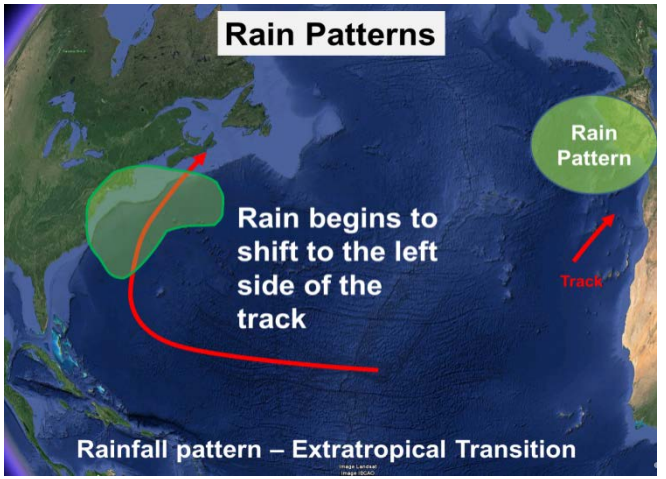


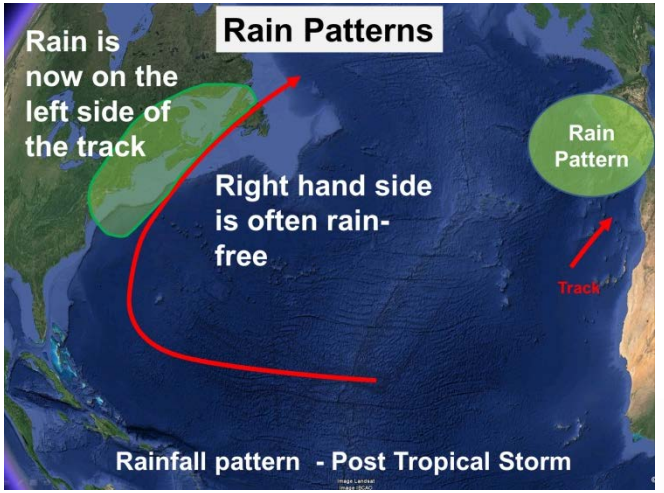
Tropical Cyclone Hazards

Rainfall

- As a hurricane the distribution of rainfall is almost the same on either side of the actual track
- As the storm approaches Canada it becomes post-tropical meaning it takes on the structure of a winter-type storm
- Rain on the right side begins to erode leaving the heaviest rain on the left side of the track
- Rainfall rates can reach 20-50 mm per hour







Tropical Cyclone Hazards

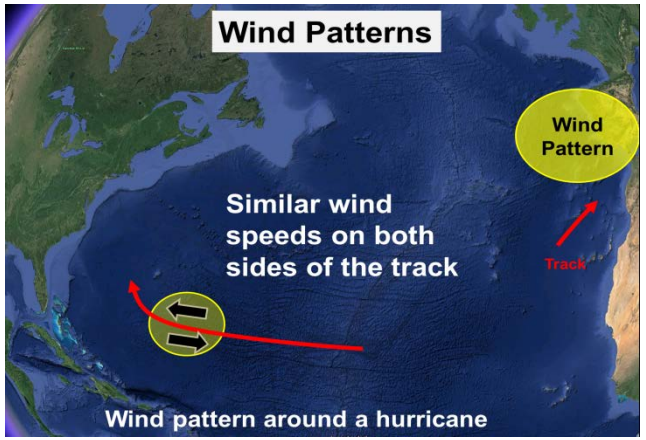
Extreme rainfall examples

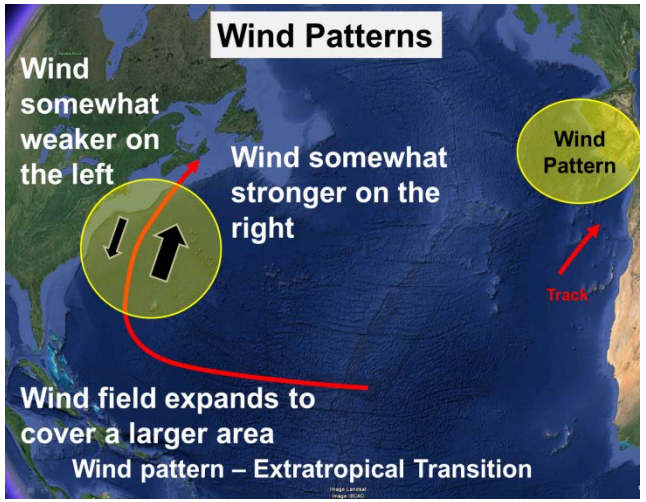
- Hazel in 1954 (213 mm)
- Beth in 1971 (296 mm)
- Bertha in 1990 (194 mm)
- Harvey in 1999 (302 mm)
- Gabrielle in 2001 (175 mm)
- Hanna in 2008 (145 mm)
- Igor in 2010 (232 mm)

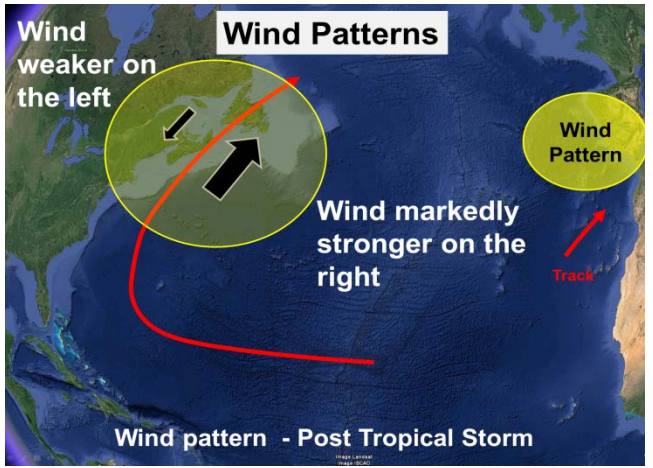
Tropical Cyclone Hazards

Wind

- Winds on both sides of a hurricane are very similar
- The difference in wind speed from right to left increases as the speed of the storm increases
- The maximum wind speed may not be as strong but the contrast between the left and right sides is higher
- Wind covers a larger area as the storm becomes post-tropical







Tropical Cyclone Hazards

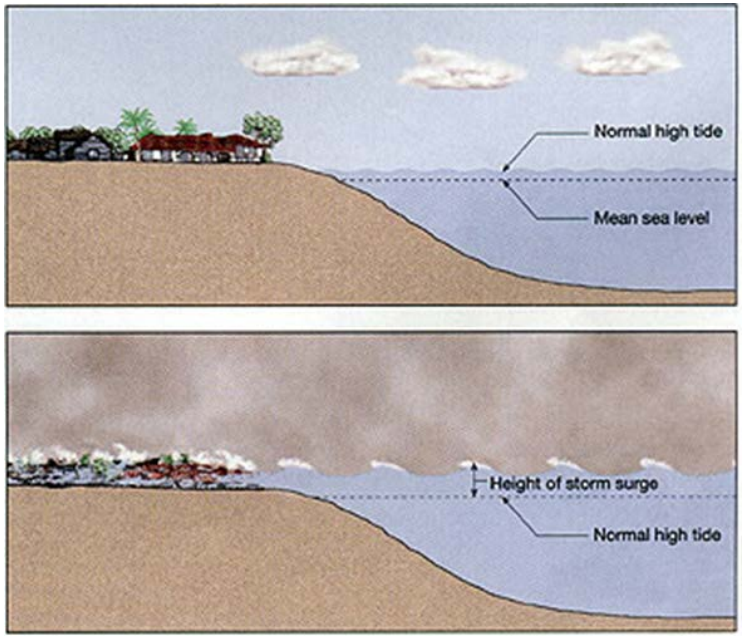
Damaging wind examples

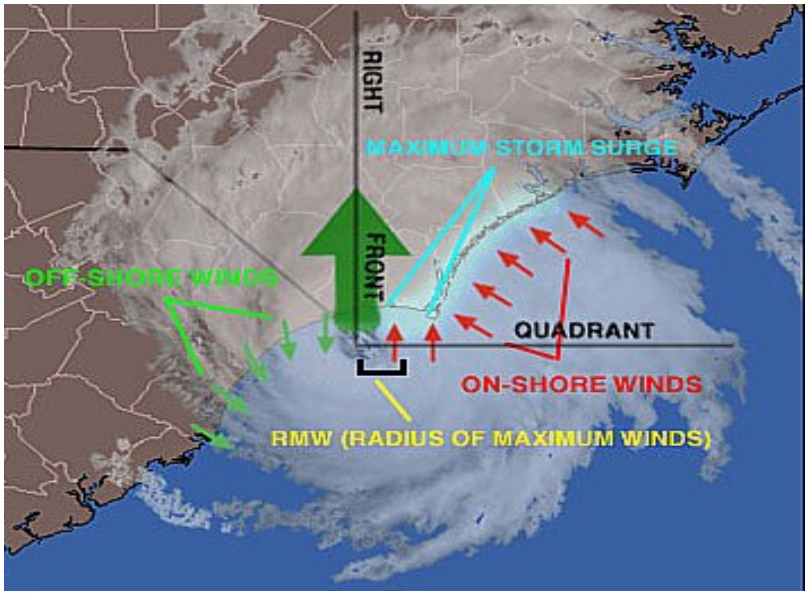
- Edna in 1954 (161 km/h)
- Ginny in 1963 (178 km/h)
- Gerda in 1969 (175 km/h)
- Juan in 2003 (176 km/h)
- Noel in 2007 (139 km/h)
- Igor in 2010 (172 km/h)

Tropical Cyclone Hazards

Storm Surge

- Abnormal rise in water generated by a storm, over and above the astronomical tide
- Caused primarily by force of wind blowing across water surface
- Contribution by low pressure within center of storm is minimal





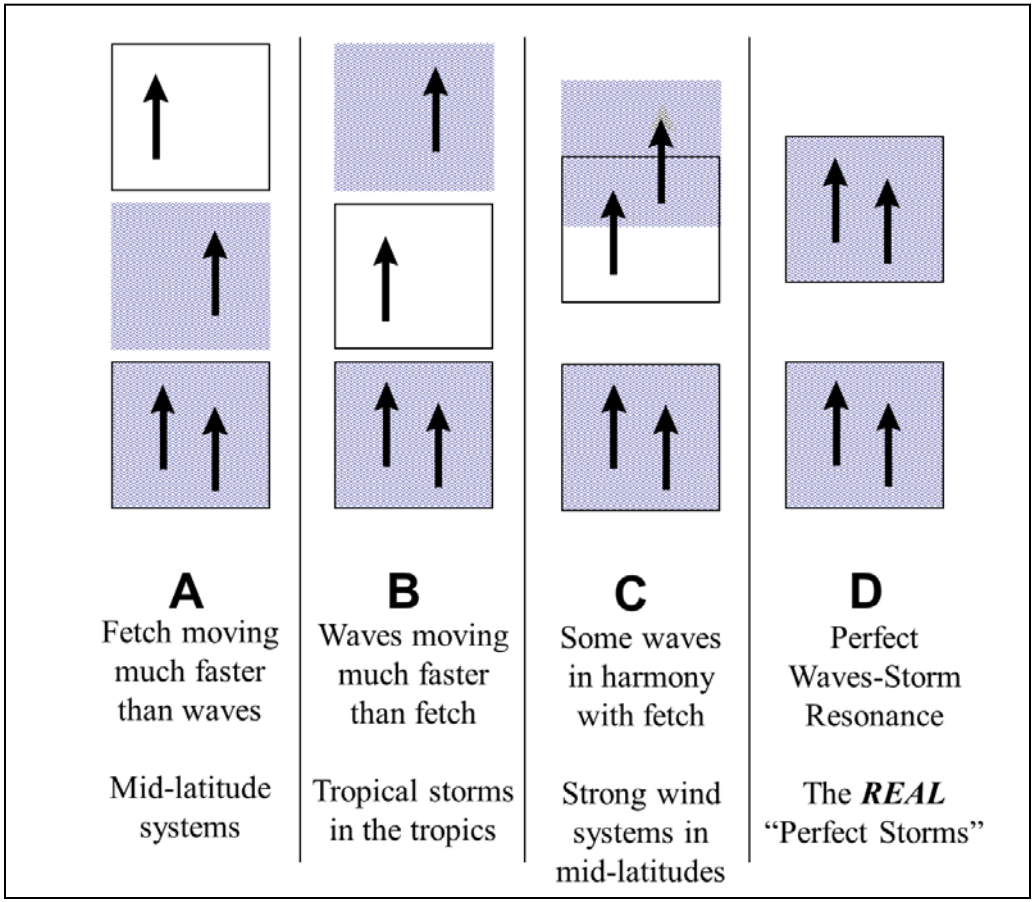
Some Factors Affecting Storm Surge:

- Wind speed
- Direction of the storm
- Size of the storm
- Coastal bathymetry

Tropical Cyclone Hazards

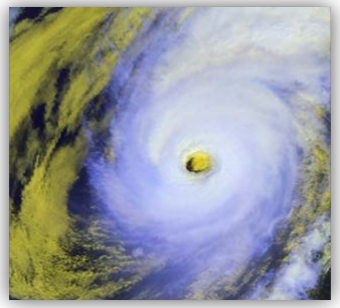
Damaging Waves

- On occasion a particular phenomenon can give rise to extreme wave heights
- Meteorologists at the (CHC) have investigated the problem of waves that are “trapped” within a weather system
- Waves move in harmony with a storm, allowing waves to build to enormous heights
- This threat is most significant along the Atlantic coast
- Large waves and ponding surf can also be a threat in the Gulf of St Lawrence

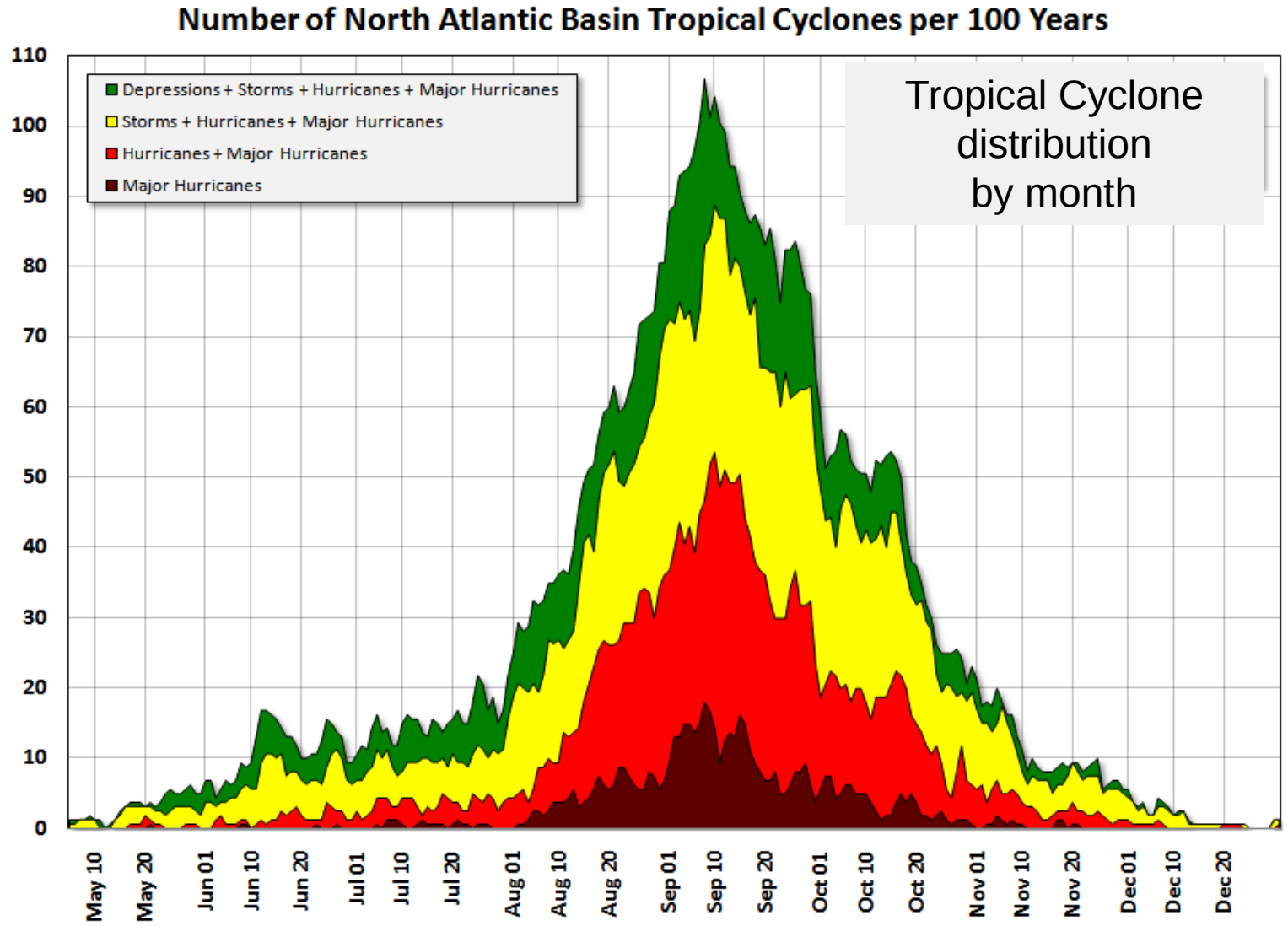


Questions #2



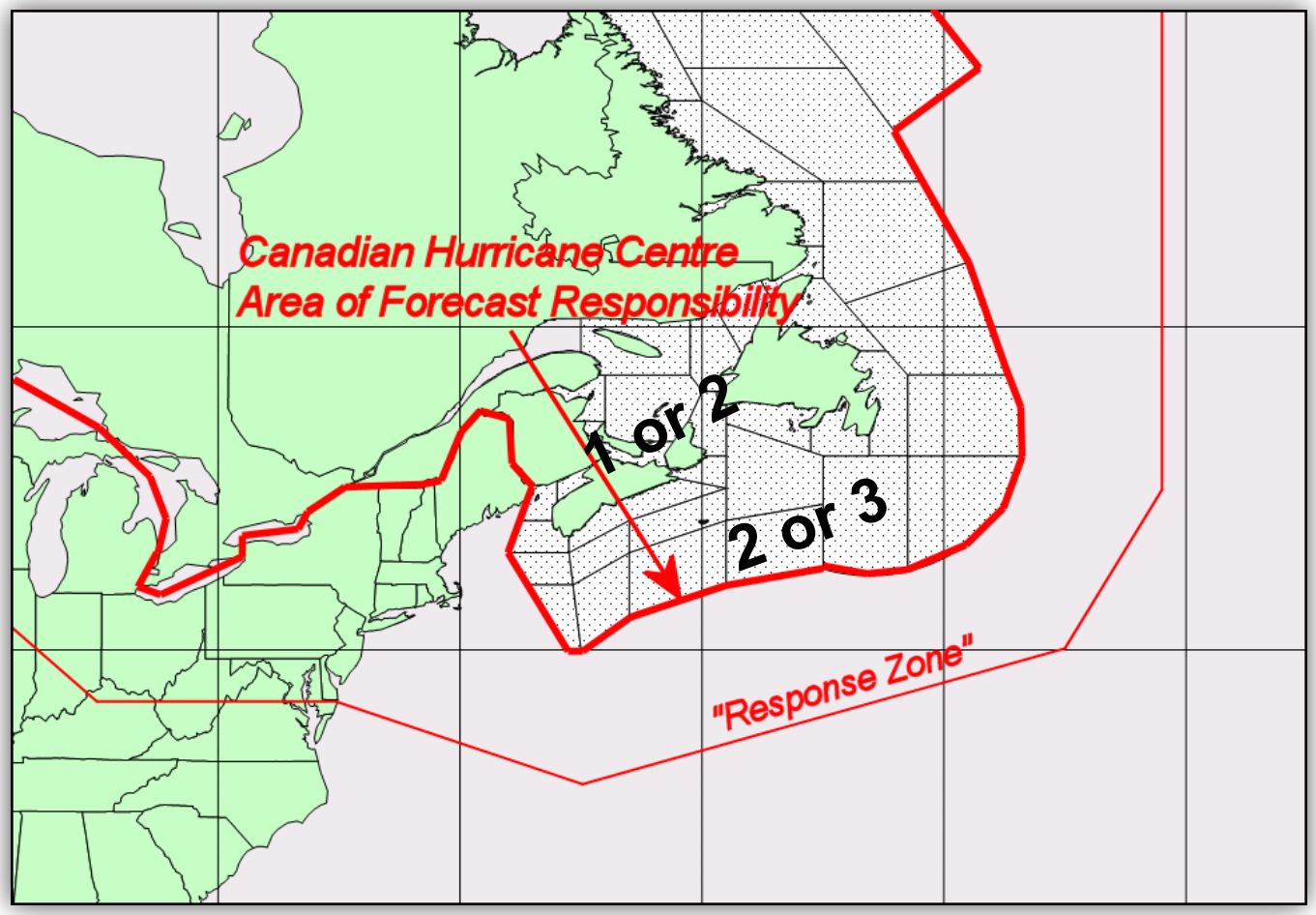



Tropical Cyclone Climatology



Canadian Hurricane Centre Response Zone

On average, 1 or 2 storms directly affect Canadian land regions each year. Another 2 or 3 typically threaten our offshore waters.



Hurricane Season 2013 in Review

Summary:

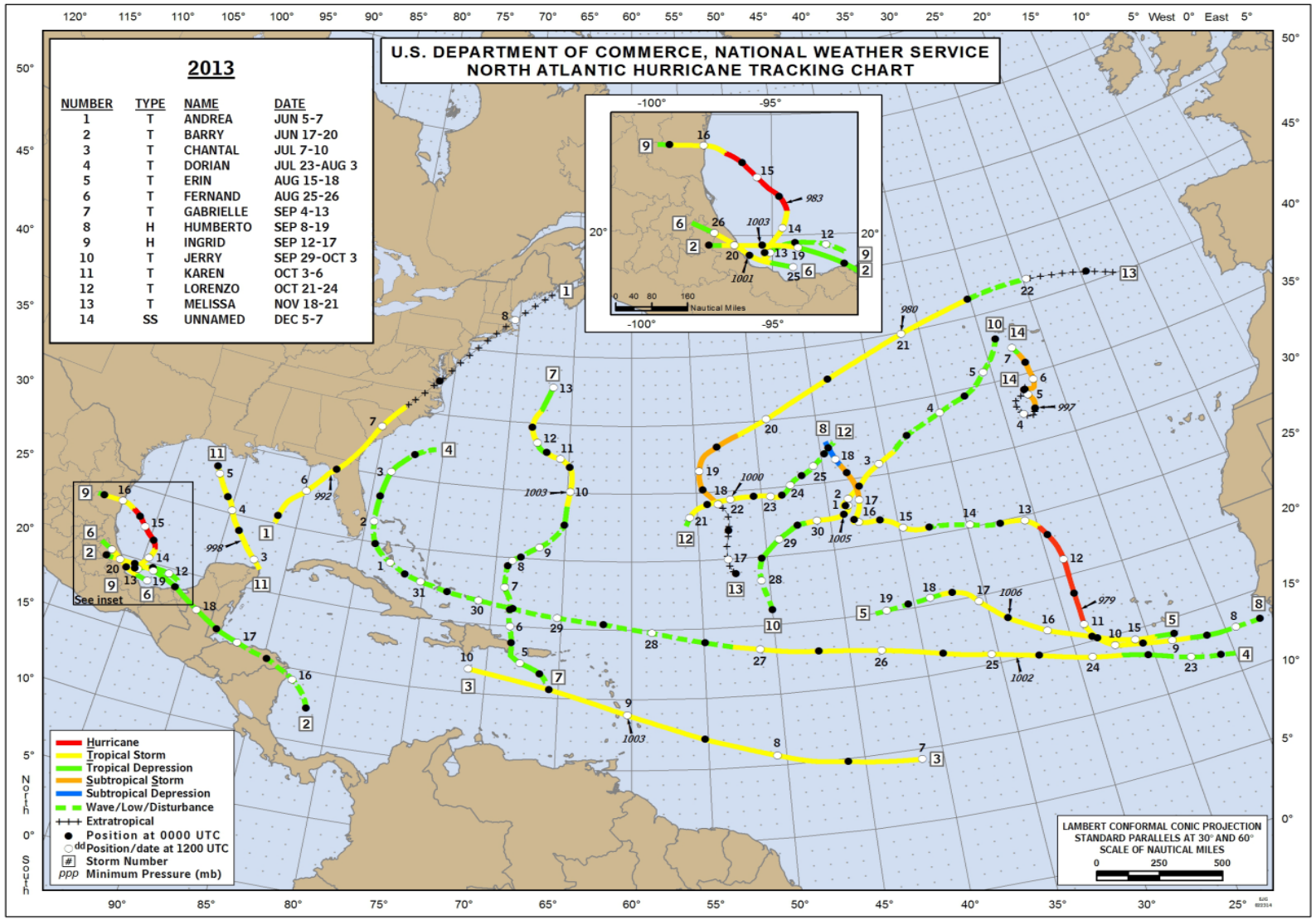
14 Named Storms

2 Hurricanes

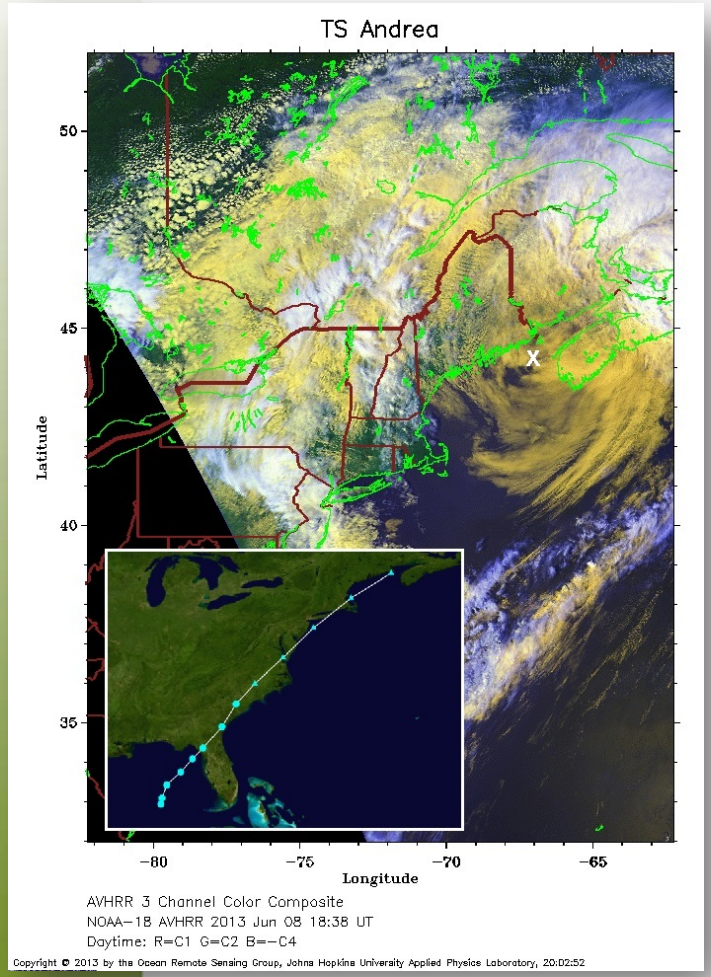
0 Major hurricanes

Canadian Hurricane Centre

2013 Season in Review



Storms affecting Canadian territory in 2013

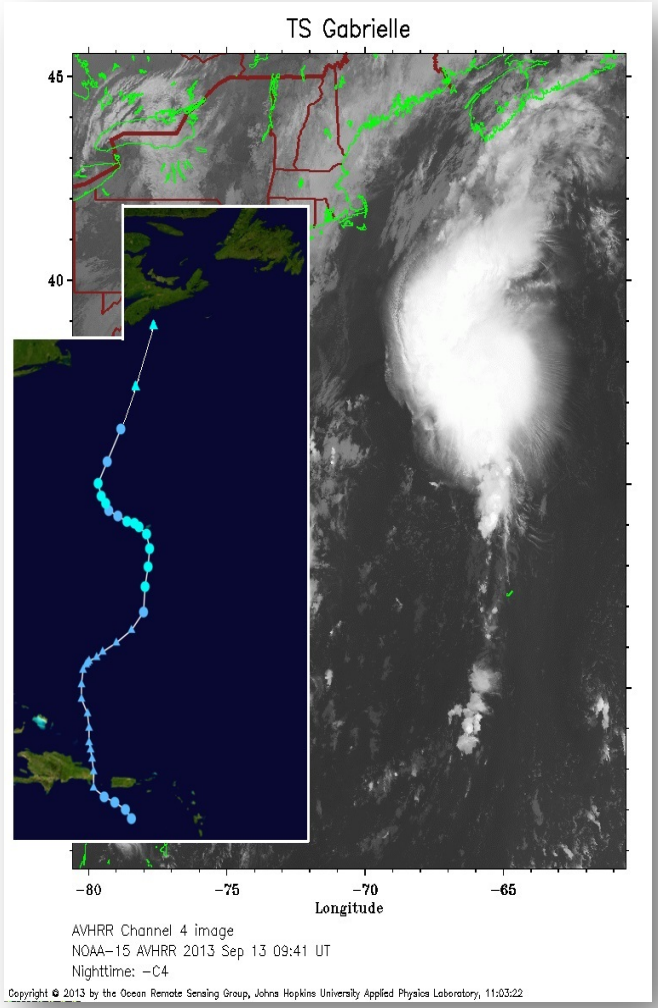


Post-Tropical Storm Andrea

- Heavy rainfall over parts of the Maritime Provinces
- Over 100 mm of rain in some areas but little or no flooding
- Gusty wind caused scattered power outages

Post-Tropical Storm Gabrielle

- Mostly a rainfall event with as much as 75 mm



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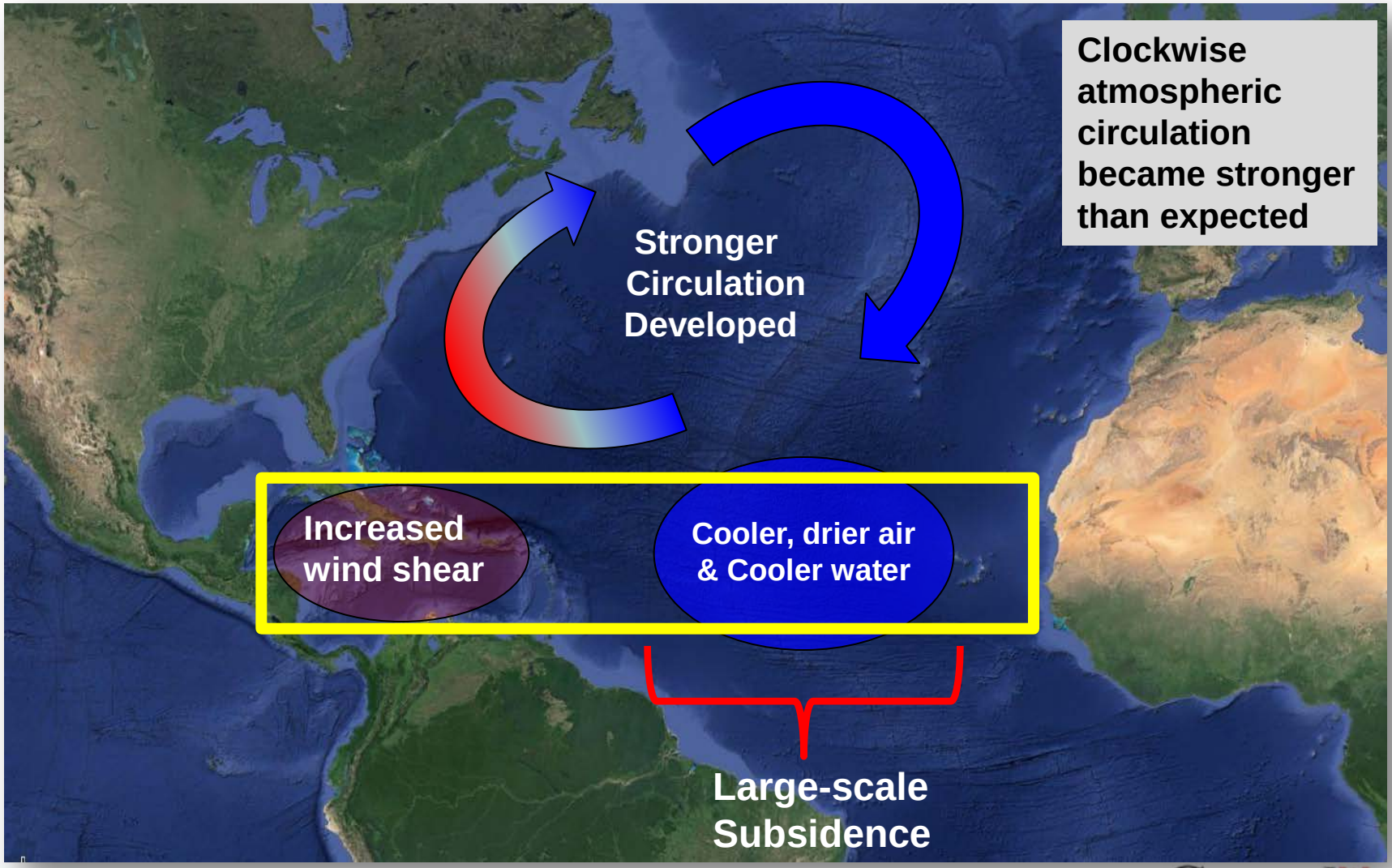
What happened last year?

	Named Storms	Hurricanes Category 1 to 5	Major Hurricanes Category 3-5
National Oceanic and Atmospheric Administration (US)	**13-20**	**7-11**	**3-6**
Actual Storms	**14**	**2**	**0**

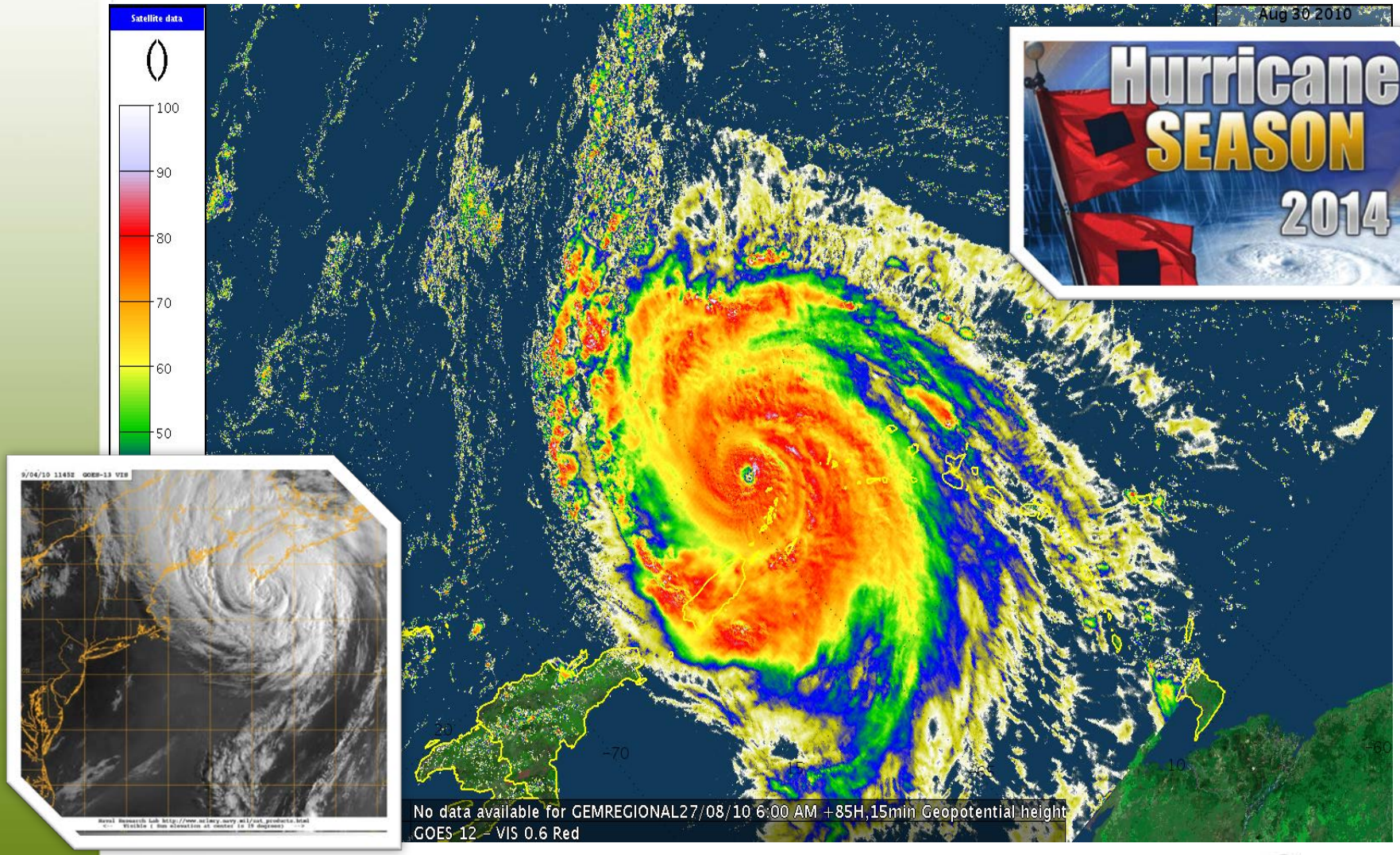
- Fewest number of hurricanes since 1982
- First time there were no major hurricanes since 1994
- First time there were no storms stronger than category 1 since 1968

What happened last year?



2014 Hurricane Season Outlook

Canadian Hurricane Centre



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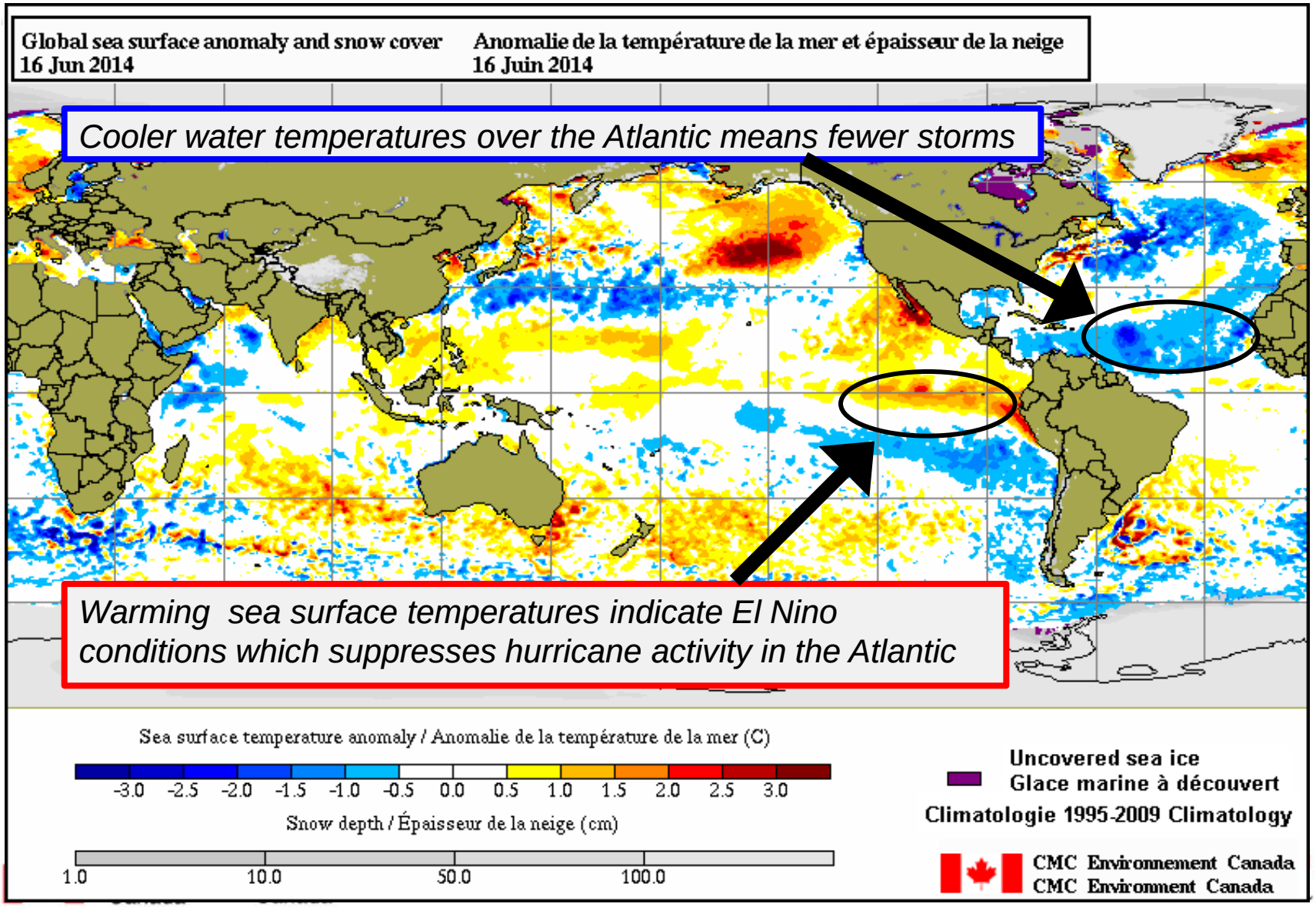
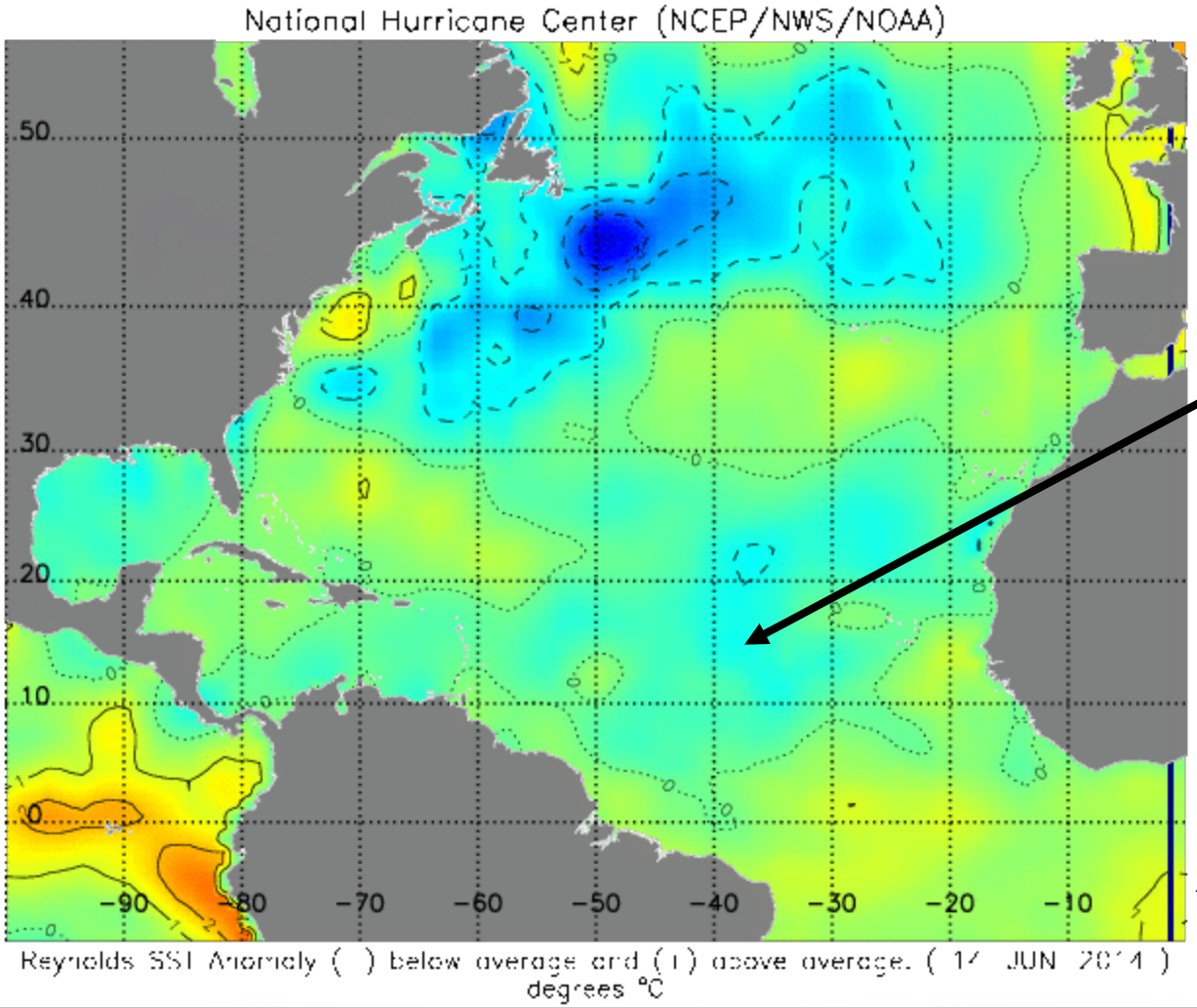
2014 Hurricane Season Outlook

	Named Storms	Hurricanes Category 1 to 5	Major Hurricanes Category 3-5
National Oceanic and Atmospheric Administration (US)	**8-13**	**3-6**	**1-2**
1981-2010 Average	**12**	**6**	**3**
1961-2010 Average	**11**	**6**	**2 or 3**

Global Sea Surface Temperatures



Latest Atlantic Sea Surface Temperature Pattern



Cooler than normal sea surface temperature

Water temperatures are cooler than normal in the main storm formation region of the tropical Atlantic Ocean.

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List of Atlantic Storm Names

2014	2015	2016	2017	2018	2019
Arthur	Ana	Alex	Arlene	Alberto	Andrea
Bertha	Bill	Bonnie	Bret	Beryl	Barry
Cristobal	Claudette	Colin	Cindy	Chris	Chantal
Dolly	Danny	Danielle	Don	Debby	Dorian
Edouard	Erika	Earl	Emily	Ernesto	Erin
Fay	Fred	Fiona	Franklin	Florence	Fernand
Gonzalo	Grace	Gaston	Gert	Gordon	Gabrielle
Hanna	Henri	Hermine	Harvey	Helene	Humberto
Isaias	Ida	Ian	Irma	Isaac	Imelda
Josephine	Joaquin	Julia	Jose	Joyce	Jerry
Kyle	Kate	Karl	Katia	Kirk	Karen
Laura	Larry	Lisa	Lee	Leslie	Lorenzo
Marco	Mindy	Matthew	Maria	Michael	Melissa
Nana	Nicholas	Nicole	Nate	Nadine	Nestor
Omar	Odette	Otto	Ophelia	Oscar	Olga
Paulette	Peter	Paula	Philippe	Patty	Pablo
Rene	Rose	Richard	Rina	Rafael	Rebekah
Sally	Sam	Shary	Sean	Sara	Sebastien
Teddy	Teresa	Tobias	Tammy	Tony	Tanya
Vicky	Victor	Virginie	Vince	Valerie	Van
Wilfred	Wanda	Walter	Whitney	William	Wendy

2014 Hurricane Season Outlook

Consider the following forecast:

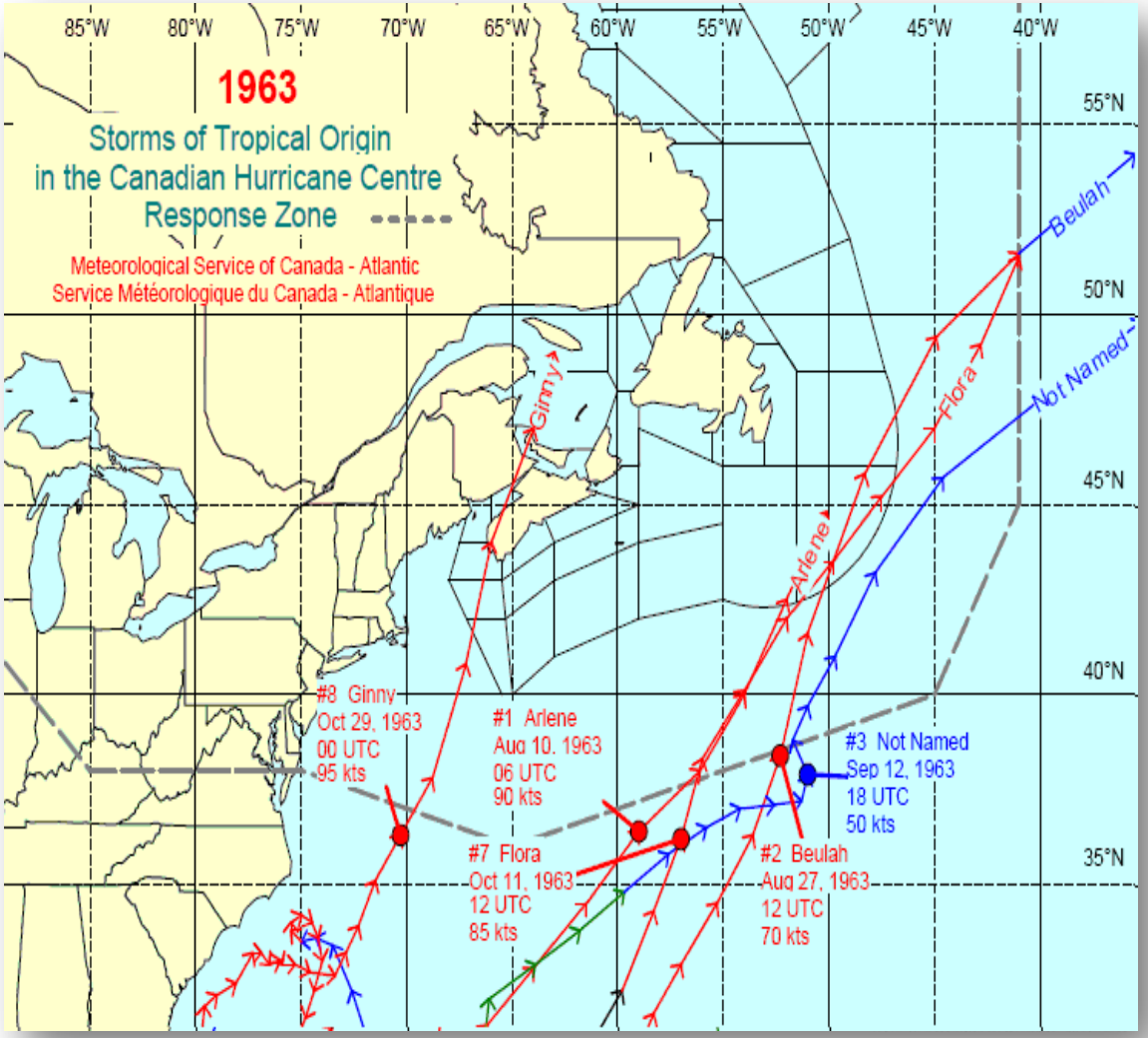
100% Guarantee that there will be 8 named storms this hurricane season

What would be your initial reaction?

2014 Hurricane Season Outlook

Consider the 1963 hurricane season:

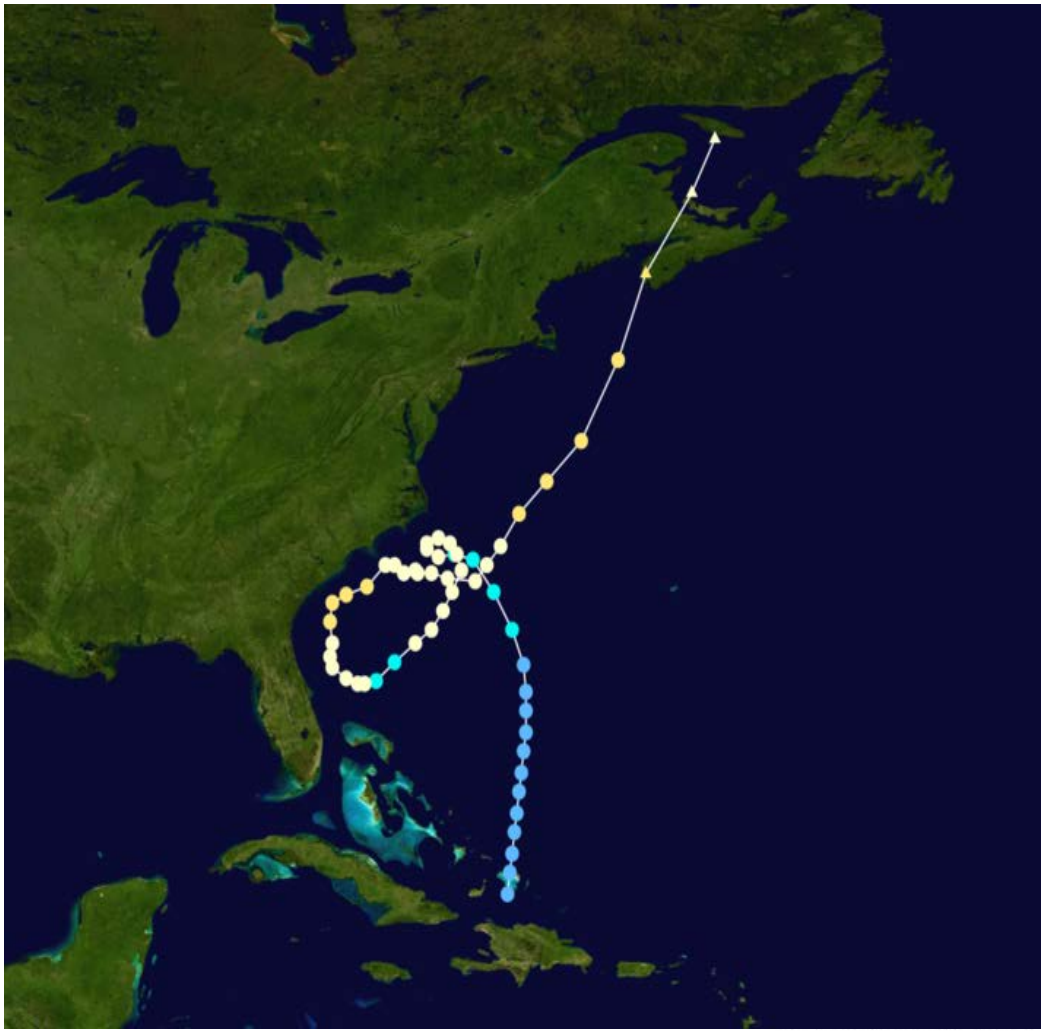
- A total of 8 storms
- 5 storms entered the CHC response zone
- 4 of those storms were hurricanes
- Landfalling category 2 hurricane - Ginny



2014 Hurricane Season Outlook

Consider the 1963 hurricane season:

- Transformed to a powerful post-tropical storm
- 176 km/h maximum sustained winds
- Buildings damaged and coastal infrastructure submerged
- Widespread power and communications outages



FREDERICKSBURG, VIRGINIA, THURSDAY, OCTOBER 24, 1963 WFLS 1350 AM - 93.3 FM TEN CENTS

Watch Widens For Hurricane

MIAMI, Fla. (AP) — A hurricane watch was extended northward from Daytona Beach, Fla., to Myrtle Beach, S.C., today as hurricane Ginny drifted slowly up the Atlantic.

The storm was centered about 105 miles east-northeast of Daytona Beach and moving toward the northwest at five miles an hour. Peak winds of 75 m.p.h. barely qualified the storm as a hurricane.

As the season's seventh tropical storm plodded northward, gale warnings were extended to Savannah, Ga., and lowered south of Daytona Beach.

Little possibility remained that the hurricane would move inland over Florida. But be-

state's northeast coast.

A slight change in direction toward the coast could bring a rapid increase in winds, forecasters cautioned. But forecaster Gordon Dunn said no important damage would be expected even if t ashore.

Some beach heavy swells w dence of the s offshore. Pleas prevailed fro Georgia.

BOATS BIDING

Sixty shrimp ing time at waiting for s Work resumed miss led ast

pushed southward by a large mass of cool air sweeping down from Canada. When the storm reached a point opposite northeastern Florida it began to drift southward at decreasing speed until it pulled up opposite Cape

Ginny's Gales Hit Maritimes, Move On East

HALIFAX — (CP) — Reports of damage began to mount Tuesday night as Hurricane Ginny moved across the Maritimes on a course toward western Newfoundland.

Many small buildings were knocked over by the winds that hit 100 miles an hour in gusts. Dozens of small vessels broke their moorings and were piled up on shore and at least one freighter met the same fate.

Flames fanned by the high winds destroyed one of Nova Scotia's showcase farms near Amherst. Telephone lines were down in many coastal areas.

At least one ship and several yachts and fishing vessels broke their moorings and were driven ashore by high waves. In neighboring Dartmouth, the 884-ton freighter North Star VI—used as a sealer in the spring—snapped her moorings and was grounded on rocks. The extent of her damage was not known but it appeared serious.

It was expected to be felt in Newfoundland and Labrador to-

Ginny Stalls, Threatens 'Yo-Yo' Route

MIAMI (UPI) — Wrong-way hurricane Ginny stalled again Wednesday off the Florida coast and showed signs of swinging into an erratic loop that would send it shooting back to the north like a yo-yo.

While awaiting its next move, weathermen put a 175-mile stretch of Florida coastline—from Cape Canaveral to Fort Lauderdale—under a hurricane watch. Fort Lauderdale is just a few miles north of Miami.

Heavy seas kicked up by Ginny's 75 mile an hour winds

Maritimes Prepared For Ginny

HALIFAX (CP) — The Weather Office said Monday night Hurricane Ginny appeared to be heading for the Maritimes. Wind and heavy

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Ginny Moves Over Canada, Leaves Rain, Snow In N.E.

BOSTON (AP)—Hurricane Ginny, still a threat, raged over Nova Scotia and Prince Edward Island late Tuesday, leaving behind welcome heavy rains in parched New England.

Greenwood, N.S., measured winds exceeding 100 miles per hour and St. Johns, N.B., had gusts up to 92 m.p.h.

Although winds at the storm's center measured about 100 m.p.h. in gusts, Ginny's travel over land and cold water caused it to lose tropical characteristics and the Weather Bureau said it is no longer a true hurricane.

Moving To Northeast

At last report the center of the storm was over the western portion of Prince Edward Island after having crossed Nova Scotia near Yarmouth. It was moving rapidly to the northeast, with gales extending 150 miles from the center in its western semicircle and 350 miles in the eastern semicircle.

The advisory said the storm would continue to move in a northeasterly direction at about 35 miles an hour during the next 12 hours, then take a more easterly course. The Weather Bureau warned that Ginny would continue to carry high winds for at least 12 to 24 hours.

Higher Tides

Tides were expected to remain one to two feet above normal along the Maine coast southward to New Jersey for at least 12 hours and owners of small craft were advised to remain in port.

Afternoon tides were about one to two feet above normal along the Maine coast southward to New Jersey, except two to four feet on the bay side of Cape Cod. High seas and breakers caused some flooding.

Snow In Maine

Heavy rain ended over southeastern New England but moderate to heavy snows fell in central and northern Maine. Eight inches had fallen at Greenville, Maine, since morning. Rain was the heaviest along the coast. Nantucket Island measured slightly more than 2.5 inches.

The coastal half of New England picked up from one to two inches of much needed rain Western New Hampshire, Vermont and western Massachusetts got little benefit from the storm.

Hazard Remains

The Northeastern Forest Fire Protection Commission reported in Hartford, Conn., that forest fire conditions still were hazardous in Connecticut, Vermont

(Continued On Page 18)

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Other examples of note

Years with low number of storms but with damaging ones or near-misses:

- 1954 saw 8 named storms – one was Hazel (massive flooding in Ontario) and the other was Edna (damaging wind in the Maritimes)
- 1964 saw 9 storm – 6 entered the Canadian with 2 landfalls at almost the identical location
- 1991 saw 7 named storms during that El Nino year – one was hurricane Bob and the other was the so-called “Perfect-Storm”
- 1996 saw 13 named storms – one was a landfalling hurricane in the Maritimes (Hortense)
- 2002 saw 12 named storms during that El Nino season - one was a landfalling hurricane in the Maritimes (Gustav)
- 2009 saw 11 named storms – 2 entered the response zone but one was hurricane Bill which came to within about 40 km of making landfall with 140 km and 20+ m waves

Canadian Hurricane Centre

Hurricane Readiness and Operational Response to Hurricanes

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Pre-Season Hurricane Readiness

- Good opportunity to review emergency plans

- Public education and training

- Hurricane seasonal briefing for emergency managers

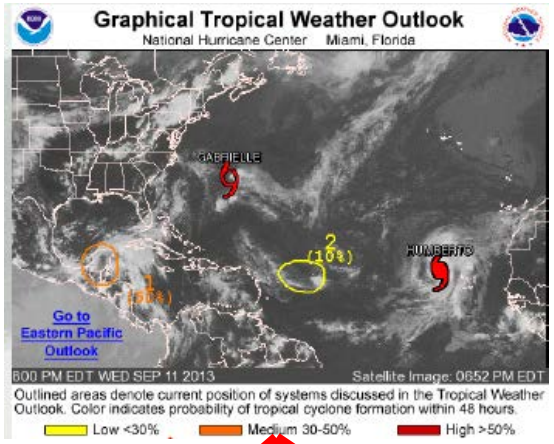
- Cover the basics of tropical cyclones and how they affect Canada, review of previous year and outlook for the current year. Also review of the established operational practices used during actual storms

- Decision to execute many of the steps in an emergency plan will be based on weather information

Monitoring Tropical Activity

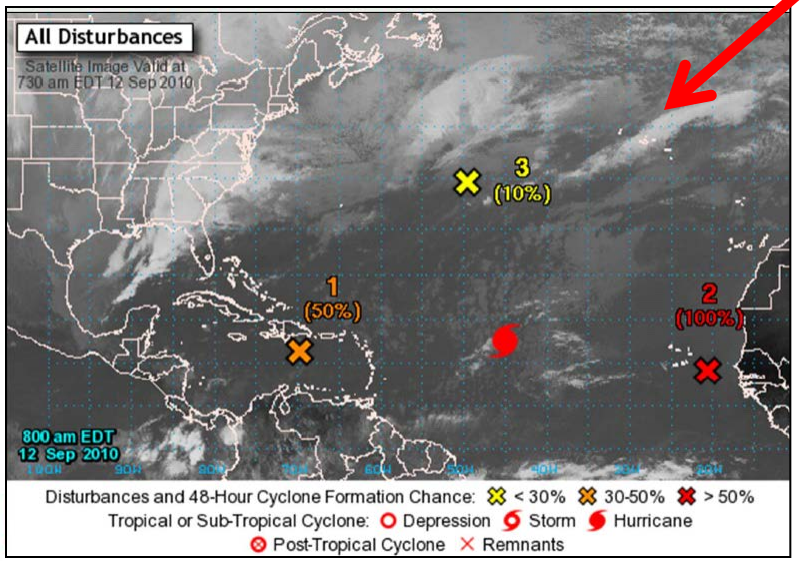
- A good tool to check overall tropical activity is the Tropical Weather Outlook issued by the NHC in Miami

http://www.nhc.noaa.gov/gtwo_atl.shtml

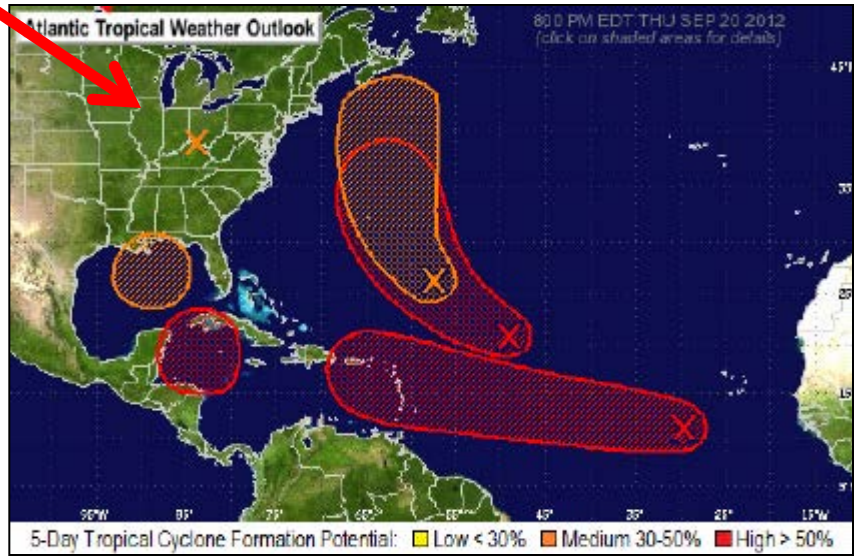


Previous GTWO

New 48 hour GTWO



New 5-day GTWO



Storm Watch - 120 hours

- Tropical Weather Outlook (NHC) still a good place to start

- CHC will issue preliminary bulletins once or twice per day beyond 72 hours prior to the storm entering the response zone

- All tracks will be displayed on the CHC hurricane track map
  - Red tracks are NHC-issued tracks

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WOCN31 CWHX 060545
TROPICAL CYCLONE INFORMATION STATEMENT ISSUED BY THE CANADIAN
HURRICANE CENTRE OF ENVIRONMENT CANADA AT 12:18 AM ADT THURSDAY
6 JUNE 2013.
-------------------------------------------------------------------------
TROPICAL CYCLONE INFORMATION STATEMENT FOR:
=NEW= ATLANTIC PROVINCES.

      FOR TROPICAL STORM ANDREA.

      THE NEXT STATEMENT WILL BE ISSUED BY 3:00 PM ADT.

      NEWLY-FORMED TROPICAL STORM ANDREA WEST OF FLORIDA EXPECTED TO
      TRANSFORM INTO WET LOW PRESSURE SYSTEM AFFECTING ATLANTIC
      CANADA THIS WEEKEND.

-------------------------------------------------------------------------
==DISCUSSION==
THE NATIONAL HURRICANE CENTER (NHC) IN MIAMI FLORIDA HAS DECLARED AN
AREA OF HEAVY RAINFALL AND GUSTY WINDS WEST OF FLORIDA AS TROPICAL
STORM ANDREA - THE FIRST NAMED STORM OF THE 2013 HURRICANE SEASON.
THIS STORM IS NOT EXPECTED TO ATTAIN SIGNIFICANT WIND INTENSITY, BUT
WILL LIKELY TRANSFORM INTO A WET LOW PRESSURE SYSTEM AS IT TRACKS
TOWARD THE MARITIME PROVINCES THIS WEEKEND.

THE CANADIAN HURRICANE CENTRE WILL MAINTAIN A GENERAL WATCH OF THE
LOW PRESSURE SYSTEM AND ITS ASSOCIATED RAINFALL WITH UPDATES AS
NECESSARY.  WE WILL ISSUE ANOTHER BULLETIN THURSDAY AFTERNOON TO
UPDATE EXPECTED RELATED WEATHER FOR EASTERN CANADA AND SIMPLY CARRY
THE NHC FORECAST TRACK ON OUR WEBSITE AT
WWW.WEATHER.GC.CA/HURRICANE/TRACK_E.HTML (ALL LOWERCASE).  IF DEEMED
NECESSARY TO ACTIVATE THE FORECAST DESK 24/7, A SPECIFIC TRACK WITH
ADDITIONAL DETAILS WILL BE ISSUED ON THE WEBSITE AND WILL APPEAR BLUE
ON THE MAP.

END/FOGARTY/BORGEL
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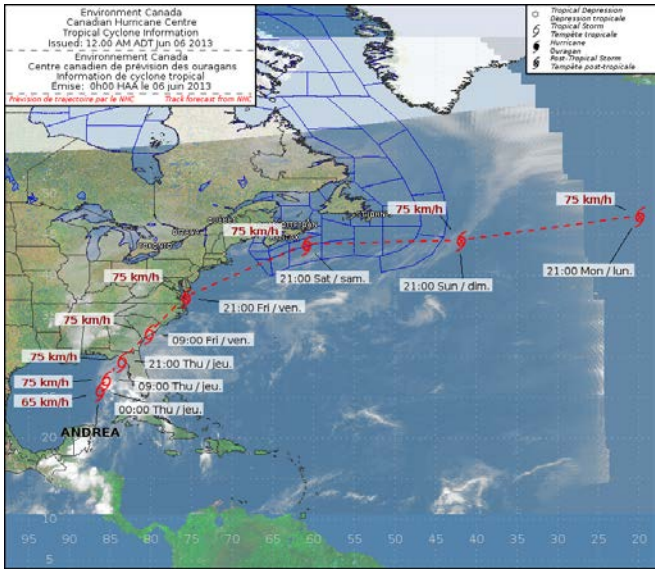


CHC Website

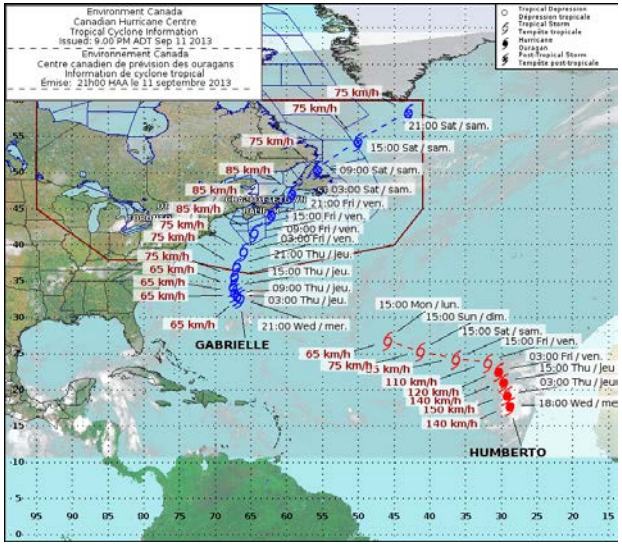
www.hurricanes.ca

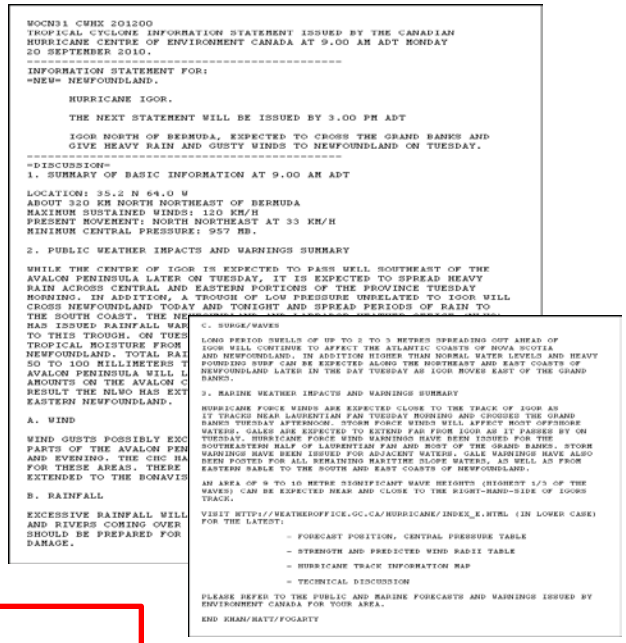
Storm Watch - 72 hours

- CHC will typically begin to issue regularly scheduled information bulletins every 6 hours about 72 hours prior to the storm entering the response zone

- Issue times are 3 and 9 am and pm
  - Summary information on initial position, intensity, motion
  - Public impacts and warnings broken down by hazard (wind, rainfall, surge/waves)
  - Marine impacts and warning

- All tracks will be displayed on the CHC hurricane track map
  - Blue tracks are CHC-issued tracks
  - Red tracks are NHC-issued tracks





WOCN31 CWHX 201200
TROPICAL CYCLONE INFORMATION STATEMENT ISSUED BY THE CANADIAN HURRICANE CENTRE OF ENVIRONMENT CANADA AT 9.00 AM ADT MONDAY 20 SEPTEMBER 2010.

INFORMATION STATEMENT FOR:
=NEW= NEWFOUNDLAND.

HURRICANE IGOR.

THE NEXT STATEMENT WILL BE ISSUED BY 3.00 PM ADT

IGOR NORTH OF BERMUDA, EXPECTED TO CROSS THE GRAND BANKS AND GIVE HEAVY RAIN AND GUSTY WINDS TO NEWFOUNDLAND ON TUESDAY.

=DISCUSSION=
1. SUMMARY OF BASIC INFORMATION AT 9.00 AM ADT

LOCATION: 35.2 N 64.0 W
ABOUT 320 KM NORTH NORTHEAST OF BERMUDA
MAXIMUM SUSTAINED WINDS: 120 KM/H
PRESENT MOVEMENT: NORTH NORTHEAST AT 33 KM/H
MINIMUM CENTRAL PRESSURE: 957 MB.

2. PUBLIC WEATHER IMPACTS AND WARNINGS SUMMARY

WHILE THE CENTRE OF IGOR IS EXPECTED TO PASS WELL SOUTHEAST OF THE AVALON PENINSULA LATER ON TUESDAY, IT IS EXPECTED TO SPREAD HEAVY RAIN ACROSS CENTRAL AND EASTERN PORTIONS OF THE PROVINCE TUESDAY MORNING. IN ADDITION, A TROUGH OF LOW PRESSURE UNRELATED TO IGOR WILL CROSS NEWFOUNDLAND TODAY AND TONIGHT AND SPREAD PERIODS OF RAIN TO THE SOUTH COAST. THE NE
HAS ISSUED RAINFALL WAR
TO THIS TROUGH. ON TUES
TROPICAL MOISTURE FROM
NEWFOUNDLAND. TOTAL RAI
50 TO 100 MILLIMETERS T
AVALON PENINSULA WILL C
AMOUNTS ON THE AVALON C
RESULT THE NLWO HAS EXT
EASTERN NEWFOUNDLAND.

A. WIND

WIND GUSTS POSSIBLY EXC
PARTS OF THE AVALON PEN
AND EVENING. THE CHC HA
FOR THESE AREAS. THERE
EXTENDED TO THE BONAVIS

B. RAINFALL

EXCESSIVE RAINFALL WILL
AND RIVERS COMING OVER
SHOULD BE PREPARED FOR
DAMAGE.

C. SURGE/WAVES

LONG PERIOD SWELLS OF UP TO 2 TO 3 METRES SPREADING OUT AHEAD OF IGOR WILL CONTINUE TO AFFECT THE ATLANTIC COASTS OF NOVA SCOTIA AND NEWFOUNDLAND. IN ADDITION HIGHER THAN NORMAL WATER LEVELS AND HEAVY POUNDING SURF CAN BE EXPECTED ALONG THE NORTHEAST AND EAST COASTS OF NEWFOUNDLAND LATER IN THE DAY TUESDAY AS IGOR MOVES EAST OF THE GRAND BANKS.

3. MARINE WEATHER IMPACTS AND WARNINGS SUMMARY

HURRICANE FORCE WINDS ARE EXPECTED CLOSE TO THE TRACK OF IGOR AS IT TRACKS NEAR LAURENTIAN FAN TUESDAY MORNING AND CROSSES THE GRAND BANKS TUESDAY AFTERNOON. STORM FORCE WINDS WILL AFFECT MOST OFFSHORE WATERS. GALES ARE EXPECTED TO EXTEND FAR FROM IGOR AS IT PASSES BY ON TUESDAY. HURRICANE FORCE WIND WARNINGS HAVE BEEN ISSUED FOR THE SOUTHEASTERN HALF OF LAURENTIAN FAN AND MOST OF THE GRAND BANKS. STORM WARNINGS HAVE BEEN ISSUED FOR ADJACENT WATERS. GALE WARNINGS HAVE ALSO BEEN POSTED FOR ALL REMAINING MARITIME SLOPE WATERS, AS WELL AS FROM EASTERN NABLE TO THE SOUTH AND EAST COASTS OF NEWFOUNDLAND.

AN AREA OF 9 TO 10 METRE SIGNIFICANT WAVE HEIGHTS (HIGHEST 1/3 OF THE WAVES) CAN BE EXPECTED NEAR AND CLOSE TO THE RIGHT-HAND-SIDE OF IGORS TRACK.

VISIT HTTP://WEATHEROFFICE.GC.CA/HURRICANE/INDEX_E.HTML (IN LOWER CASE) FOR THE LATEST:

- FORECAST POSITION, CENTRAL PRESSURE TABLE
- STRENGTH AND PREDICTED WIND RADII TABLE
- HURRICANE TRACK INFORMATION MAP
- TECHNICAL DISCUSSION

PLEASE REFER TO THE PUBLIC AND MARINE FORECASTS AND WARNINGS ISSUED BY ENVIRONMENT CANADA FOR YOUR AREA.

END KHAN/MATT/FOGARTY

CHC Website

www.hurricanes.ca

Environment Canada Environnement Canada

Canada

Operational Response to Hurricanes

Forecast/Business Cycle at the CHC	
Time (HR:MM) (Atlantic time)	**Event or Task**
9:00 am	• Issue CHC Hurricane Information Statement, Technical Bulletin and the forecast track map • Update any Tropical Warnings
09:15 am	• Emergency Management Briefings (if necessary)
10:00 am	• Federal GOC Briefing (if necessary)
11:00 am	• Internal coordination call
12:00 pm	• Transmit intermediate bulletin (if necessary) • Prepare material for media briefing • Review NHC updated advisory • Review new model guidance
1:00 pm	• Media technical media briefing
2:00 pm	• Blackout period for the media • Intermediate consultation with emergency managers
3:00 pm	• New cycle begins

Storm Watch - 36 hours

Watches and Warnings

- Once the storm is close enough and forecast confidence is higher watches and warnings are issued in addition to the information bulletins

Tropical Storm: winds 70 km/h to 118 km/h

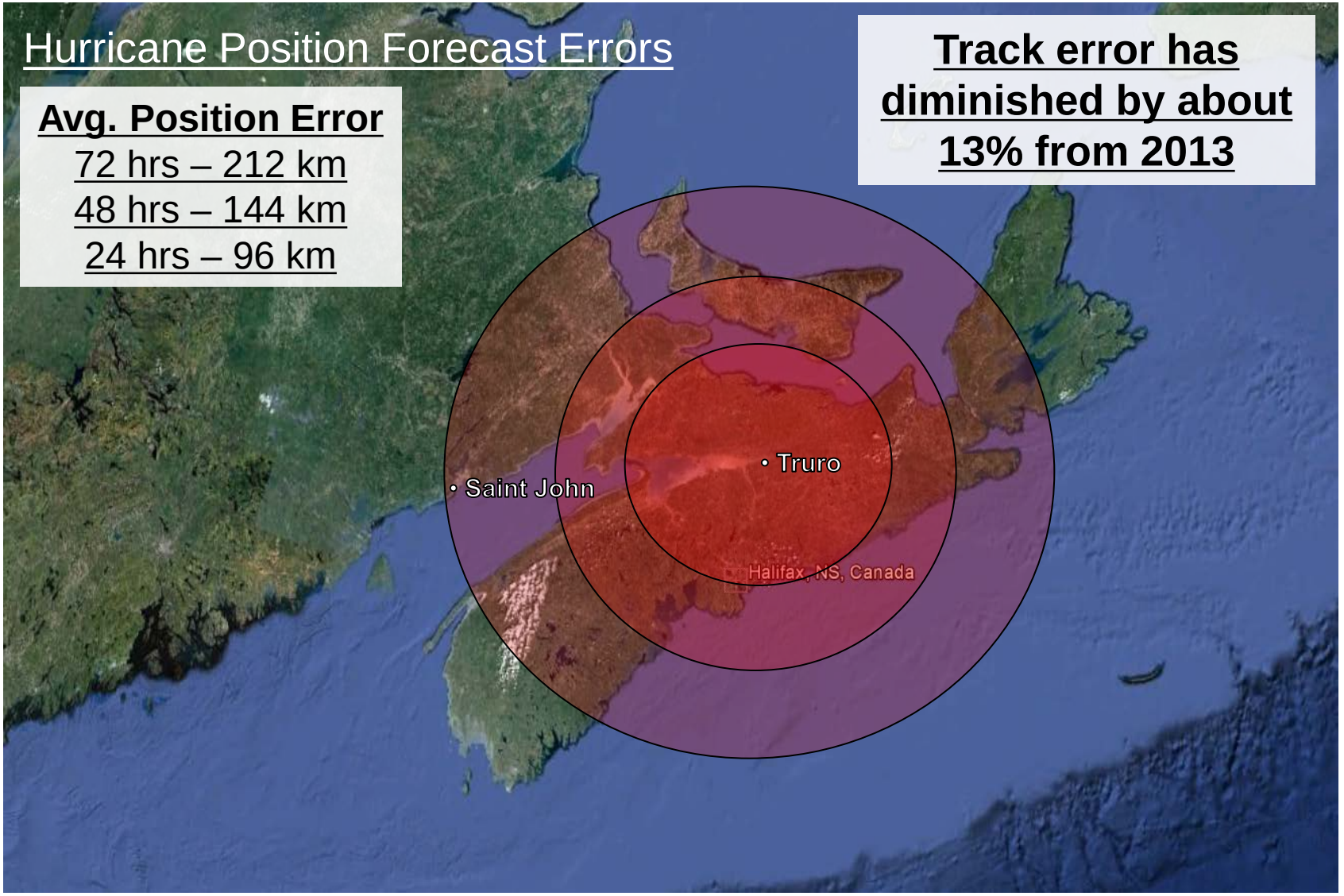
Hurricane: winds 119 km/h or more

A Watch: wind conditions possible within 36 hours

A Warning: wind conditions expected within 24 hours

Note: It is recommended that all storm preparation activities be complete prior to the arrival of Tropical Storm Force winds

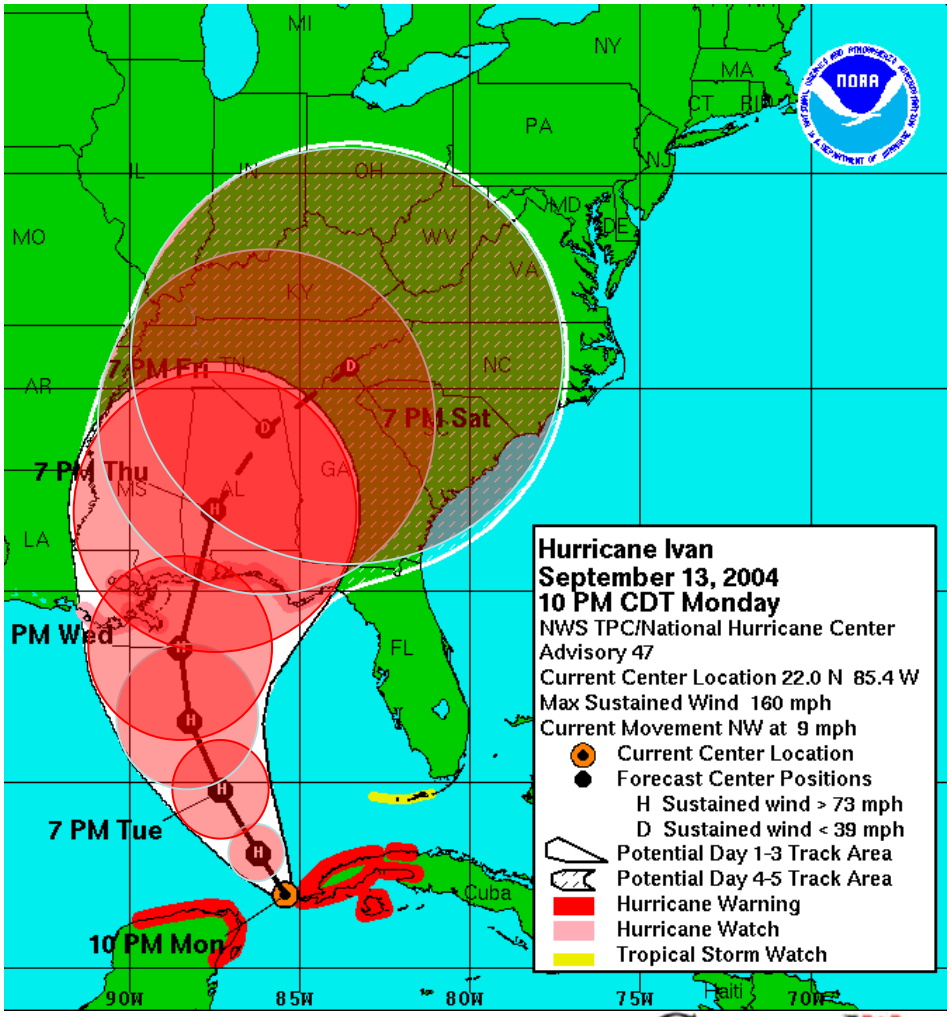
Operational Response to Hurricanes



Operational Response to Hurricanes

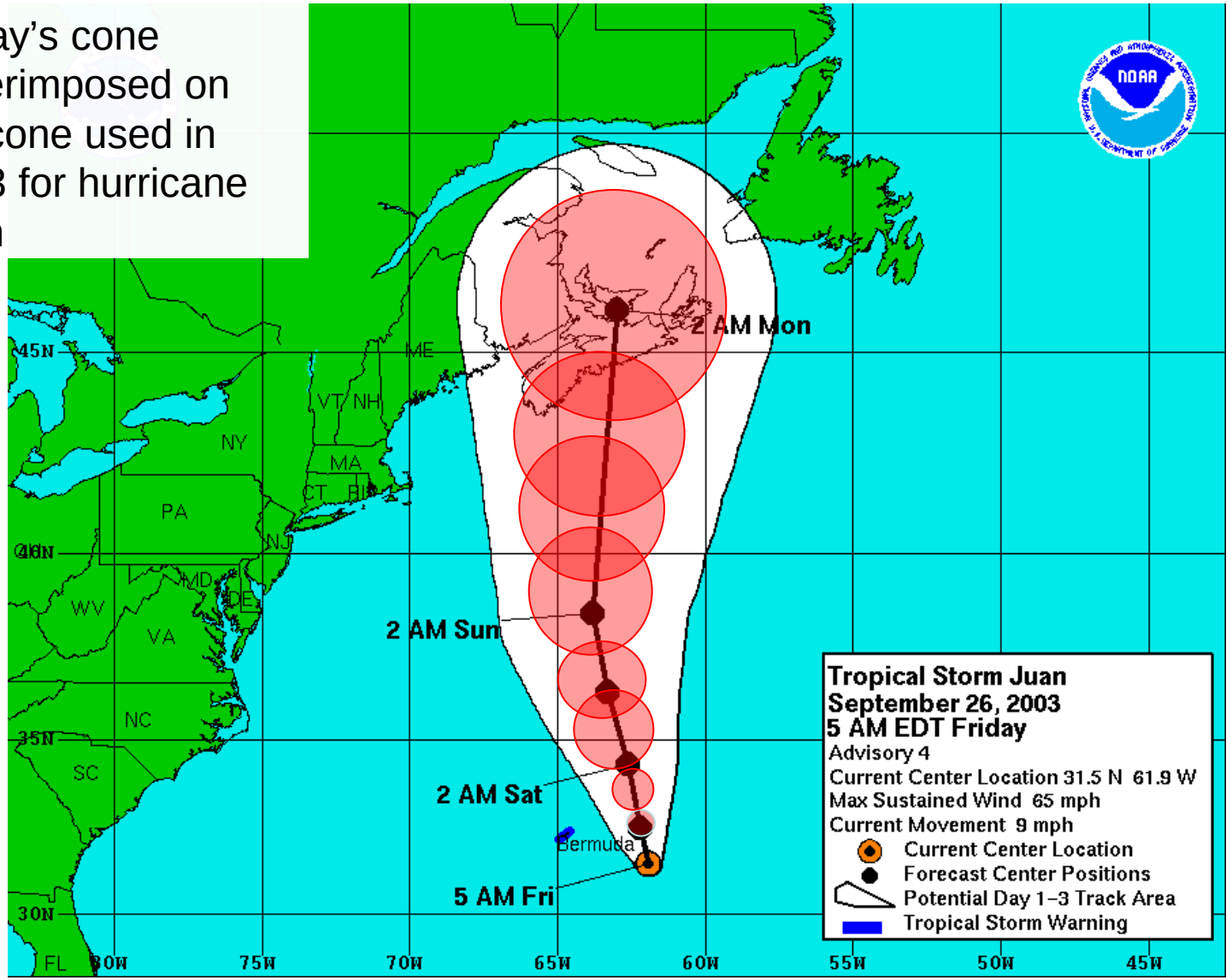
Common Misconception – Track Forecast

- Represents the probable track of the *center* of the tropical cyclone
- Track error cone is formed by connecting circles centered on each forecast point (at 12, 24, 36 h, etc.)
- Size of the circles are determined so that the actual storm position at a certain time will be within the corresponding circle 67% of the time



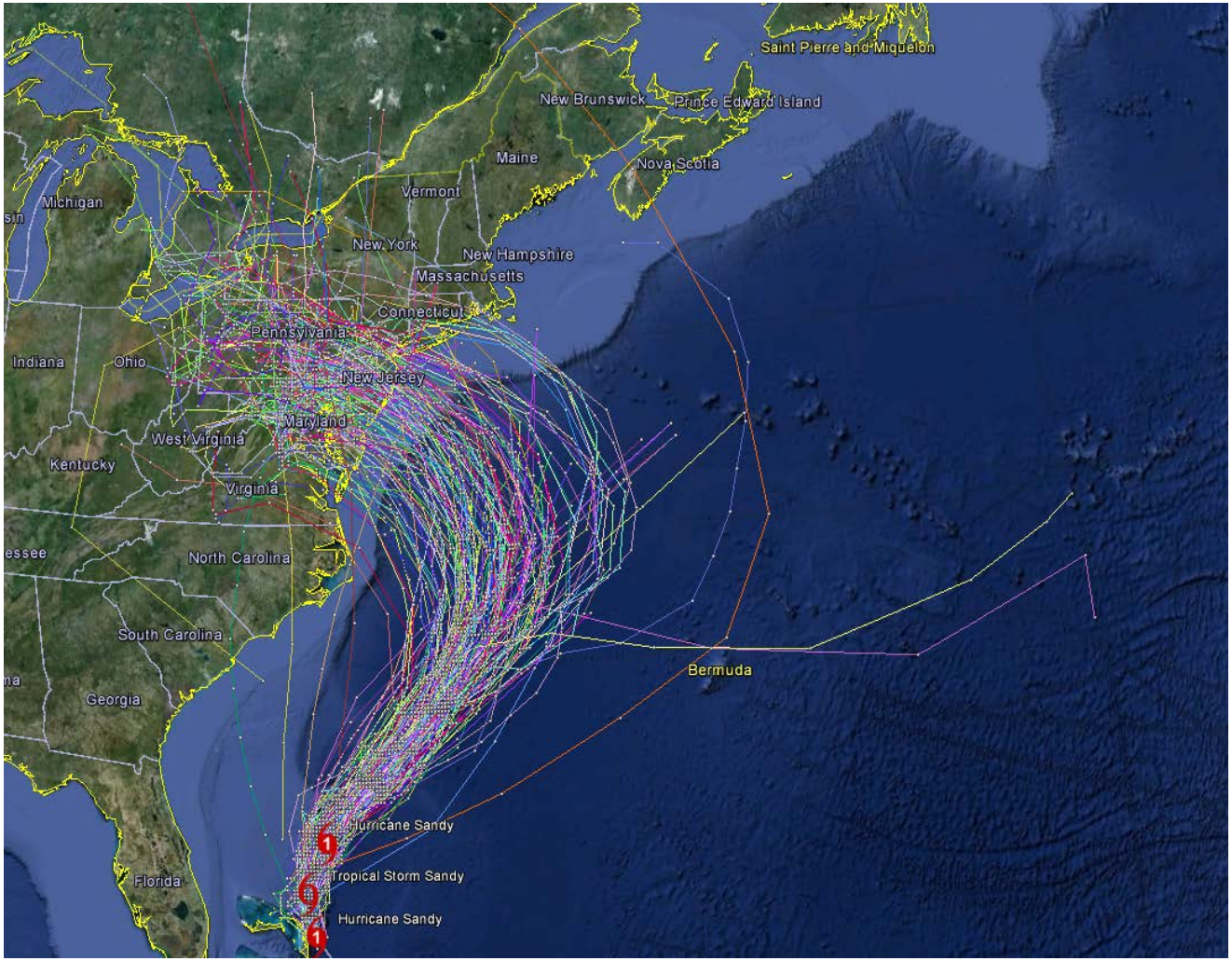
Operational Response to Hurricanes

Today's cone superimposed on the cone used in 2003 for hurricane Juan



Operational Response to Hurricanes

Use caution when interpreting model track forecasts!

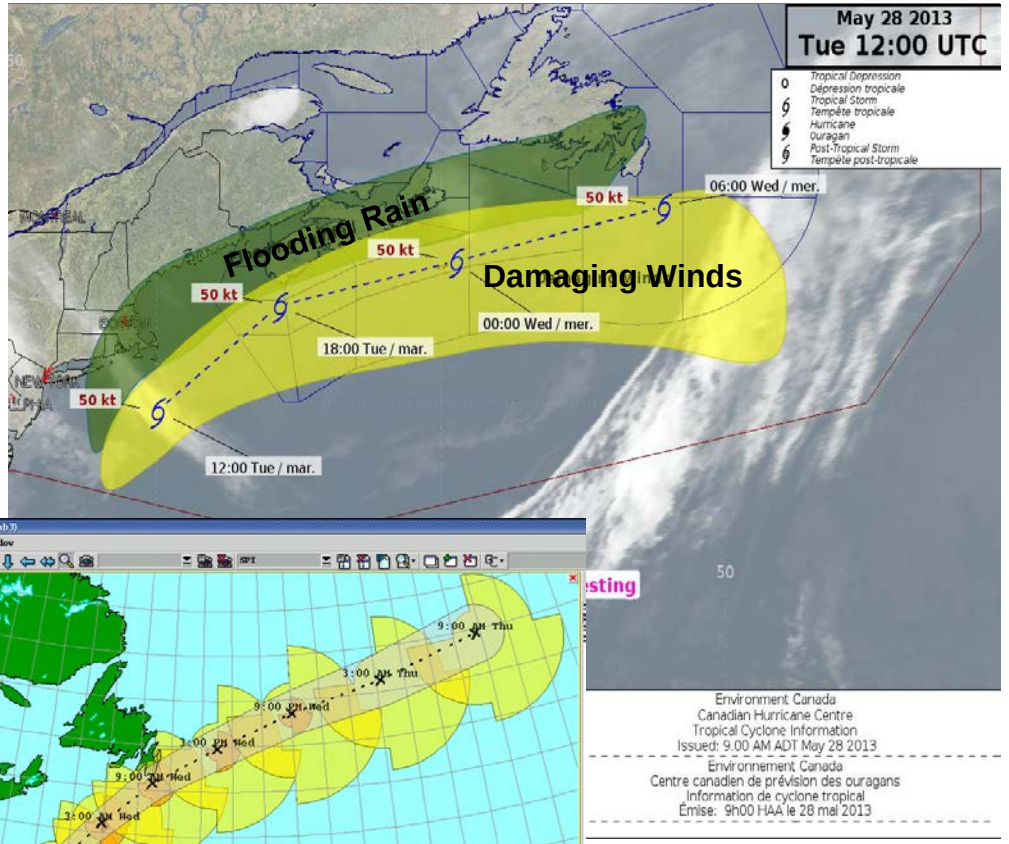


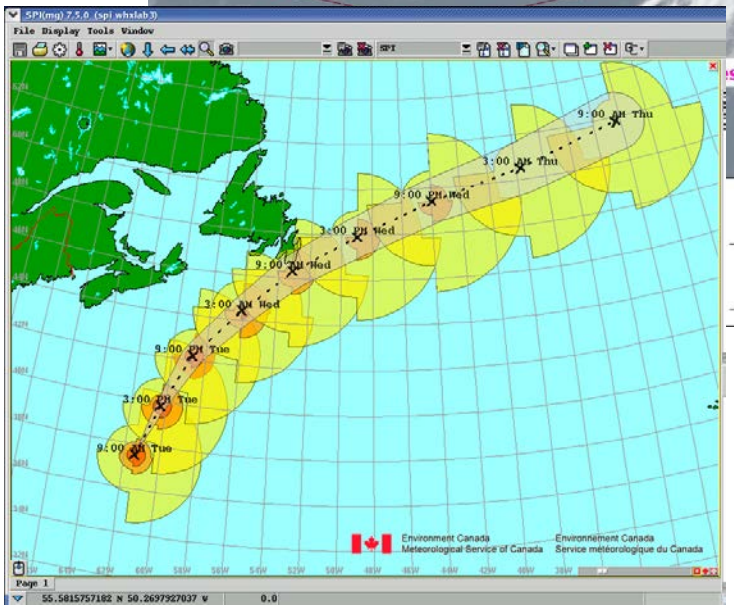
- About 35 different track models
- Some of these models will provide more than one possibility
- Some models simply do not apply under certain situations
- Some of the best models are not used in these plots

Operational Response to Hurricanes

New Experimental Tools

- Threat areas for rainfall and wind (and possibly other parameters) can be produced time permitting and made available to emergency managers
- Product will be internal for 2014 but will look at making it widely available in the future

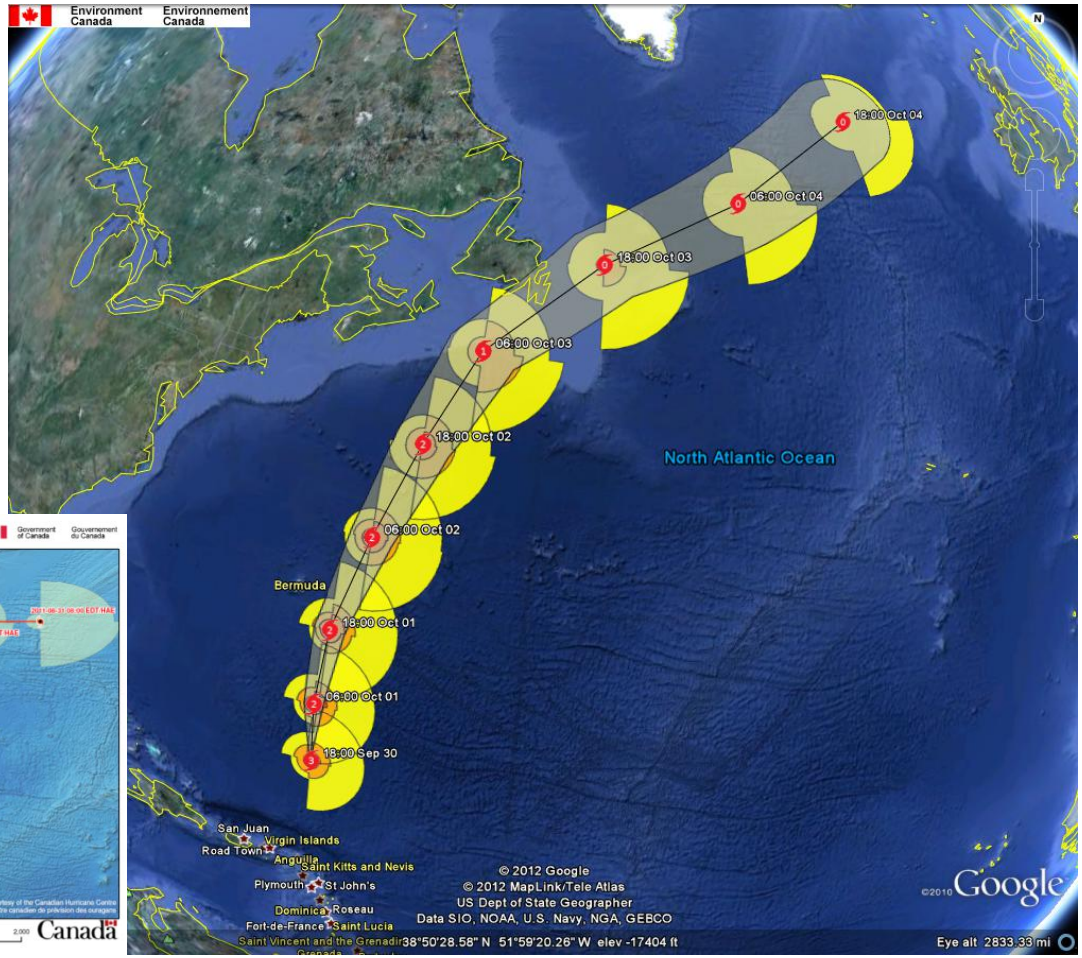


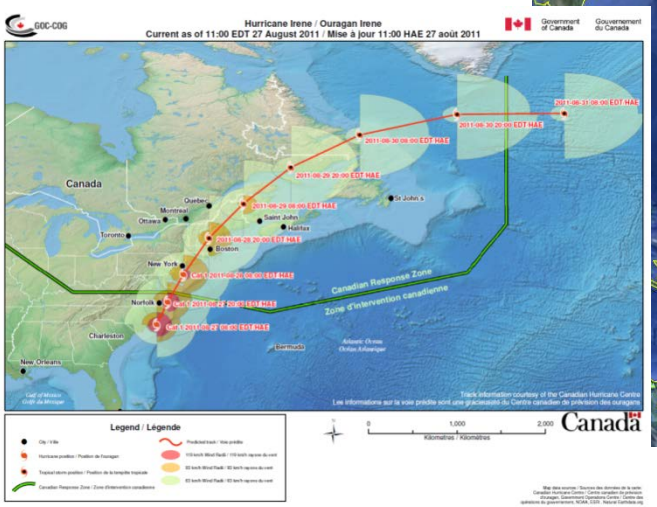


Operational Response to Hurricanes

New and Upcoming Tools

- Shape files are produced by the Canadian Hurricane Centre to be ingested into GIS applications
- Can also be viewed using Google Earth





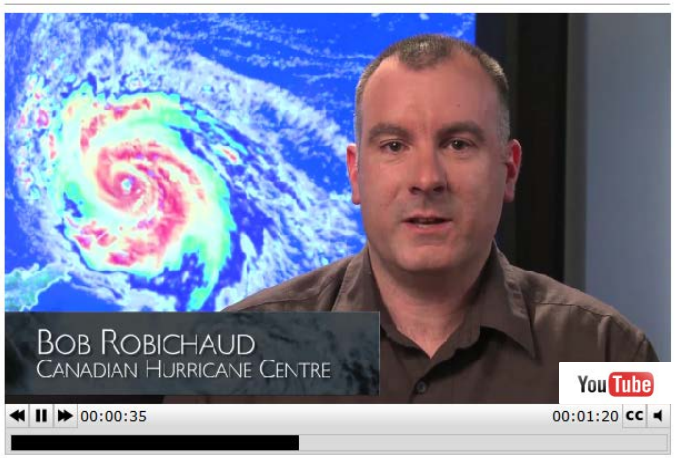
Operational Response to Hurricanes

Social Media

- Using Twitter more this year to point to updates in the hurricane status
- Experimenting with YouTube to post short updates on active storms approaching Canada

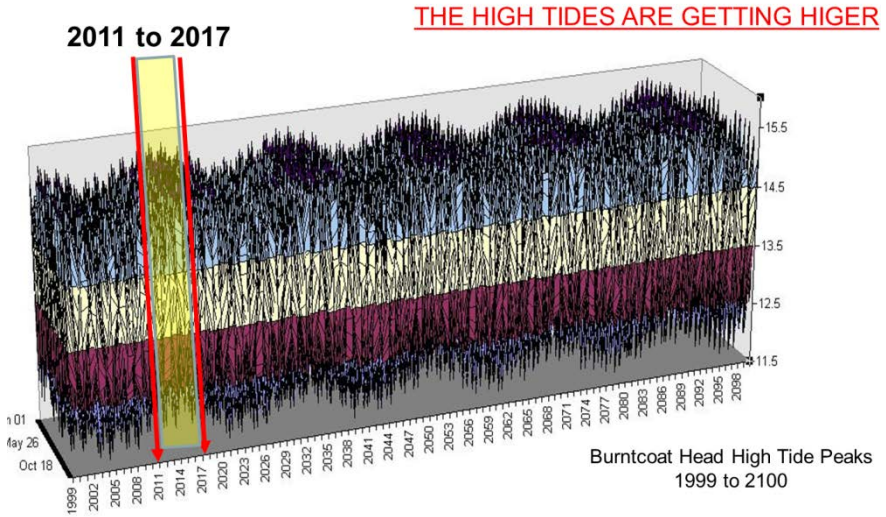
twitter

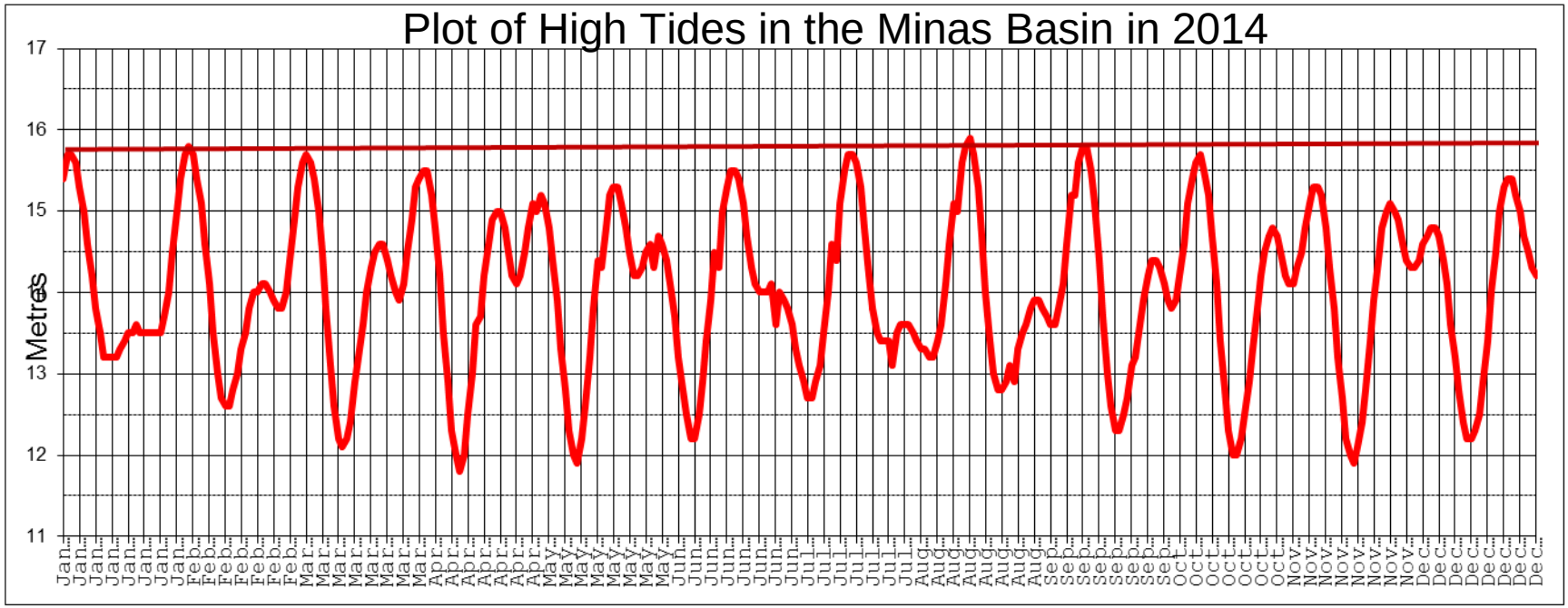
@environmentca



Tides during hurricane season

- As we are near the peak of the 19-year tidal cycle we are seeing record tides
- Record level tides occurred in early January and February of this year
- Those records will be broken once again in August





Tides during hurricane season

Photo: Randy Mosher

Tides during hurricane season

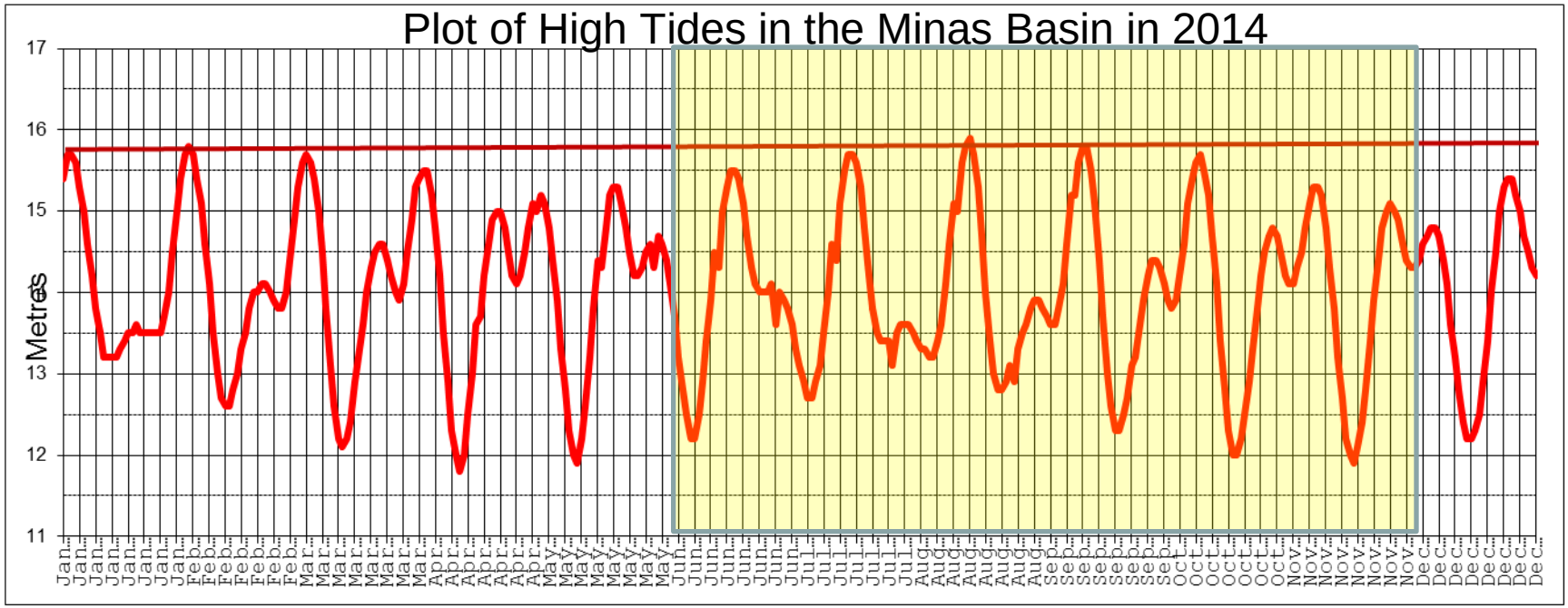
Photo: Randy Mosher

Tides during hurricane season

Should a storm surge producing hurricane approach during high tide this summer and fall the impacts could be more significant than they would normally be

Peak High Tide Dates this Season

- August 12th
- September 10th
- October 9th
- November 7th



….it only takes one storm!
Are you prepared?