

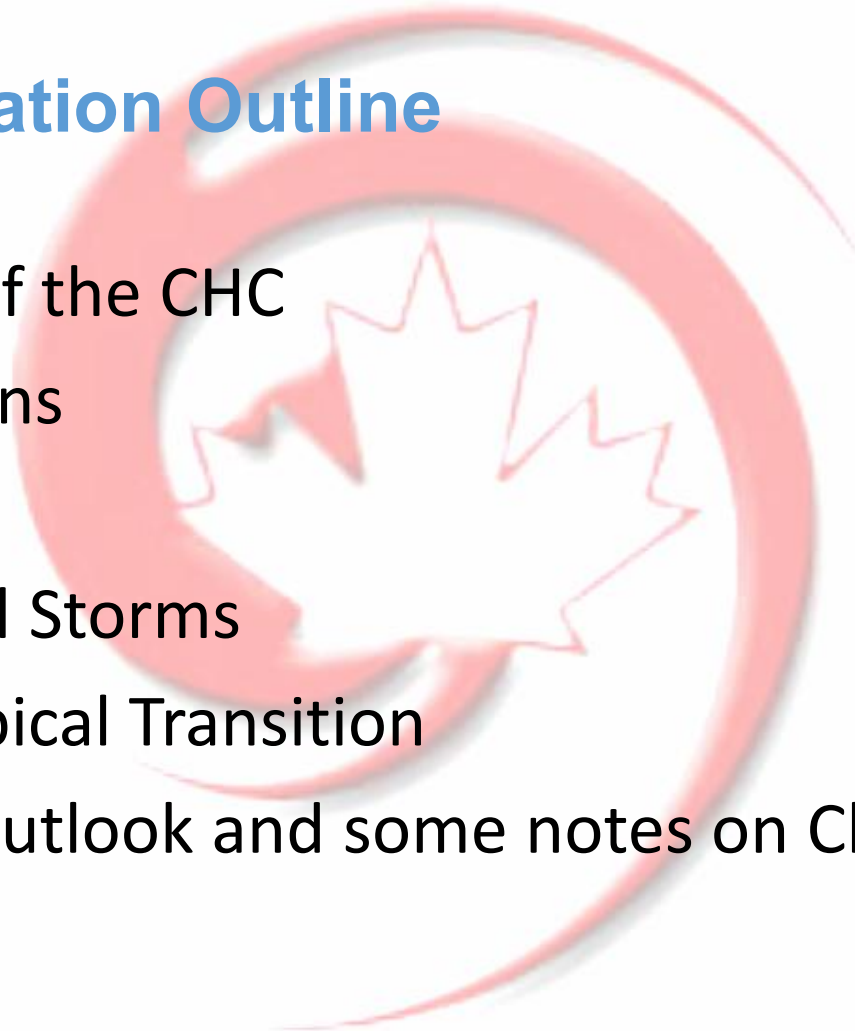
The Canadian Hurricane Centre: ***Forecasting and Operations***

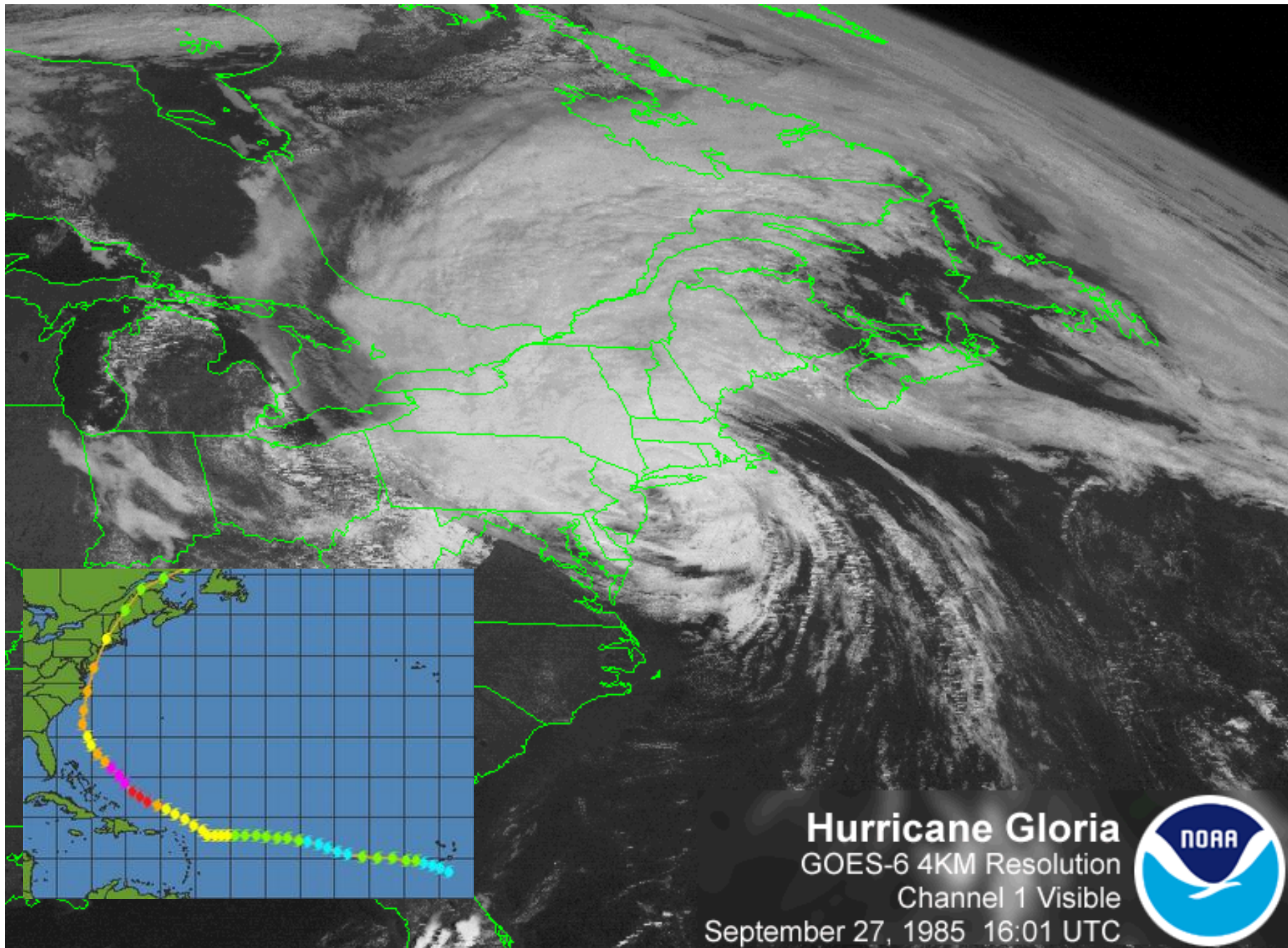
Dr. Chris Fogarty, Manager – Canadian Hurricane Centre (CHC),
Dartmouth, NS, Canada
ECCC/MSC



Presentation Outline

- History of the CHC
- Operations
- Products
- Historical Storms
- Extratropical Transition
- Season outlook and some notes on Climate Change





Hurricane Gloria

GOES-6 4KM Resolution

Channel 1 Visible

September 27, 1985 16:01 UTC



History – Early Years

- All started with Hurricane Gloria in 1985:
- Canadians had to rely largely on neighboring New England forecasts / newscasts
- Storm impact in Eastern Canada much less than anticipated
- Considerable confusion in the media / general public
- Canadians basically translated the destruction of the storm in the eastern U.S. into Canada
- Little understanding of the extratropical transition (ET) process
- Lead to creation of CHC – essentially a separate forecast desk and a group of forecasters trained in tropical met and ET

History – Post Gloria

- **1986** - Study on tropical cyclones in Canada was commissioned to determine basis for the CHC (*Barks and Richards*)
- Study used to establish the CHC 'Response Zone'
- **August 31, 1987** – EC established the CHC at the then Maritimes Weather Centre (MWC) (Bedford, N.S.)

Forecasters: *Abraham, Bowyer, MacAfee, MacDonald, Merrick*

- **September 25, 1987** – Very first CHC bulletins issued for Hurricane Emily

The very first CHC bulletin

Public Info Statement (Hurricane Emily 1987):

WPCN3 CWHX 260130

CANADIAN HURRICANE INFORMATION STATEMENT ISSUED BY
ENVIRONMENT CANADA AT 1030 PM ADT FRIDAY 25 SEPTEMBER 1987.

THE NEXT STATEMENT WILL BE ISSUED BY 0430 AM ADT.

HURRICANE EMILY WAS ESTIMATED TO LIE 1200 KMS OR 650 NAUTICAL
MILES SOUTH OF ST. JOHNS NEWFOUNDLAND ... 38.0N 56.0W ... AT 9 PM
ADT FRIDAY 25 SEPT. EMILY HAS BEEN MOVING TO THE NORTHEAST AT 74
KMH OR 40 KTS AND IS EXPECTED TO CONTINUE THIS MOTION FOR THE NEXT
24 TO 48 HOURS. THIS PLACES HURRICANE EMILY 780 KM OR 420 NAUTICAL
MILES SOUTHEAST OF ST. JOHNS AT 9 AM ADT SATURDAY 26 SEPT AND 1200
KMS OR 650 NAUTICAL MILES EAST OF ST. JOHNS BY 9 PM SATURDAY.

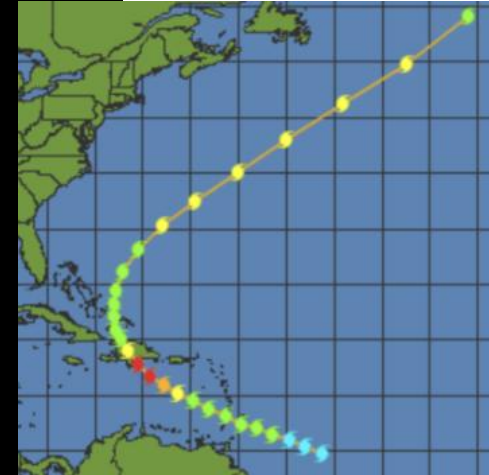
MAXIMUM WINDS OF 145 KMH OR 80 KTS ARE EXPECTED TO WEAKEN ON SATURDAY
AS EMILY MOVES TO THE SOUTHEAST OF THE SOUTHEASTERN NEWFOUNDLAND
MARINE AREAS BUT GALES ARE EXPECTED TO SPREAD INTO THOSE WATERS.

HEAVY RAIN ASSOCIATED WITH HURRICANE EMILY IS ALSO EXPECTED TO AFFECT
THE SOUTHEASTERN NEWFOUNDLAND MARINE AREAS ON SATURDAY.

CURRENT INDICATIONS ARE THAT EMILY WILL BECOME AN EXTRATROPICAL STORM AS
IT MOVES OVER COLDER WATERS ON SUNDAY.

FURTHER DETAILS ARE AVAILABLE IN THE REGULAR PUBLIC AND MARINE WEATHER
FORECASTS AND WARNINGS ISSUED BY ENVIRONMENT CANADA.

END RWH





CHC/ASPC Operations



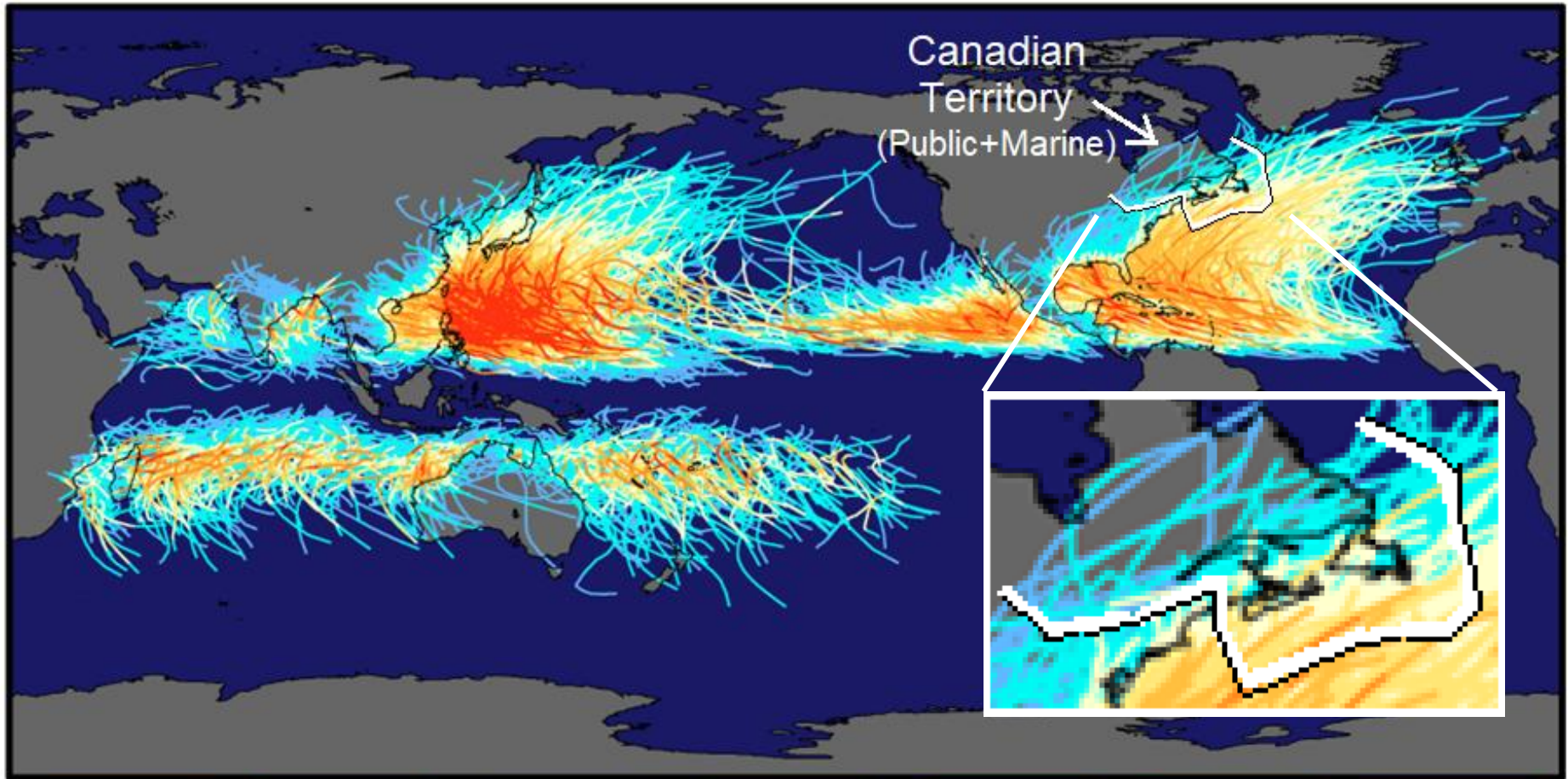


Main ASPC Operations area

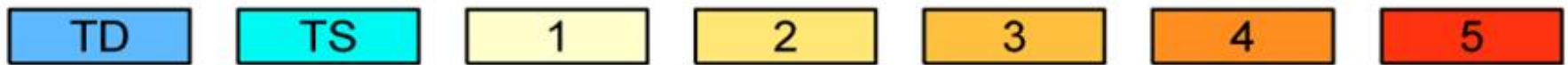
CHC desk

Close coord. occurs b/w ASPC and CHC side of the room - direct conversation / file sharing

~150 years of Global Tropical Cyclones

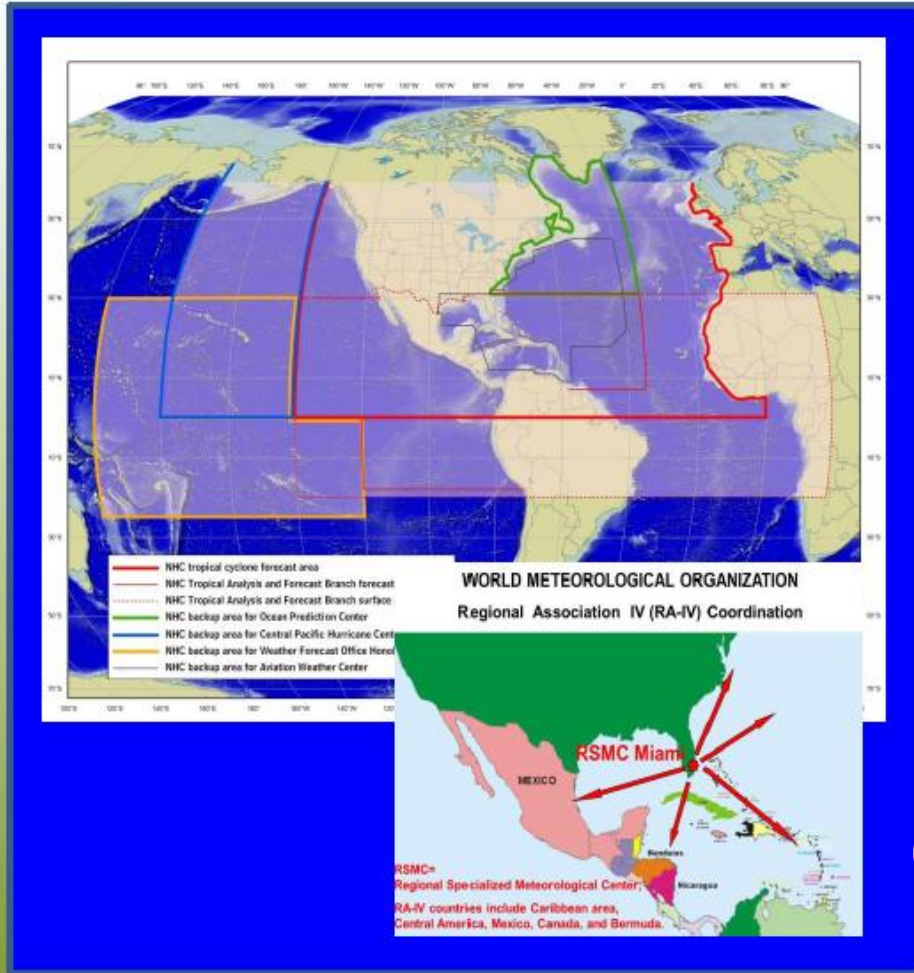


Canadian
Territory
(Public+Marine)

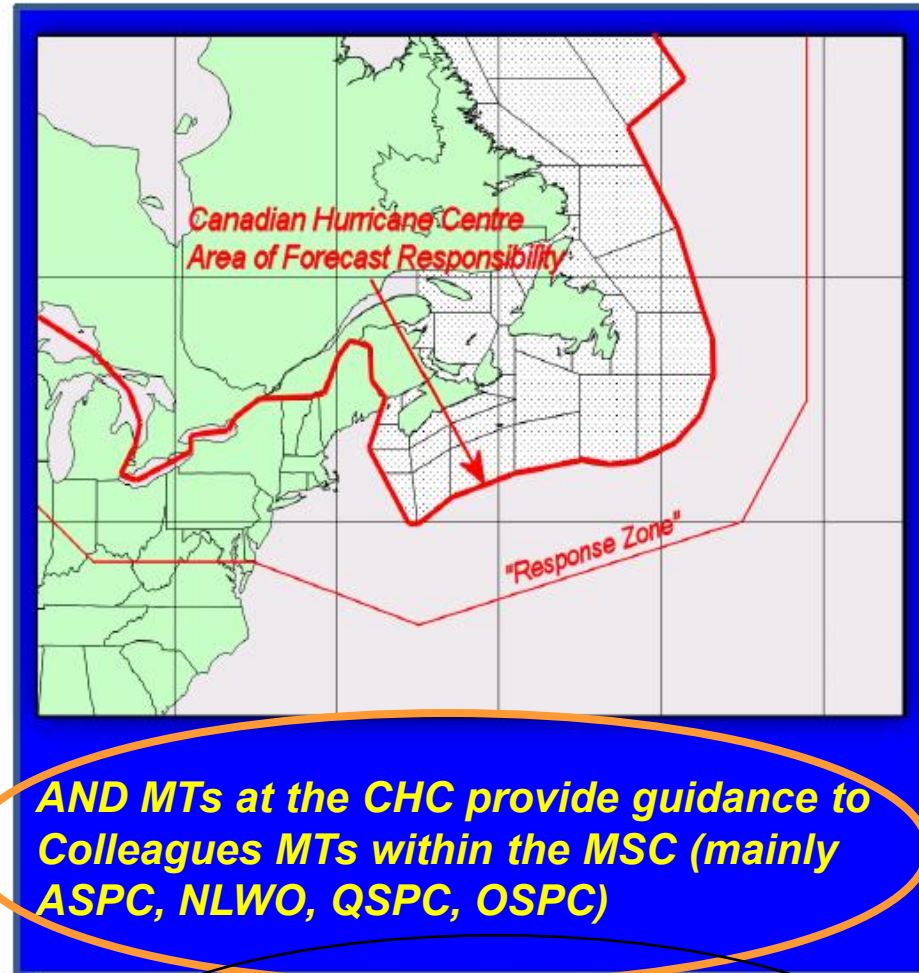


Saffir-Simpson Hurricane Intensity Scale

Operations at the Canadian Hurricane Centre

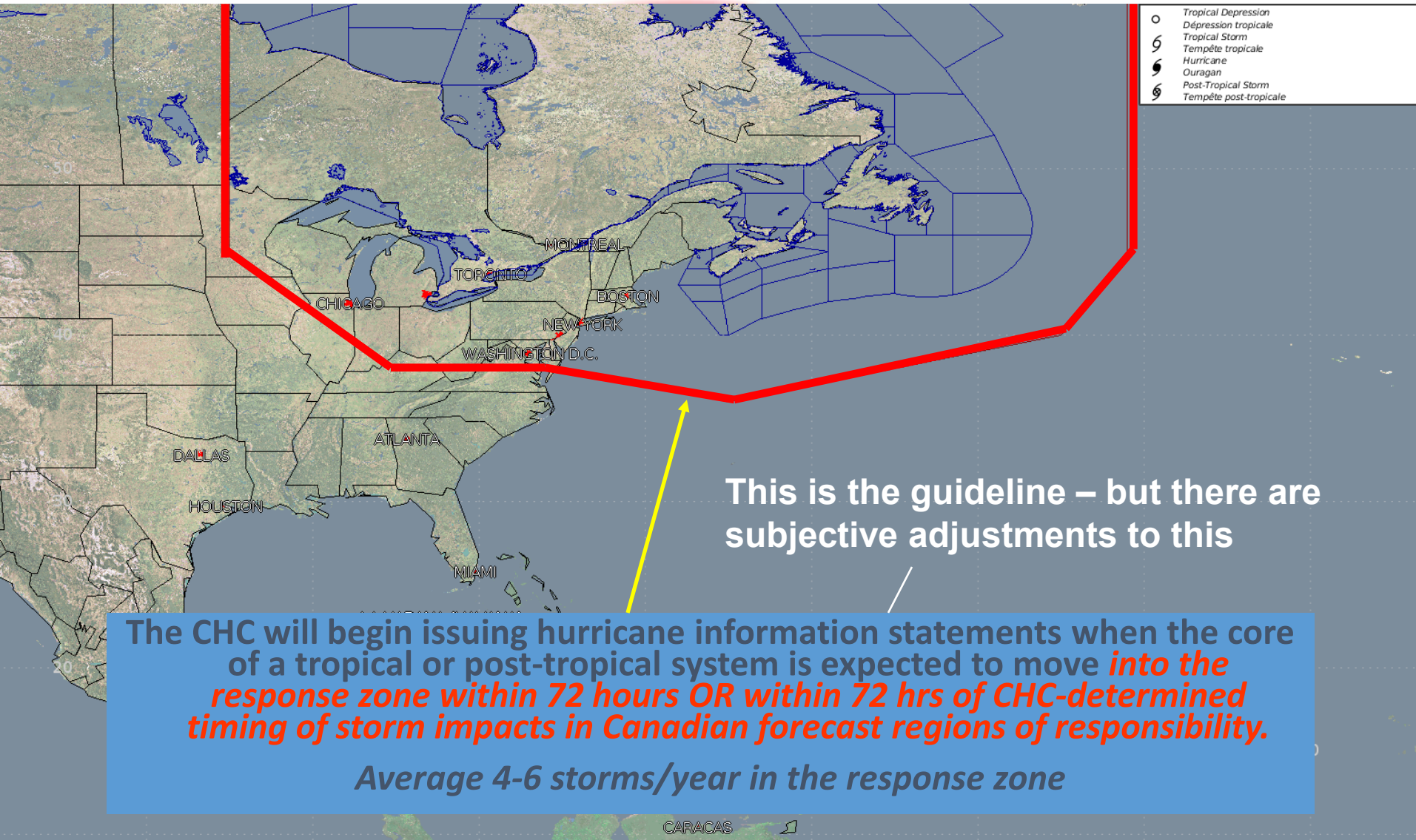


NHC is the Regional Specialized Meteorological Center (RSMC) for the WMO RA-IV

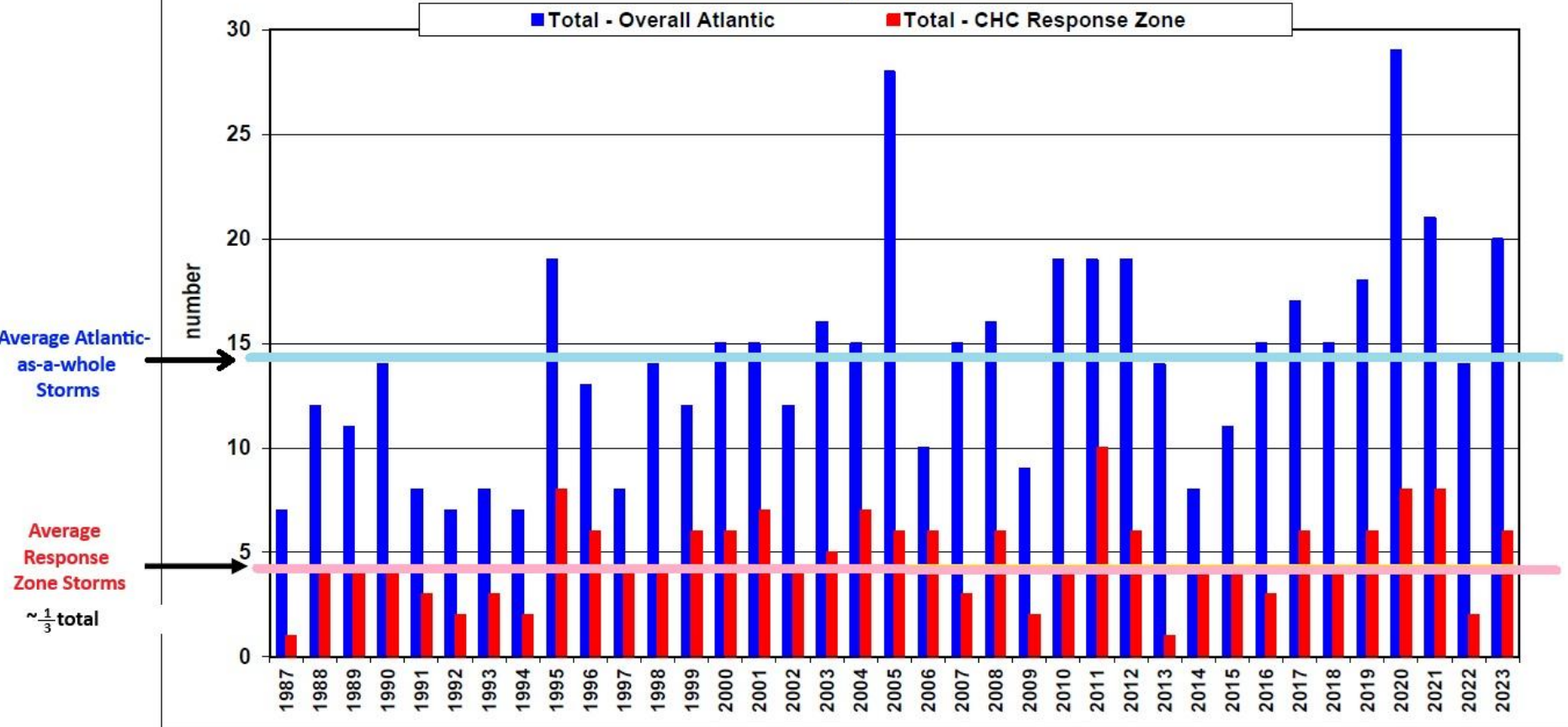


CHC provides Canadians with meteorological information on hurricanes, tropical storms and post-tropical storms

CHC “Response Zone” (RZ)



Number of storms each year in the Atlantic Basin and CHC Response Zone



Staffing at the CHC



1. CHC level-1 Forecasters – MT3 min (in training - OJT)
2. CHC level-2 Forecasters – MT3 min (trained, can work solo)
3. CHC level-3 Forecasters - typically MT5/6 and experienced 3s

Forecasters must have completed NHC-hosted WMO training (Miami) and in-house on-the-job training level 2.

Chris Fogarty – Program Manager
Steve Hatt – Reports, archivist/data steward
Jim Tirone – NinJo focal, media and training

Shifts on the desk 10Z-22Z / 22Z-10Z are on O/T basis and all work regular (ASPC) ops outside the hurricane season except the program manager

Functions of the CHC

- prepare and issue Canadian *Tropical Cyclone Information Statements* (WOCN31/41) to provide general information and guidance to all Canadians.
- prepare and issue Canadian *Technical (Prognostic) Information Statements* (FXCN31/41) to guide the **meteorological community**;
- prepare and issue *Tropical Cyclone Track Maps* to provide a graphical overview of all tropical cyclones in the North Atlantic;
- prepare *other tropical cyclone related-products*, such as watches/warnings as required, to satisfy the needs of the department or other MSC clients;
- provide *media interviews* on meteorological matters relating to tropical cyclones
- The program manager (Fogarty) or designate provides regular updates via *email communique and MS Teams*

CHC Products



WOCN31 – TC Information Statements

FXCN31 – TC Technical Statements

Track Maps – Web/DMS/GeoMET

WTCN31 – TS/Hurricane *Warnings*

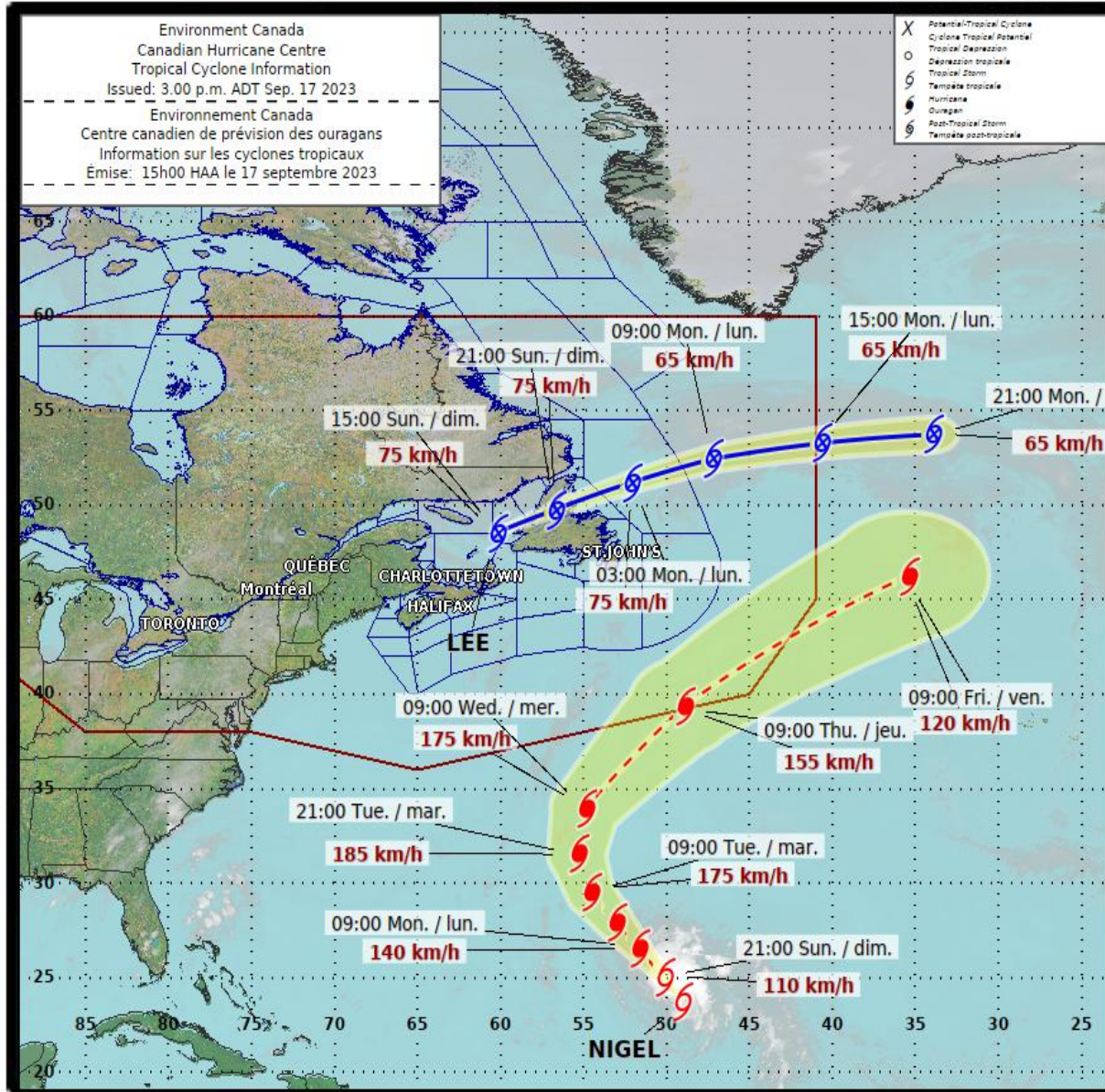
WWCN31 – TS/Hurricane *Watches*

In the rare case we have two concurrent storms, the bulletins will be the '32' series for the second storm

The WOCN31 applies to both public and marine zones

CHC Standard Products

Tropical Cyclone Track Map



- Tracks for all storms are displayed on the CHC hurricane track map

- Blue tracks are CHC-issued tracks

- Red tracks are NHC-issued tracks

Activities of the CHC

- Forecasters train at the National Hurricane Center in Miami
- In 2015 and 2017 Hurricane Hunter aircraft visited Halifax and Gander for public display/outreach event
- Monitor tropical activity throughout the Atlantic Ocean
- Storm-specific bulletins only issued on storms that are expected to have an impact on Canada or coastal waters
- Partner with Media and EM agencies



On average there is 1 severe event (>100 million \$ damages) every ~10-15 years
(Denoted with **red boxes** in the following slides)



Abnormally long gap of ~30 years = complacency

Impacts in Canada

Juan 2003



Chantal 2007



Florence 2006



Noel 2007



Gabrielle 2001



Hazel 1954

Impacts in Canada

Beth 1971



Bill 2009



Earl 2010



Dorian 2019



Igor 2010

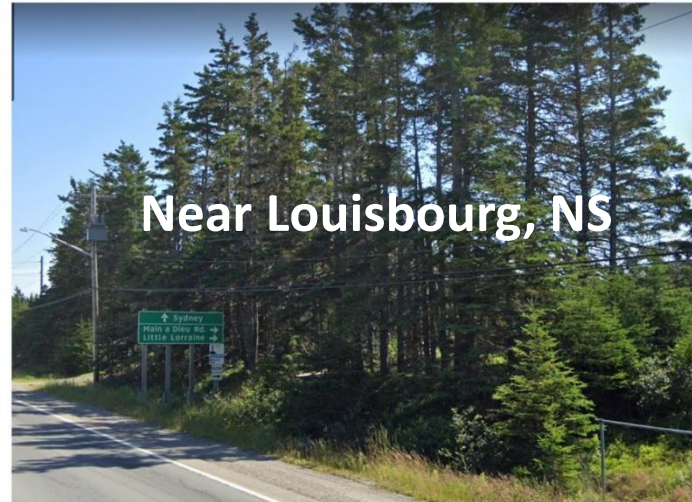
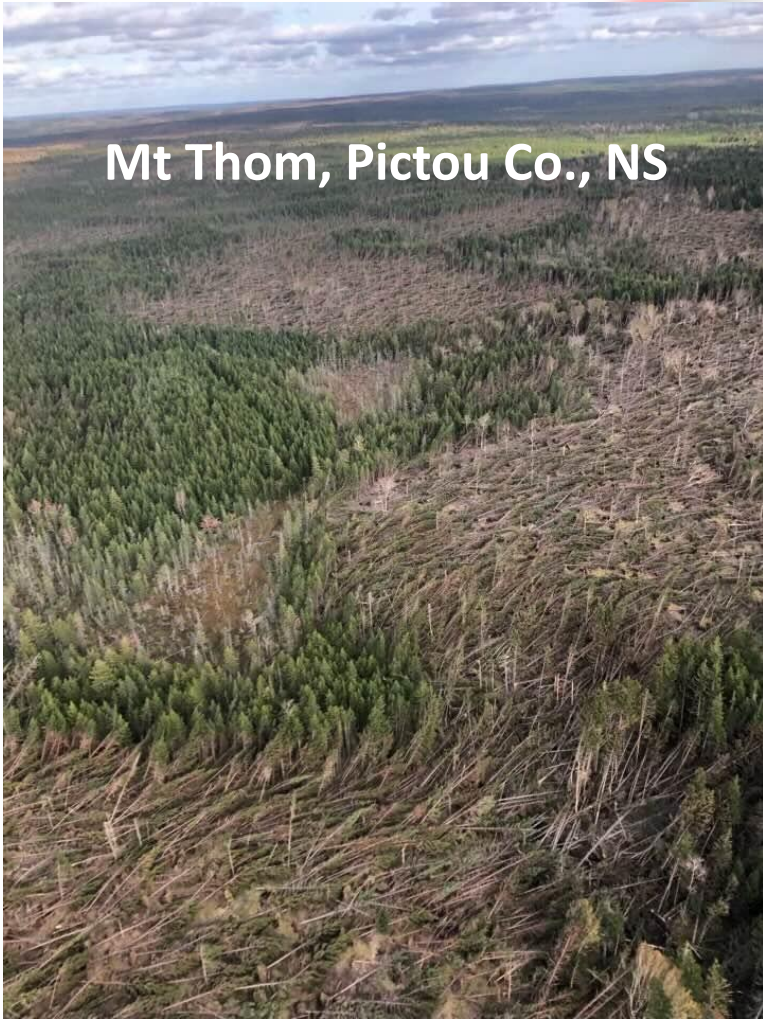


I.L.B.
Grand Bay-Westfield, N.B., residents look over the aftermath of Hanna. (Submitted by Harlwood)

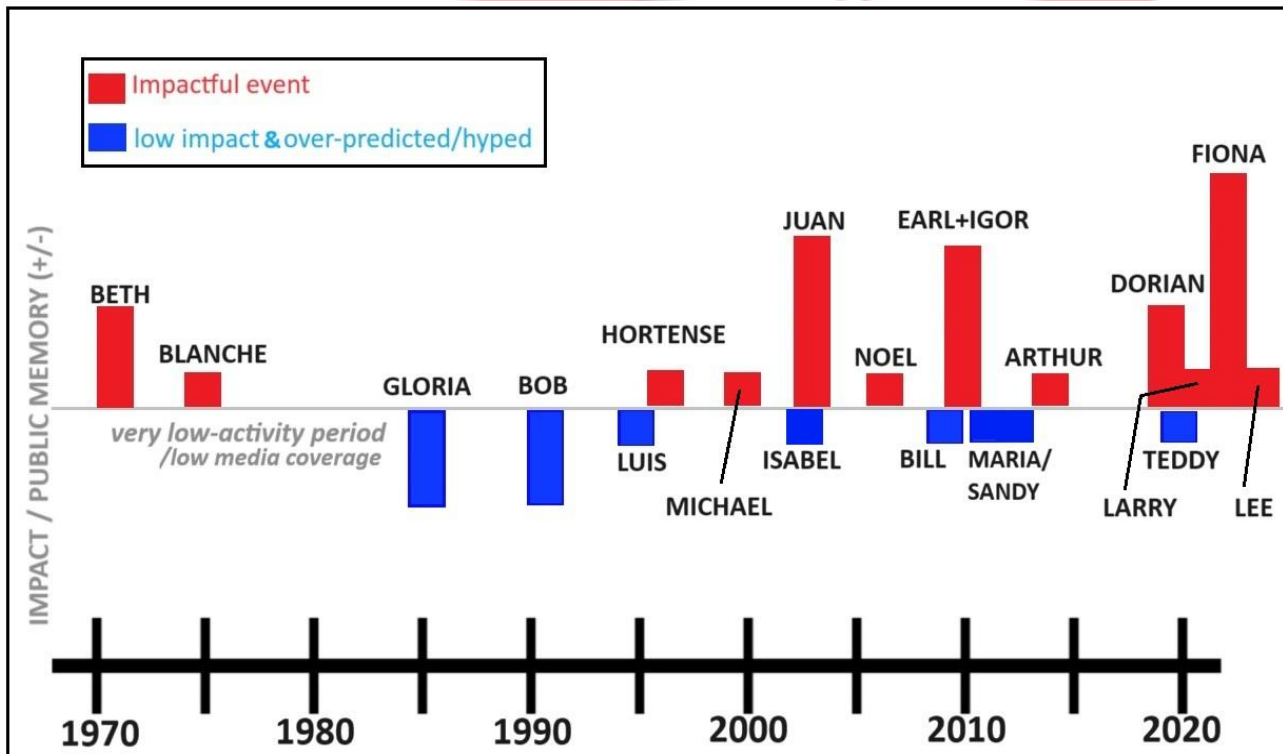
Hanna 2008

FIONA 2022





Storm History and Public Awareness



Subjective accounting of tropical cyclone events on public impression, awareness, memory over the past ~50 years in Atlantic Canada

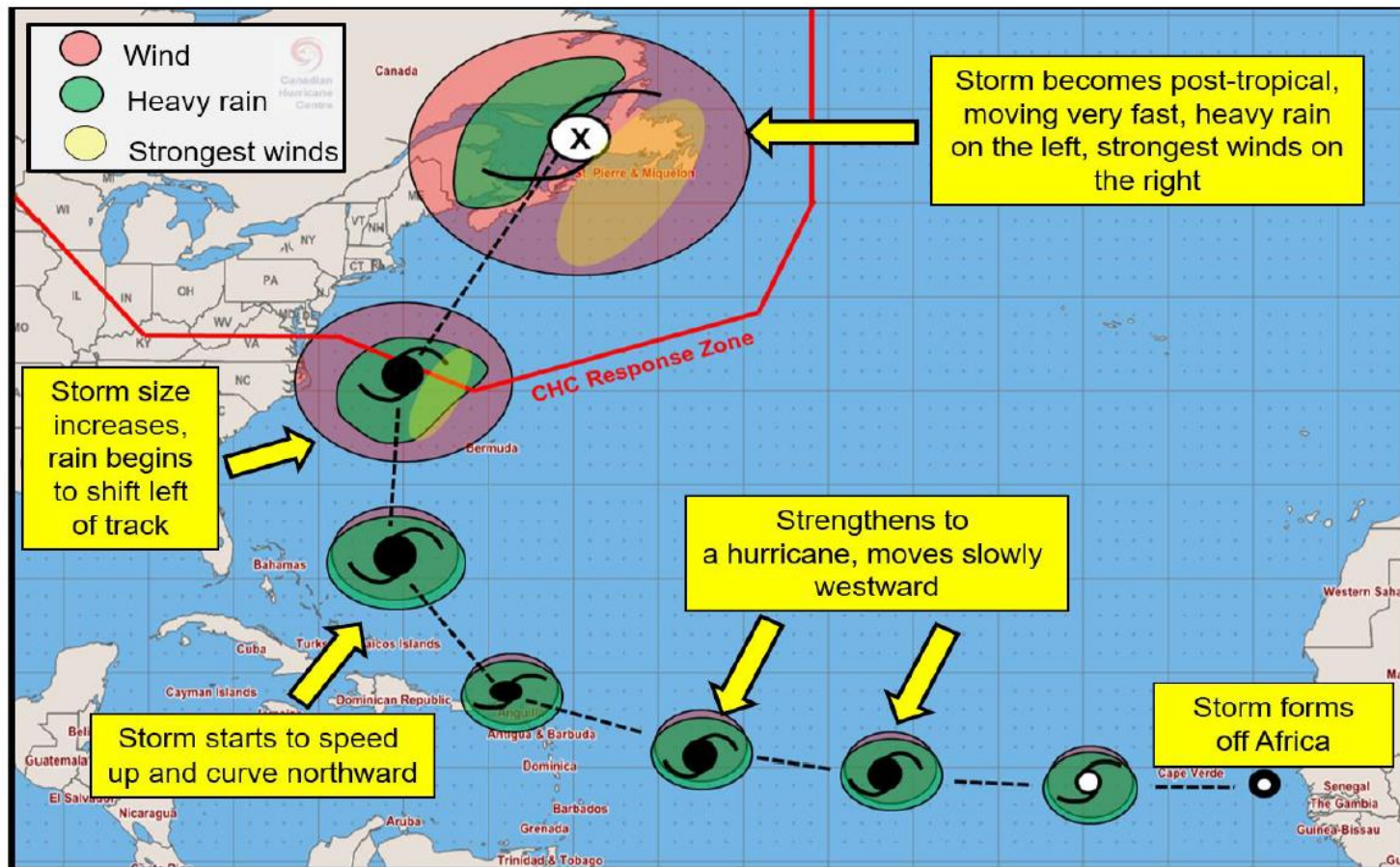
Just so happens that we (meteorologists AND public) have lots of recent experience with impacts

More red than blue means A more weather-aware / weather-ready nation

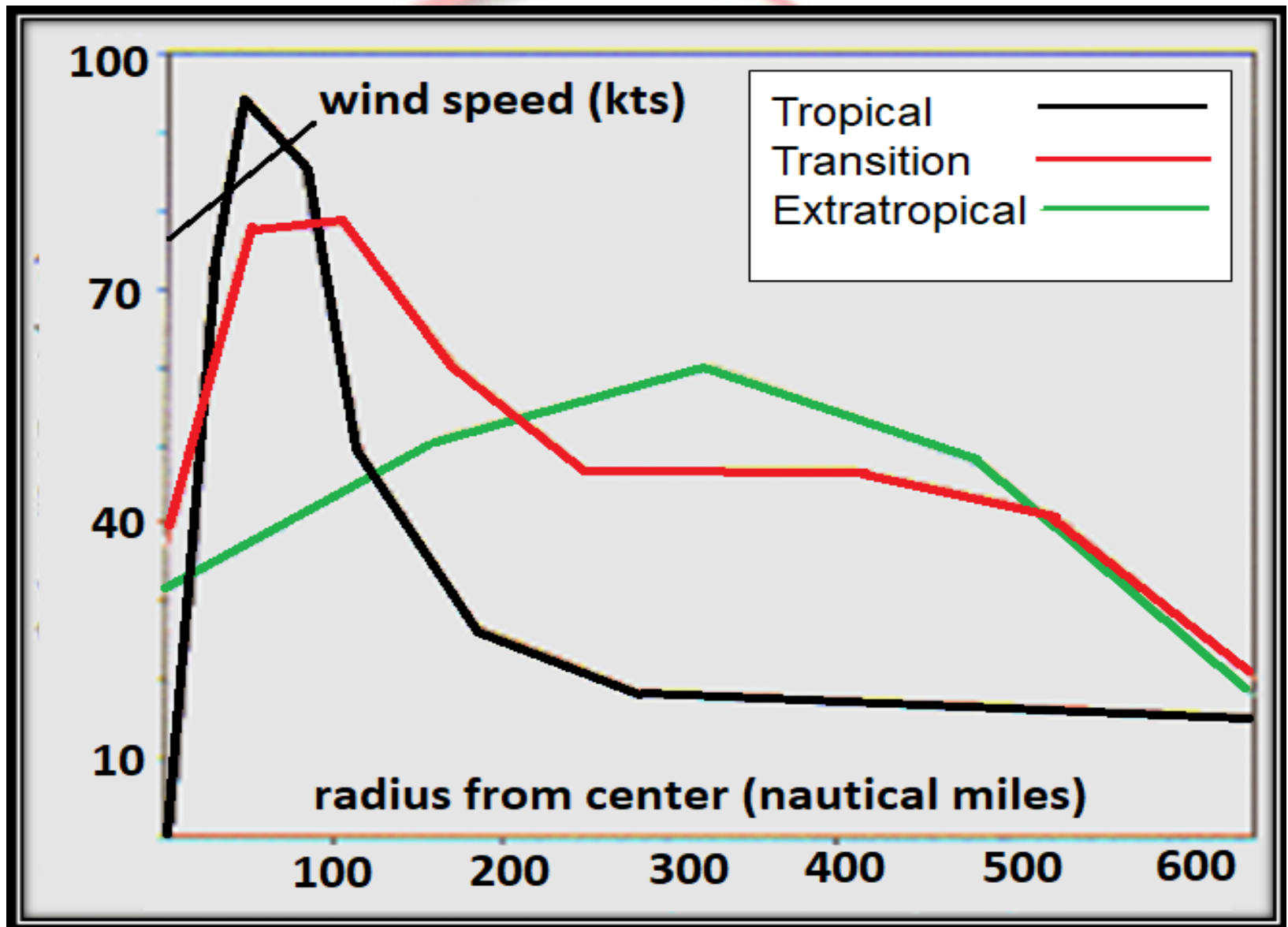
Extratropical Transition: CHC's Forecast Expertise

Extratropical Transition is simply a process whereby Tropical Storm transforms into an Extratropical Storm

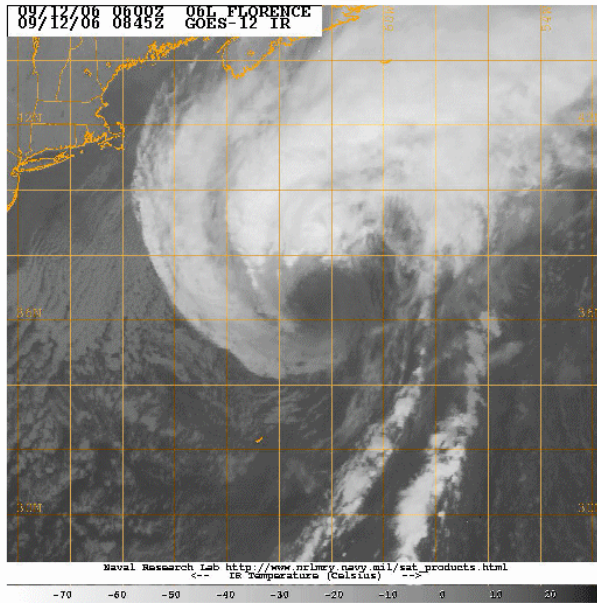
A Tropical Storm that has gone through and completed transition is called a Post-Tropical Storm



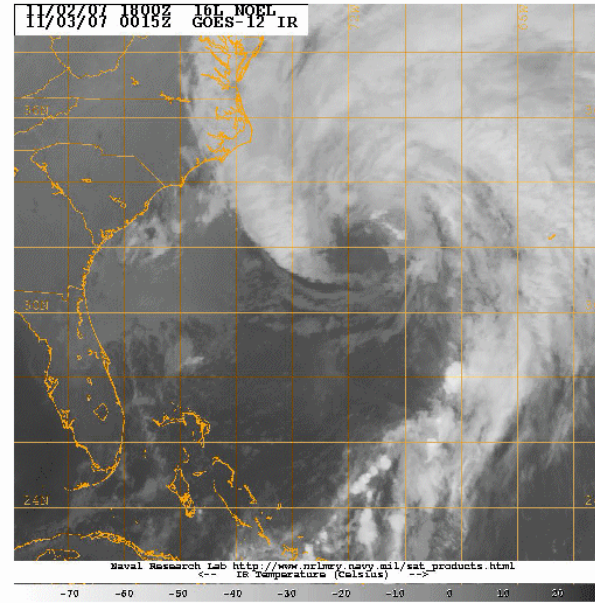
ET – wind profile evolution



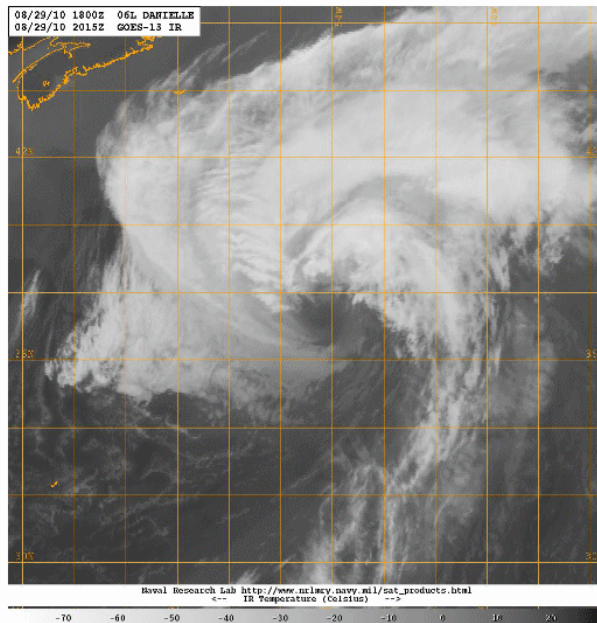
FLORENCE_2006



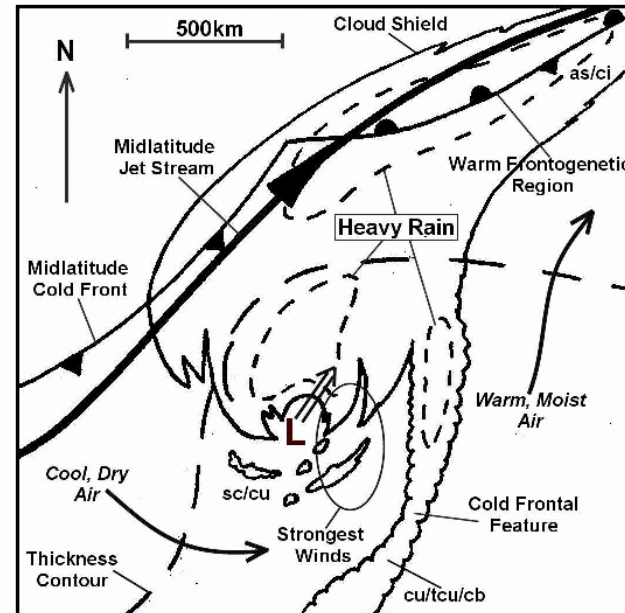
NOEL_2007



DANIELLE_2010



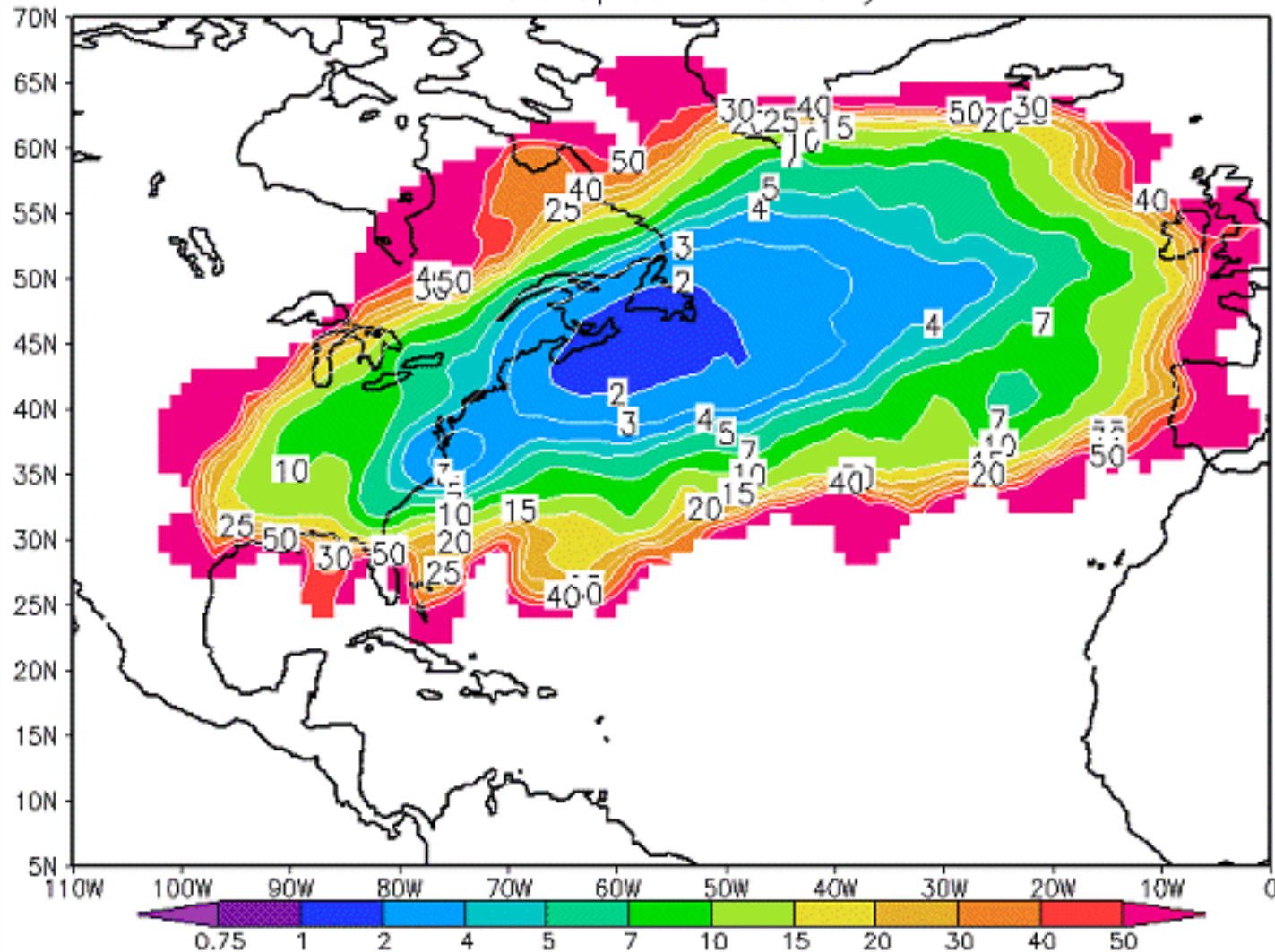
ET SCHEMATIC



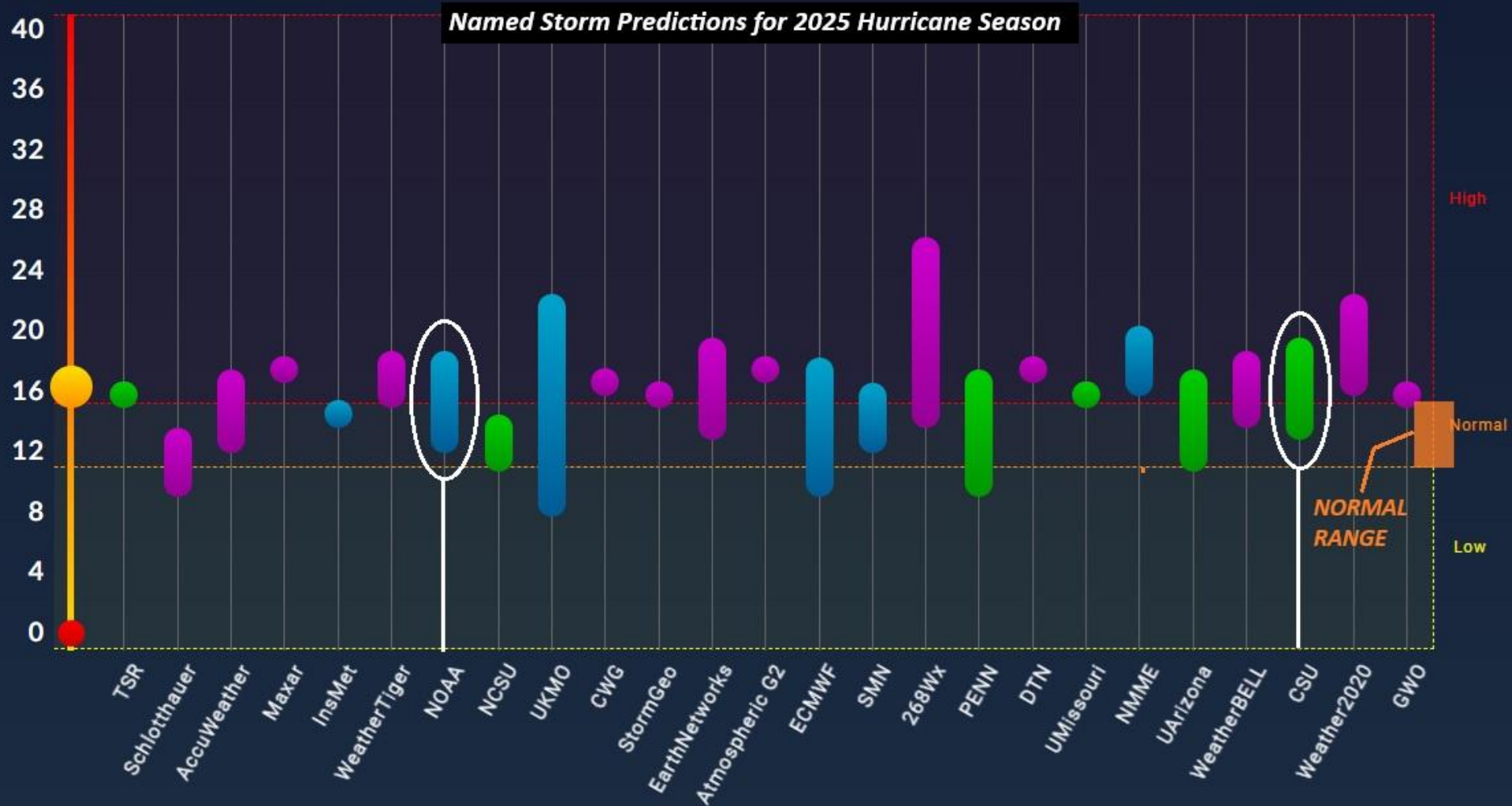
Climatology of Extratropical Transition (ET)

(Hart and Evans, 2001)

Tropical Cyclone Return Period (yrs):
Extratropical Phase Only



2025 season outlook



Climate Change: Effect on Impacts from Hurricanes in Canada

- Uncertain if there will be more hurricanes
- Consensus that the impacts will be worse.
Some factors:
 - Higher sea levels: worse coastal flooding
 - Warmer seas, more fuel, more intense storms
 - More moisture: worse freshwater flooding
 - Systems move more slowly: higher impacts

Tropical Summary (Aug 8 2014)

1:07 PM EDT (UTC) Tropical Summary

DATE: Thursday 8 Aug 2014

POST: 14:00 EDT (UTC)

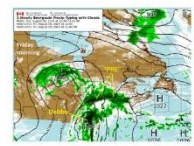
SYNOPSIS: The center of the broad circulation of Tropical Storm Debby will move northward along the Appalachians over the next couple of days while interacting with a non-tropical low pressure system to the south. There will eventually be a separation "OC" or heavy rain over southern OH and QC Friday morning - however as a disturbance **Windshear Control** in the Tropics - that will precede the region for more rain Friday afternoon into Friday night as the direct remnants of Debby move through. All messaging and alerts on this web weather complex can be accessed at <http://MetWeather.gc.ca/>. This is a **floating hazard event with one day zone of 24 hours of rain possible**. The CMC is retransmitting CMC's track of Debby which will likely be discontinued early Friday since the weather associated with it will no longer be attached to a single low center.

We will be monitoring an area of possible tropical cyclogenesis near west in the vicinity or just north of the Leeward Islands.



See CMC [Twitter](#) for occasional posts outside of storm events, including industrial alerts and information items

If you have questions, the best way to connect with me is via email or MS Teams. The CMC desk phone number (area 1) if you would like to have it on (R) can be used to speak with the duty forecaster but is only answered 0800LT the CMC desk is staffed.



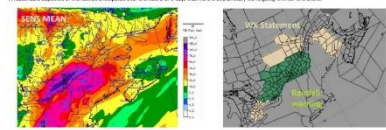
General Tropical Outlook

With National Hurricane Center Watch & Post outlook

<http://www.nhc.noaa.gov/wwp.shtml>

Other Guidance/Analysis

A reasonable depiction of the rainfall anticipated over the next 2 or 3 days that this is an area where we're going with for this event.



2 and 3 week outlook showing enhanced probability of storm formation in the tropical Atlantic (open period up to 7 Aug 2014) can be found below (it will update as more data comes in, 4-6 Aug 14)

<http://www.cmc.ec.gc.ca/forecast/atlantic/atlantic.html>

Staffing Impact

The CMC is closed with only Staff, Forecasting, and the NHC on some point on Friday as units given to Post Tropical. The CMC is not activated in 247 mode for this type of system, but the CMC Lead (2) is providing support both internally and externally.

Media Sites/messaging

Links of the open internet with it will bring heavy rain to parts of Eastern Canada Friday and into the weekend. The forecast rainfall is likely to be over the Laurentian north of Ottawa and Montreal.

See CMC [Twitter](#) for occasional updates or local CMC Twitter accounts.

General Information

Back issues of the tropical outlook can be found here: <http://tropical.atmos.ubc.ca/forecast/atlantic/atlantic.html>

Multi agency number of radio waves forecasts: <http://www.metlink.org/forecast/atlantic/atlantic.html>

You can get an instant summary of the outlook as it evolves at the following link: <http://www.cmc.ec.gc.ca/forecast/atlantic/atlantic.html>

Hurricane season runs from 1 June to 30 November.

Chris Fogarty Ph.D.

Tropical Weather Forecasting
 Lead Forecaster
 4800 Billings Road
 Downsview, Ontario M3J 1K6
 416-947-2344 ext. 2344
 Fax: 416-947-2344
 Government of Canada / Gouvernement du Canada

Partners/Collaborators e-mail summary

- About once weekly during hurricane season
- Many on the distribution list including some JMC and METOC (see below)
- STRICTLY INTERNAL

- EC.SMDCMISuperviseur-DWSJMCSupervisor.EC@ec.gc.ca
- mtmetochalifax-metochalifaxmt@ec.gc.ca

- Additions?

Canadian Hurricane Centre Contact Information

Non storm events / off season:

Chris Fogarty, CHC Manager, ~**9am-5pm** Atlantic

email: chris.fogarty@ec.gc.ca (preferred for initial contact)

(I can provide appropriate Warning Preparedness Meteorologist contact depending on province impacted by event)

Storm events - primetime:

Fogarty, ~**7am-10pm** Atlantic - **902-222-0358** email chris.fogarty@ec.gc.ca

Storm events - overnight:

CHC Ops Desk, **10pm-7am** Atlantic - **902-[unlisted]** or email F.prev.CCPO-CHC.fcstrs.F@ec.gc.ca (only during those hours please – otherwise, Fogarty likely quicker and can triage)