Newfoundland and Labrador Hurricane Season Outlook 2020

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Table of Contents

Table of Figures

1.0 Atlantic Hurricane Season Outlook 2020

June 1st marks the beginning of the Atlantic hurricane season. Although the season stretches for the period between June 1st to November 30th, hurricanes and tropical storms can form prior to or beyond that period. Nevertheless, the season's climatological activity peak occurs around September 10th each season.

There are numerous sources of weather data used in this hurricane outlook. The major sources are based on the prediction of the ENSO condition, sea surface temperatures (SSTs) model prediction, and weather patterns. The ENSO condition forecast has limited long-range skills. Models also have limited long-range skill in predicting SSTs, vertical wind shear, moisture availability, stability, and predicting weather patterns. The seasonal weather pattern prediction is an outlook to an overall season, but it does not convey the daily and weekly changes in the pattern. The short-term variability in the weather pattern plays a major role in development, intensification, and track of tropical storms and hurricanes. Furthermore, the intensity and duration of the predicted tropical storms and hurricanes can occur under different combinations of climatic signals, which amplifies the uncertainty of such predictions.

Several agencies issue an Atlantic hurricane season outlook, including the National Oceanic and Atmospheric Administration (NOAA), Colorado State University (CSU), and the University College London (UCL). The NOAA's 2020 Atlantic Hurricane Seasonal Outlook predicts a most likely above-normal season (60%), followed by a 30% chance of near-normal season and a 10% chance of a below-normal season. Colorado State University (CSU) predicts above-normal activity. It is worth noting that the NOAA and CSU use a 30-year (1981-2010) based-climatology. Meanwhile, the University College London (UCL) predicts that the 2020 Atlantic hurricane season is expected to be 25% above the long-term (1950-2019) normal and 5-10% above the recent (2010-2019) ten-year normal. Table 1 below summaries the prediction from each source.

Table 1. Atlantic basin 2020 hurricane forecast by NOAA, CSU, and UCL.

	NOAA	CSU	UCL
Named Storms	13-19	16	16
Hurricanes	6-10	8	8
Major Hurricanes	3-6	4	4

The El Niño-Southern Oscillation (ENSO) is a measure of the SST anomaly in different Niño regions in the equatorial Pacific, as seen in Figure 1. The neutral phase is determined when the Niño 3.4 region is within ±0.5 °C. La Niña and El Niño are terms used when the Niño 3.4 region is in the negative and positive phases, respectively.

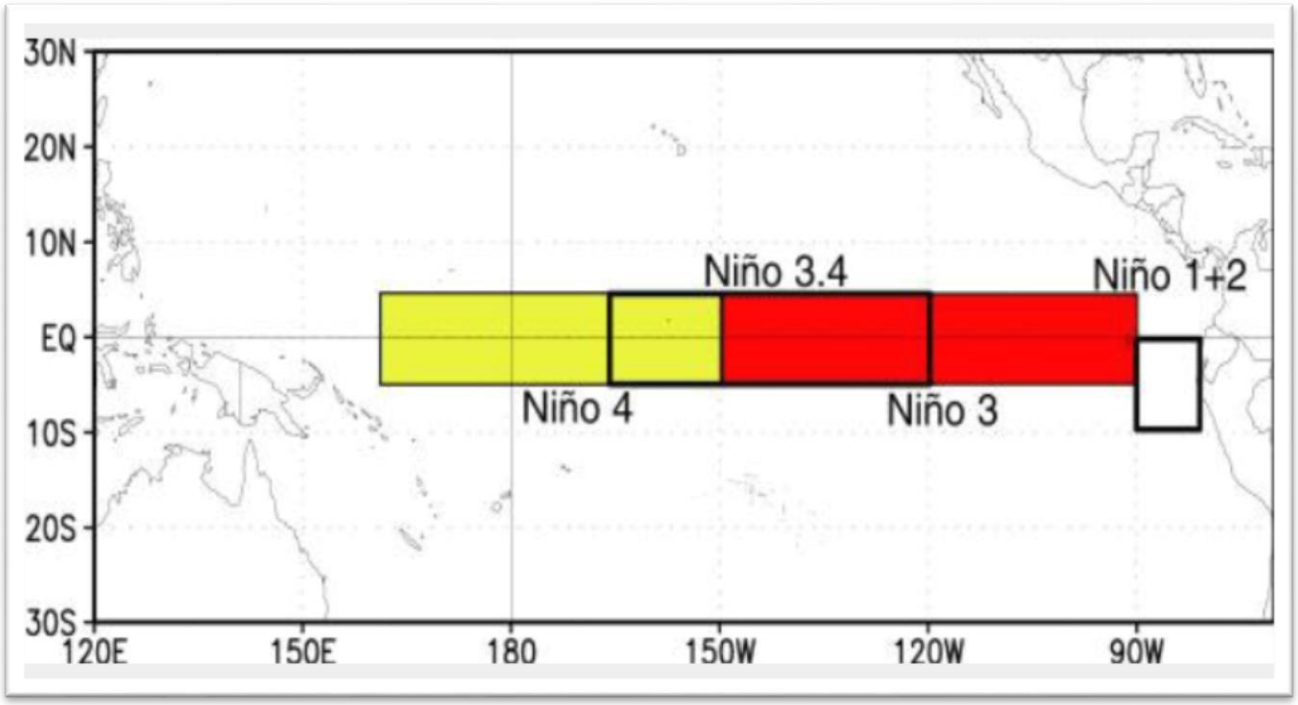


Figure 1. Nino Regions.

The La Niña phase is climatologically associated with weaker vertical wind shear, weaker trade winds, and increased atmospheric instability across the Atlantic basin, which in turn helps the overall organizational structure of any tropical storm. Meanwhile, the El Niño phase suppresses storm organization due to stronger wind shear, stronger trade winds, and greater atmospheric stability across the Atlantic basin. It is also worth noting that both ENSO phases have opposite effects on the Pacific and Atlantic basins.

Figure 2 shows the probabilistic ENSO forecast based on the Niño 3.4 SST anomaly. The figure shows that Neutral ENSO conditions are more favourable through part of this summer, but the uncertainty in determining the Niño 3.4 SST phase increases as we head into fall. The figure shows the probability of Neutral conditions decreases this fall with an increasing chance of La Niña or El Niño conditions. Although the end of the hurricane season still favours Neutral conditions, there exist equal chances of both opposite phases to occur. This is an indication of model uncertainty.

Most of the ENSO models are favouring Neutral ENSO conditions for this summer with a wider uncertainty envelope for this fall. This trend is reflected in the above-normal Atlantic basin hurricane season activity discussed earlier.

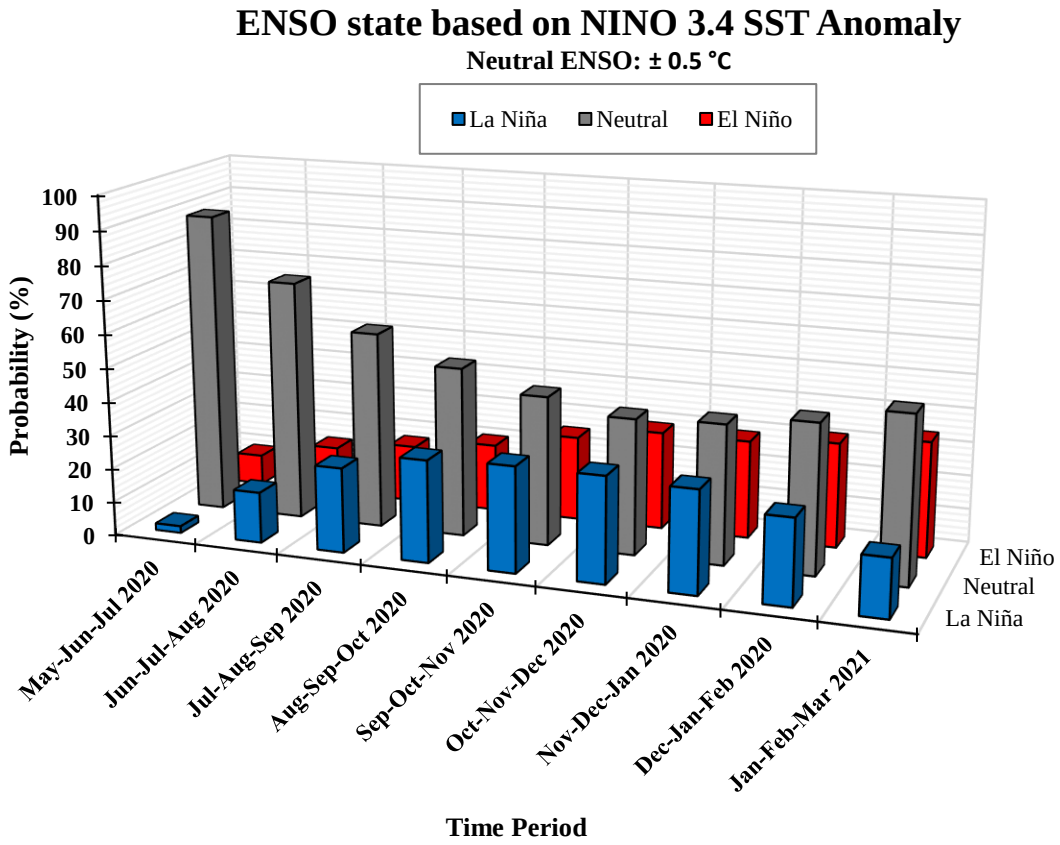


Figure 2. ENSO Probability Forecast (©IRI/CPC).

Hurricane season predictions consider the various and complex interactions of intra-seasonal variables such as the ENSO and Atlantic Multidecadal Oscillation (AMO), Madden-Julian Oscillation (MJO), mid-level moisture, and Atlantic sea level pressure and upper air patterns. The MJO is an index that measures the variability (1 to 3 months) in the tropical atmosphere. The AMO is a model that measures the decadal SST variability in the Atlantic basin. The current positive phase of the AMO (above normal SST in the North Atlantic) is conducive to lower surface pressures and moist atmospheric mid-levels over the tropical Atlantic.

The latest SST observation (Figure 3) shows a gradual warming trend in the tropical Atlantic, near the Main Development Region (MDR), 10-20 °N, and 60-20 °W (red boxes). The figure also shows warming within the Atlantic tropics between April 30th and May 23rd. Such relatively warmer temperatures are expected to be associated with moister mid-levels and lower surface pressure in the tropical Atlantic, which in turn increases the formation of tropical cyclones. The slightly warmer anomaly in the tropical Atlantic correlates with a weak positive phase of AMO. There is some disagreement between the agencies on the AMO phase, given that the colder SSTs in north Atlantic, near Newfoundland, are usually more associated with the negative phase of the AMO, as noted by CSU.

The increased cooling trend in the mid-Atlantic basin is of interest, especially in the main Canadian Bioregions. This could be attributed to the combination of the strength of the Labrador Current and the cooler air temperatures that affected Atlantic in late May. Concurrently, there is an increase of SST in the same region due to the Gulf Stream. Historically, the cooling trend in the Canadian Bioregions is likely to subside by July-August and be replaced with warmer SST. The current below-normal SST in the Canadian Bioregions is likely to negatively affect any tropical activity or storm intensifications in Atlantic Canada for the time being.

Figure 3 also shows the below-normal SST anomaly in the Niño 3.4 region can also be noticed in Figure 3 (purple boxes) between April 30th and May 23rd. But it should be noted that this trend is not stable, rather perturbed at the current time due to the upwelling process in the Niño 1+2 (Figure 1).

Figure 3 also shows a slight cooling trend in the Gulf of Mexico. This trend is likely due to the weather patterns affected that area during May that brought an ample amount of precipitation.

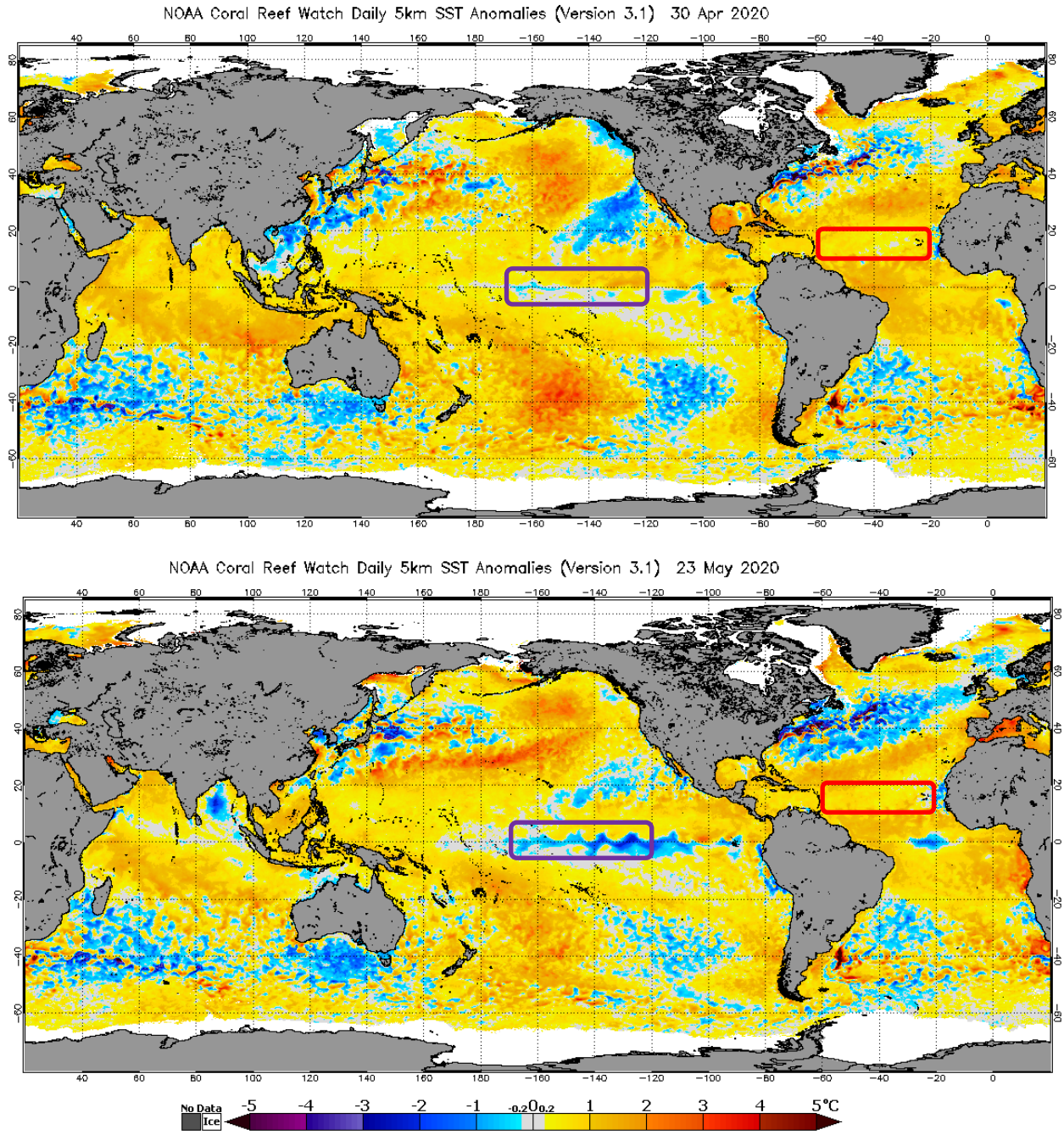


Figure 3. Global SST Anomaly on April 30th (above) and May 23rd (below), 2020. The red boxes show the MDR region and the purple boxes show the Niño 3.4 region (©NOAA).

The latest models are consistently showing warmer SST anomaly in the MDR region and drier conditions across the southern African Sahel region throughout this fall. Perhaps the only exception is the few wet periods across the southern African Sahel Region in July and part of August. Although the warmer SST can fuel thunderstorms clusters, which could eventually lead to tropical storms, below-normal precipitation in the southern African Sahel Region can deter the development of troughs that ultimately aid in storm development off the coast of Africa.

The Wood Seasonal Outlook Team is anticipating an above-normal Atlantic Hurricane Season. The anticipated SST perturbation in the Niño 3.4 region is likely to bring a noticeable monthly variation to the tropical wave activity. The Team also predicts that the main threat of tropical storm development would be on the western Atlantic and the Gulf of Mexico. Such storms are likely to develop and be fueled by the weather patterns and anomalous warmer SSTs, respectively.

2.0 Historical Newfoundland and Labrador Hurricane Season

The archive records from the National Hurricane Centers and the Canadian Hurricane Center records show Newfoundland being impacted by a higher number of tropical storms than Labrador, as seen in Figure 4. The figure shows the frequency of tropical storms by year for Newfoundland and Labrador between 1901 and 2019.

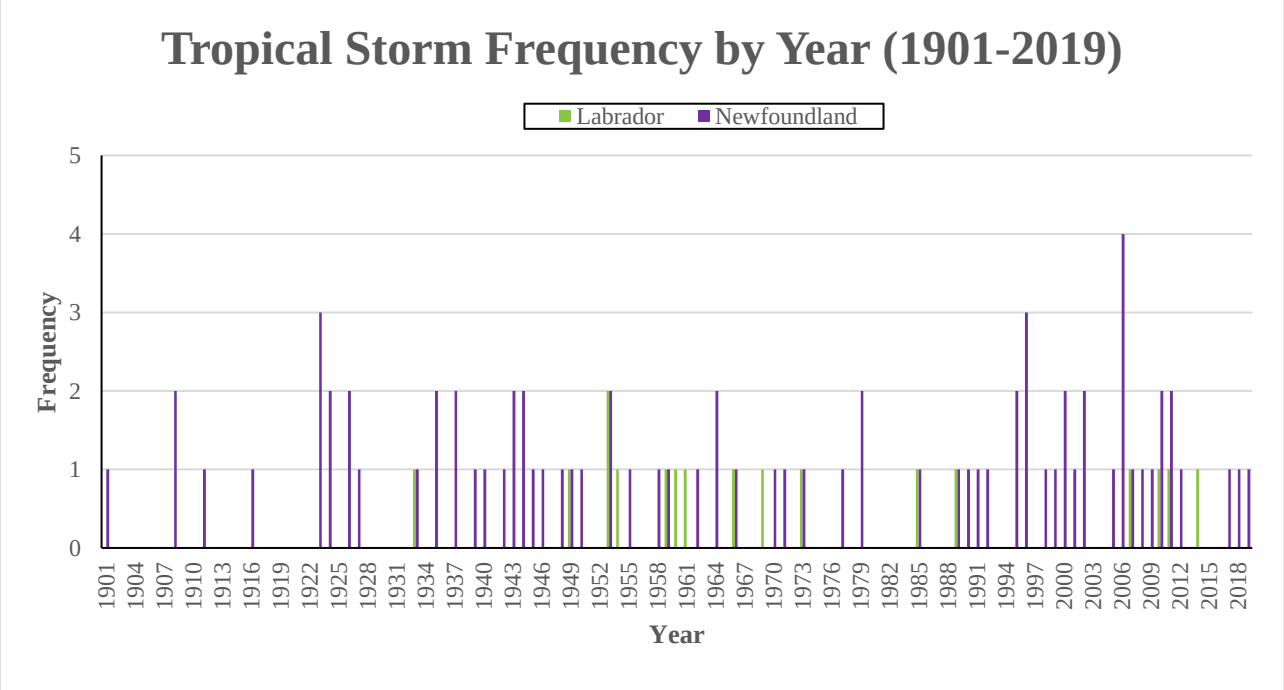
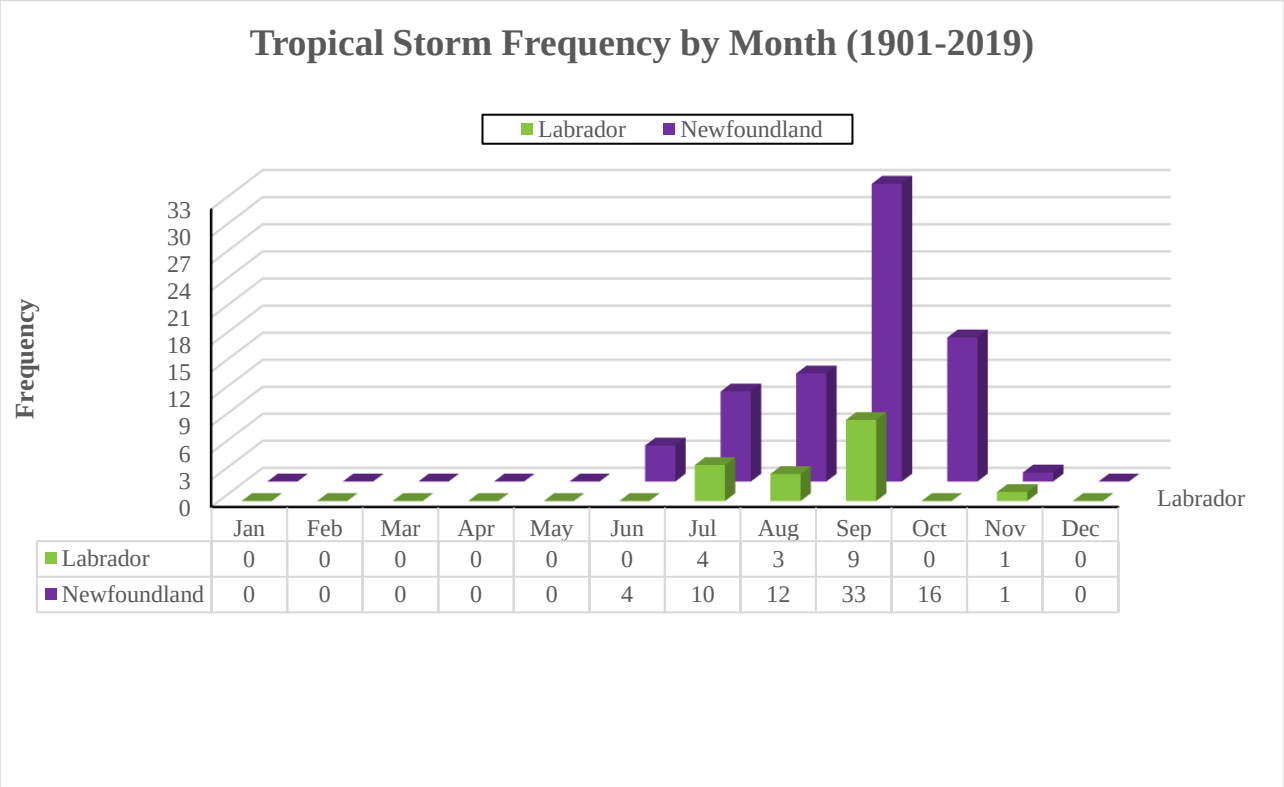


Figure 4. Tropical storm frequency by year for Newfoundland and Labrador between 1901 and 2019.

The same records reveal the month of September as the peak month for tropical storm activity, followed by October (Figure 5).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Labrador	0	0	0	0	0	0	4	3	9	0	1	0
Newfoundland	0	0	0	0	0	4	10	12	33	16	1	0

Figure 5. Tropical storm frequency by month for Newfoundland and Labrador between 1901 and 2019.

Figure 6 shows the Florida State University (FSU) probabilistic tropical cyclones trekking over Newfoundland using 1886-2016 historical data. Storms that affect Newfoundland most regularly approach from the south-southwest and generally pass near or west of Bermuda before arriving on the Newfoundland Coast.

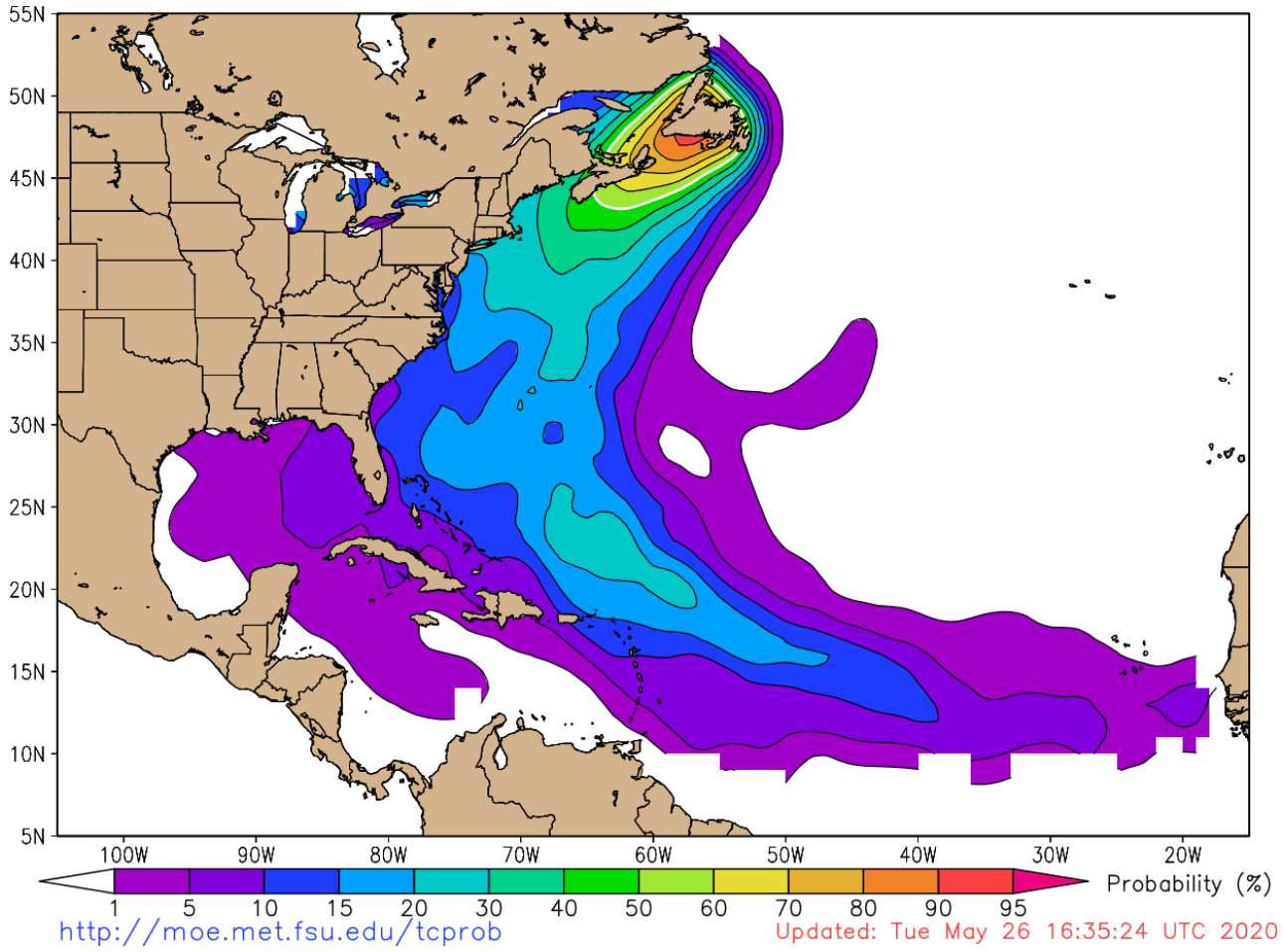


Figure 6. Newfoundland tropical cyclone probability using the 1886-2016 historical track (©FSU).

3.0 Analog Years and Historical Tracks

The Niño 3.4 region SST was in the neutral, positive phase (+0.5°C) throughout April 2020. The sudden emergence of upwelling plumes of cold water near the eastern equatorial Pacific (near the Ecuadorian and Chilean coasts) in May has dropped the region's SST to the negative, neutral phase (-0.5°C). The upwelling process is likely to be intermittent at times, thus, producing a perturbed SST in that region and affecting the weather patterns in the Atlantic Basin.

Given the projected ENSO conditions, the best analog years are 2007, 2005, 1995, and 1970. Figure 7 shows the upper air (500 hPa) geopotential height (m) composite anomaly based on 1981-2010 climatology for the period from June and through to November for the combined analog years. The main features in this figure are the anomalously the lower heights over NWT and Nunavut, higher heights over Atlantic Canada, and the lower heights over the Atlantic Basin tropics. The progressive weather pattern from west to east is expected

to enable the lower heights over NWT and Nunavut to intrude into Atlantic Canada and thus paving the way for any developed storm to track through Atlantic Canada.

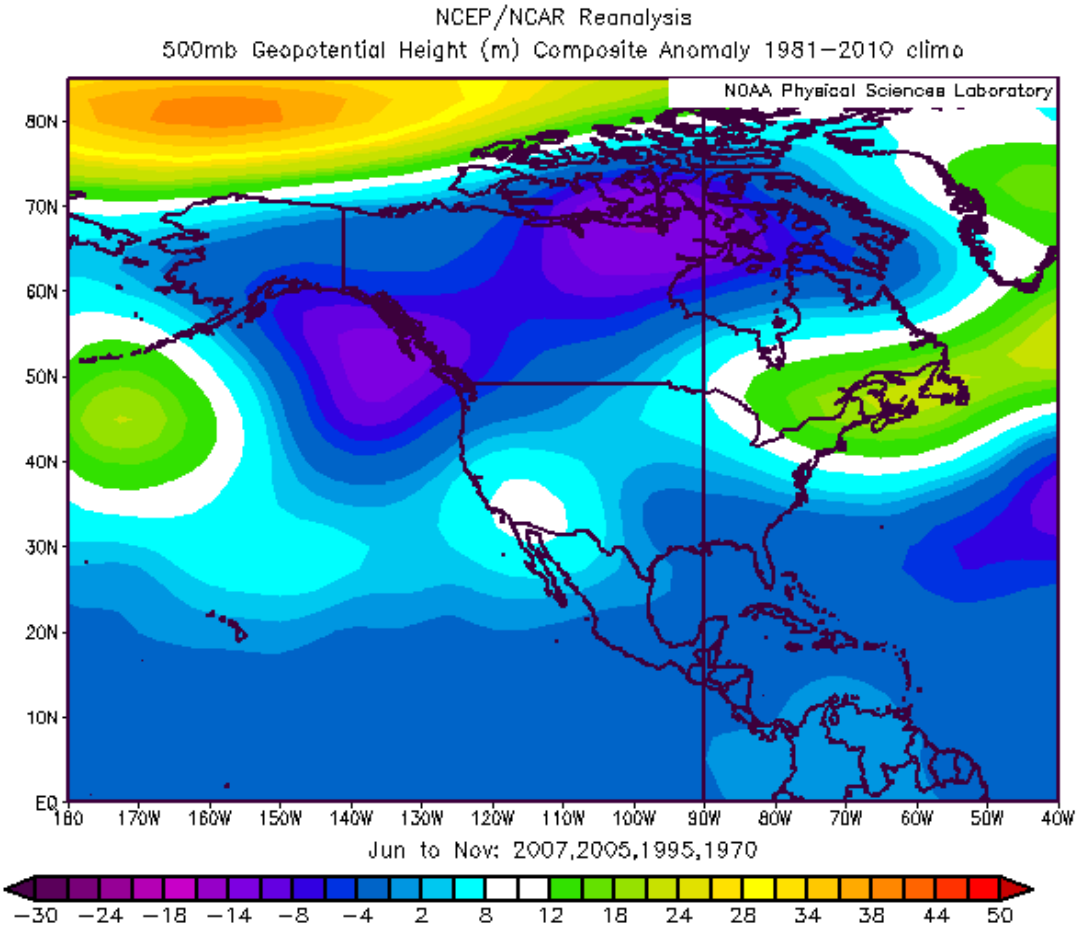


Figure 7. Upper air (500 hPa) Geopotential Heights (m) composite anomaly (1981-2010 climatology) for June through November of the analogy years (2007, 2005, 1995) (©NOAA).

The hurricane track charts for the analog years are given in Figures 8 to 10. Generally, the analog years are depicting an above-normal hurricane season with numerous storms tracking into Atlantic Canada and affecting Newfoundland and Labrador.

The extratropical storms that had a direct impact on Newfoundland and Labrador were Chantal (Aug 2007), Noel (Nov 2007), Ophelia (Sept 2005), and Allison (June 1995). The 1995 hurricane season witnessed tropical storm Barry (Jul) affecting western Newfoundland and hurricane Luis (Sept).

Luis headed northeast towards the Avalon Peninsula on September 10th, 1995. The Queen

Elizabeth II luxury liner and Canadian NOMAD buoy 44141 both experienced maximum wave heights near 30 meter and hurricane-force gusts. Early on September 11th, Luis quickly crossed the Avalon Peninsula and headed northeast, dumping anywhere from 60 to 120 mm of rain over eastern Newfoundland. The strongest winds experienced over eastern Newfoundland were northwesterly gusts of 92 to 130 km/h.

The 1970 records show a no-named category 1 hurricane made landfall on the Avalon Peninsula with 130 km/h winds later on October 16th before transitioning to extratropical cyclone early on October 17th with hurricane-force winds observed throughout Newfoundland.

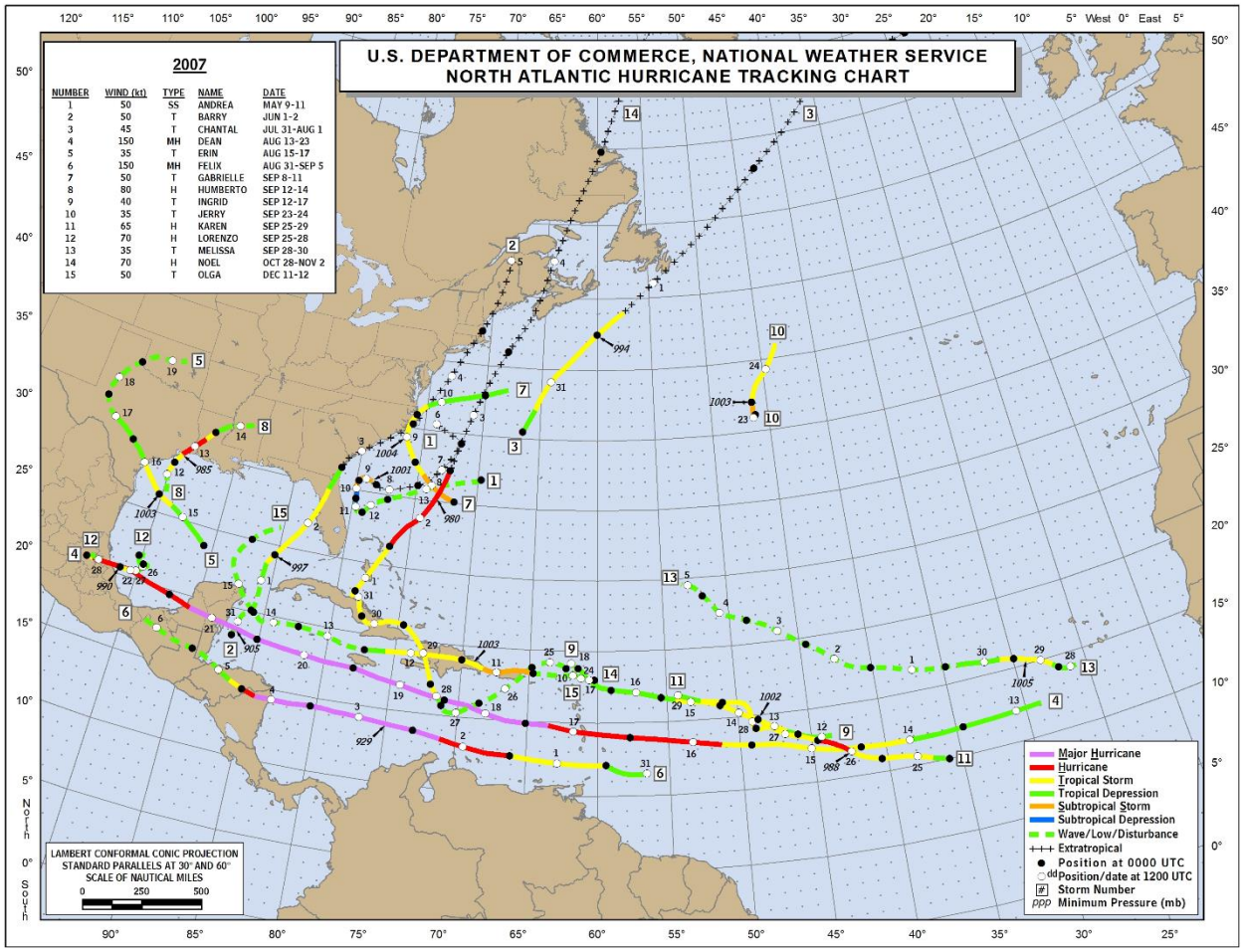
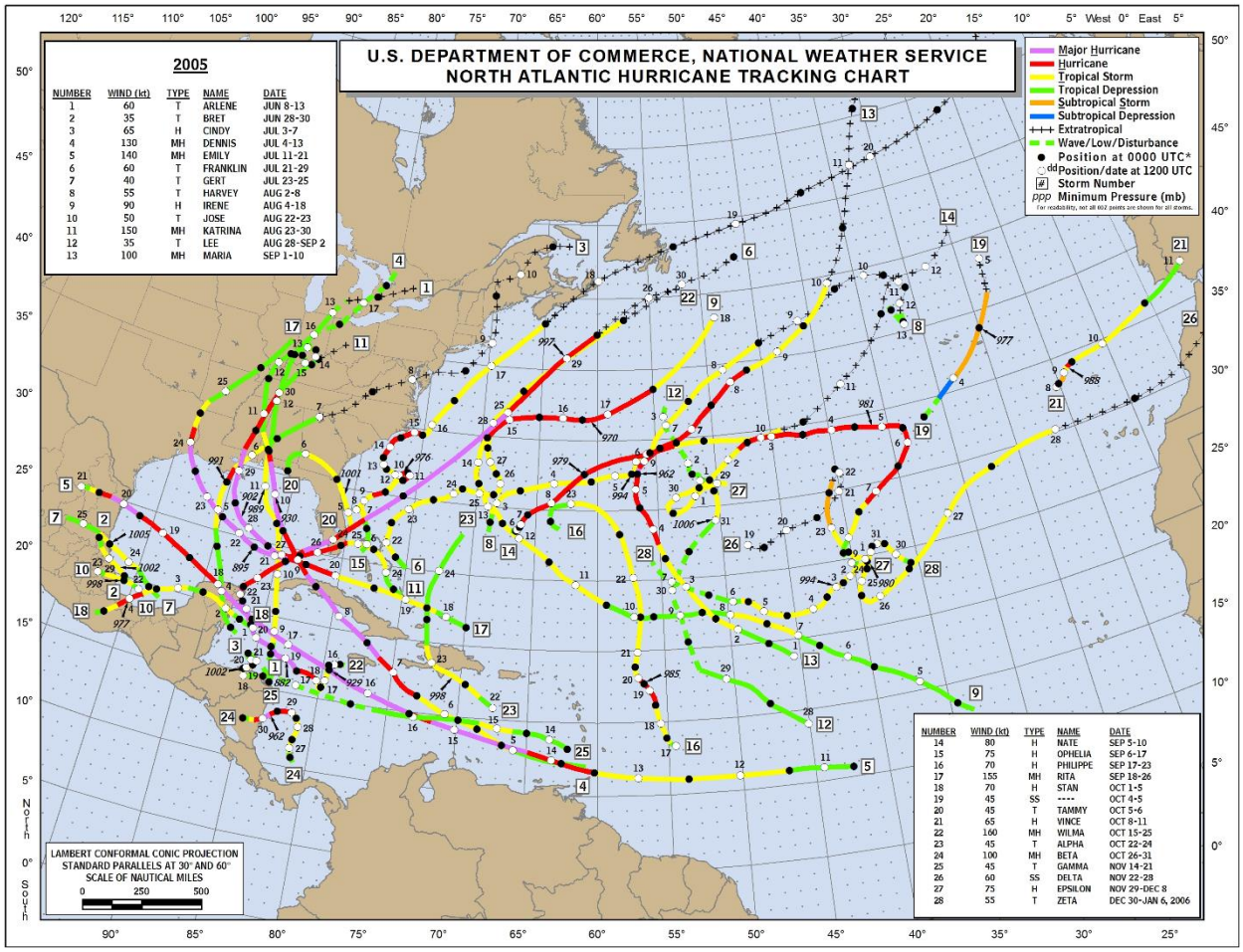


Figure 8. North Atlantic Hurricane Tracking Chart (2007) (©NHC).



NUMBER	WIND (kt)	TYPE	NAME	DATE
1	60	T	ARLENE	JUN 8-13
2	35	T	BRET	JUN 28-30
3	65	H	CINDY	JUL 3-7
4	130	MH	DENNIS	JUL 4-13
5	140	MH	EMILY	JUL 11-21
6	60	T	FRANKLIN	JUL 21-29
7	40	T	GERT	JUL 23-25
8	55	T	HARVEY	AUG 2-8
9	90	H	IRENE	AUG 4-18
10	50	T	JOSE	AUG 22-23
11	150	MH	KATRINA	AUG 23-30
12	35	T	LEE	AUG 28-SEP 2
13	100	MH	MARIA	SEP 1-10

NUMBER	WIND (kt)	TYPE	NAME	DATE
14	80	H	NATE	SEP 5-10
15	75	H	OPHELIA	SEP 6-17
16	70	H	PHILIPPE	SEP 17-23
17	155	MH	RITA	SEP 18-26
18	70	H	STAN	OCT 1-5
19	45	SS	----	OCT 4-5
20	45	T	TAMMY	OCT 5-6
21	65	H	VINCE	OCT 8-11
22	160	MH	WILMA	OCT 15-25
23	45	T	ALPHA	OCT 22-24
24	100	MH	BETA	OCT 26-31
25	45	T	GAMMA	NOV 14-21
26	60	SS	DELTA	NOV 22-28
27	75	H	EPSILON	NOV 29-DEC 8
28	55	T	ZETA	DEC 30-JAN 6, 2006

Figure 9. North Atlantic Hurricane Tracking Chart (2005) (©NHC).

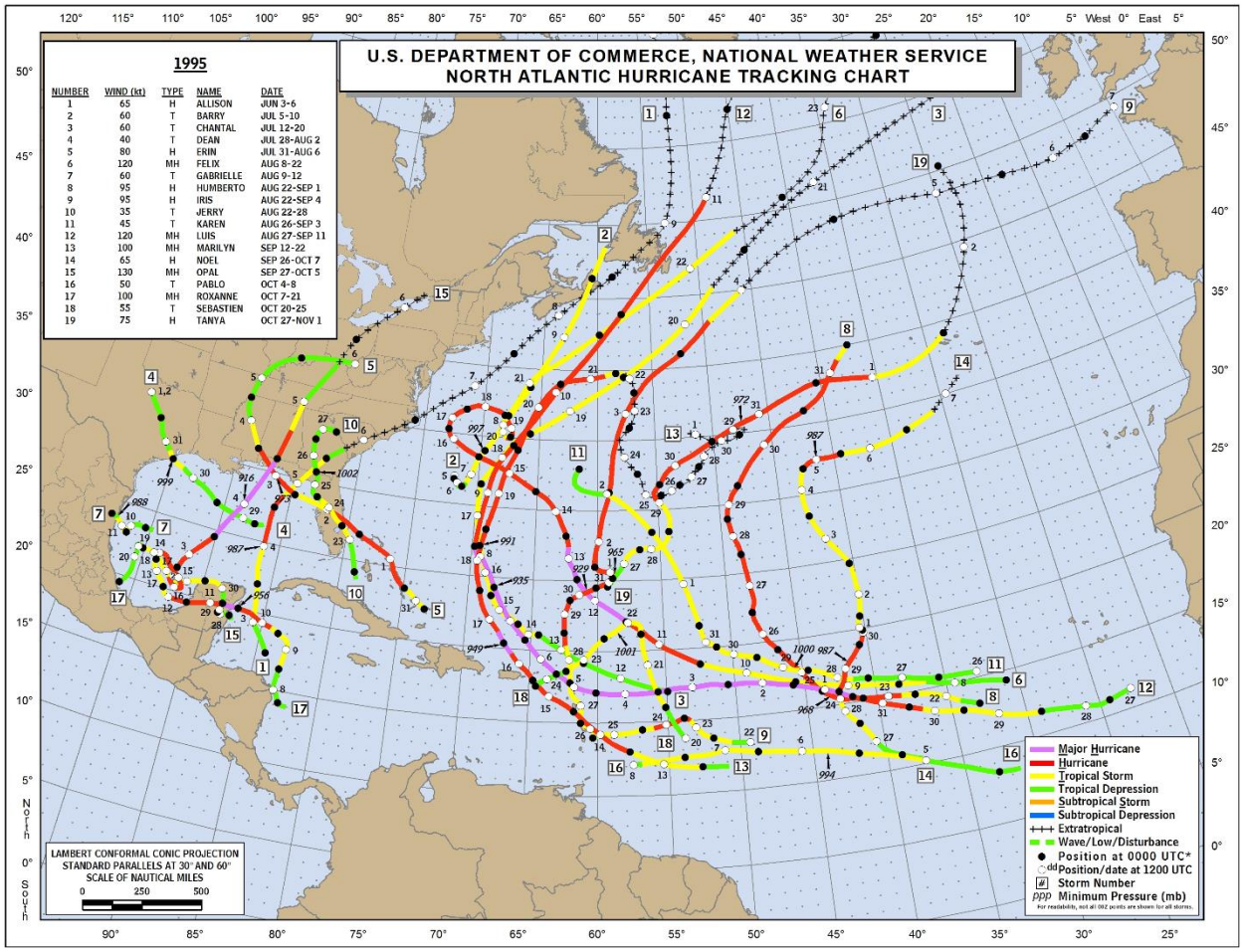


Figure 10. North Atlantic Hurricane Tracking Chart (1995) (©NHC).

4.0 Newfoundland and Labrador Hurricane Season Outlook 2020

Plumes of cold-water upwellings in the eastern Pacific equatorial and tropics are gradually moderating the anomalously warmer SST in the Niño 3.4 region. The upwellings have resulted in transitioning the ENSO conditions to a neutral, negative phase (-0.5°C). Although the continuation of such a process will eventually lead to transitioning to La Niña, the process is likely to be intermittent, thus allowing for oscillating SSTs through early summer.

The Wood team is anticipating the neutral negative ENSO conditions to transition to La Niña by mid-to-late June. The projected oscillating SST is likely to providing preferable conditions for storm formation or leading to weakening/strengthening of developing tropical storms.

Wood anticipates an active storm track across Atlantic Canada, specifically affecting Newfoundland and Labrador with extratropical storms. There is a moderate risk of a tropical storm and a low risk of a hurricane making landfall in Newfoundland. Figure 11 depicts the associated risk area. There is a risk of winds gusting up to 140 km/h and 100-130 mm of rainfall associated with any hurricane making landfall.

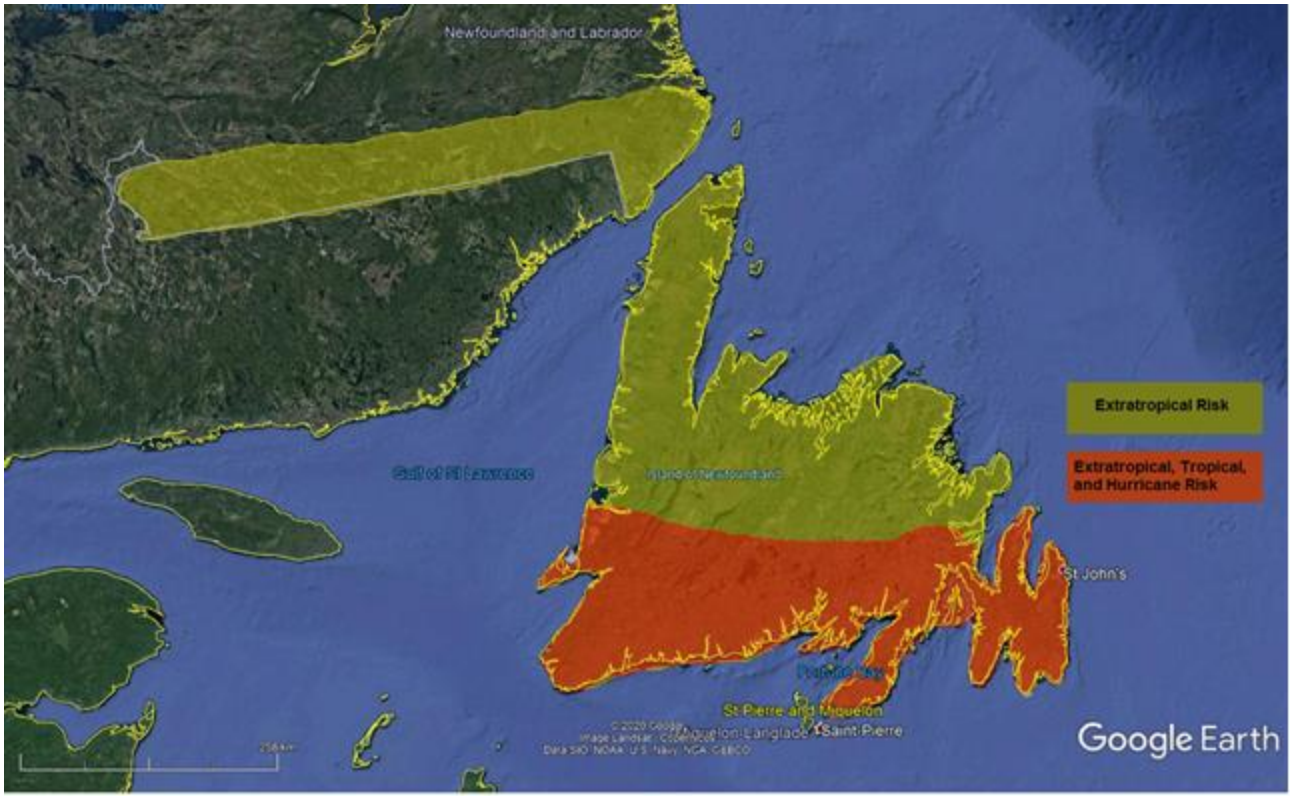


Figure 11. Newfoundland and Labrador Hurricane Season Risk Map.

5.0 Closure

We trust that this report meets your needs. Please do not hesitate to contact the author if you have any questions or comments regarding the hurricane season outlook.

Yours sincerely,

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