Hawaii Climate Indicators Summary

December 2020

PMNM Climate Change Working Group

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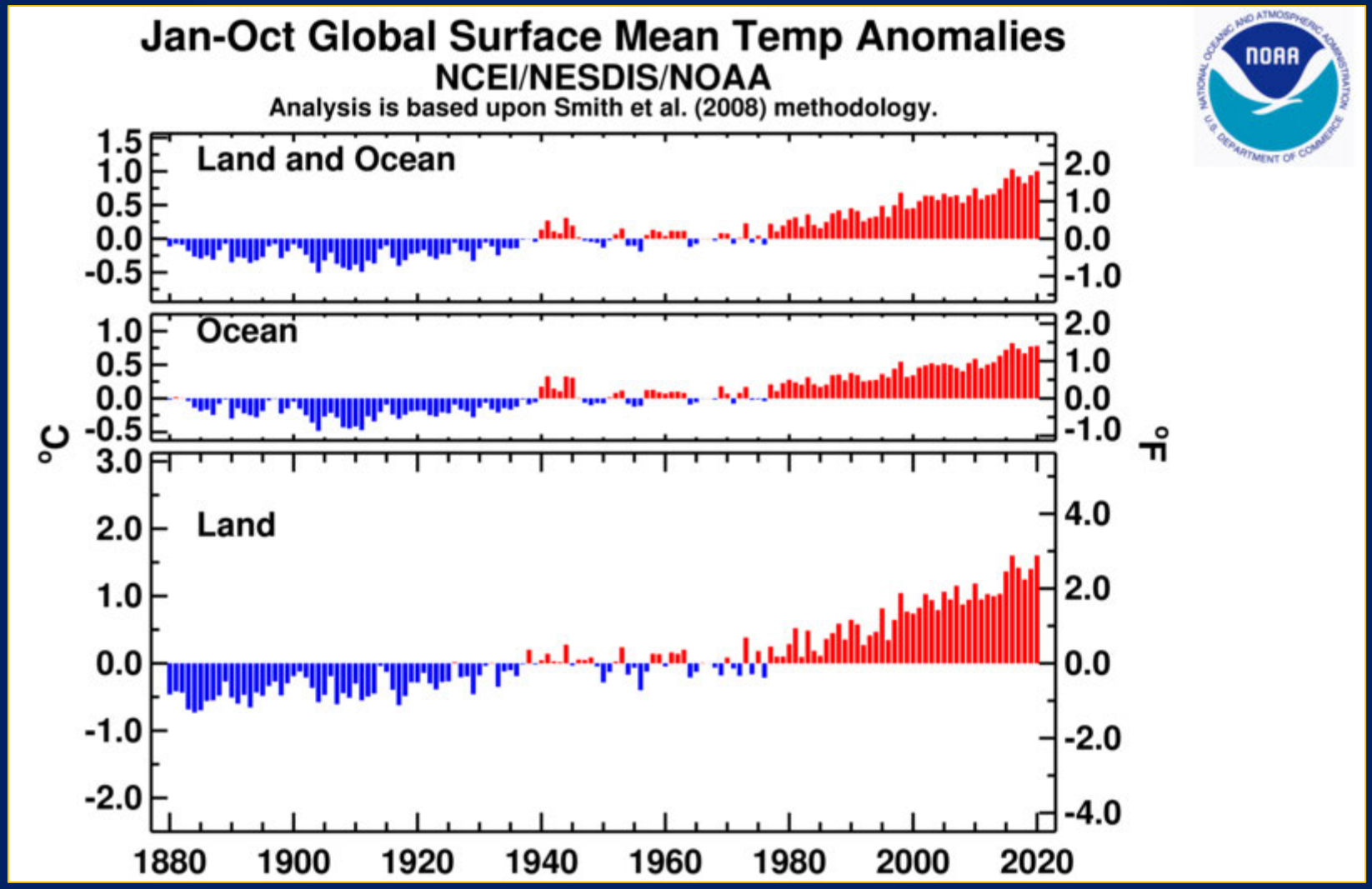
U. S. Fish & Wildlife Service

Honolulu, HI

We're Number Two!

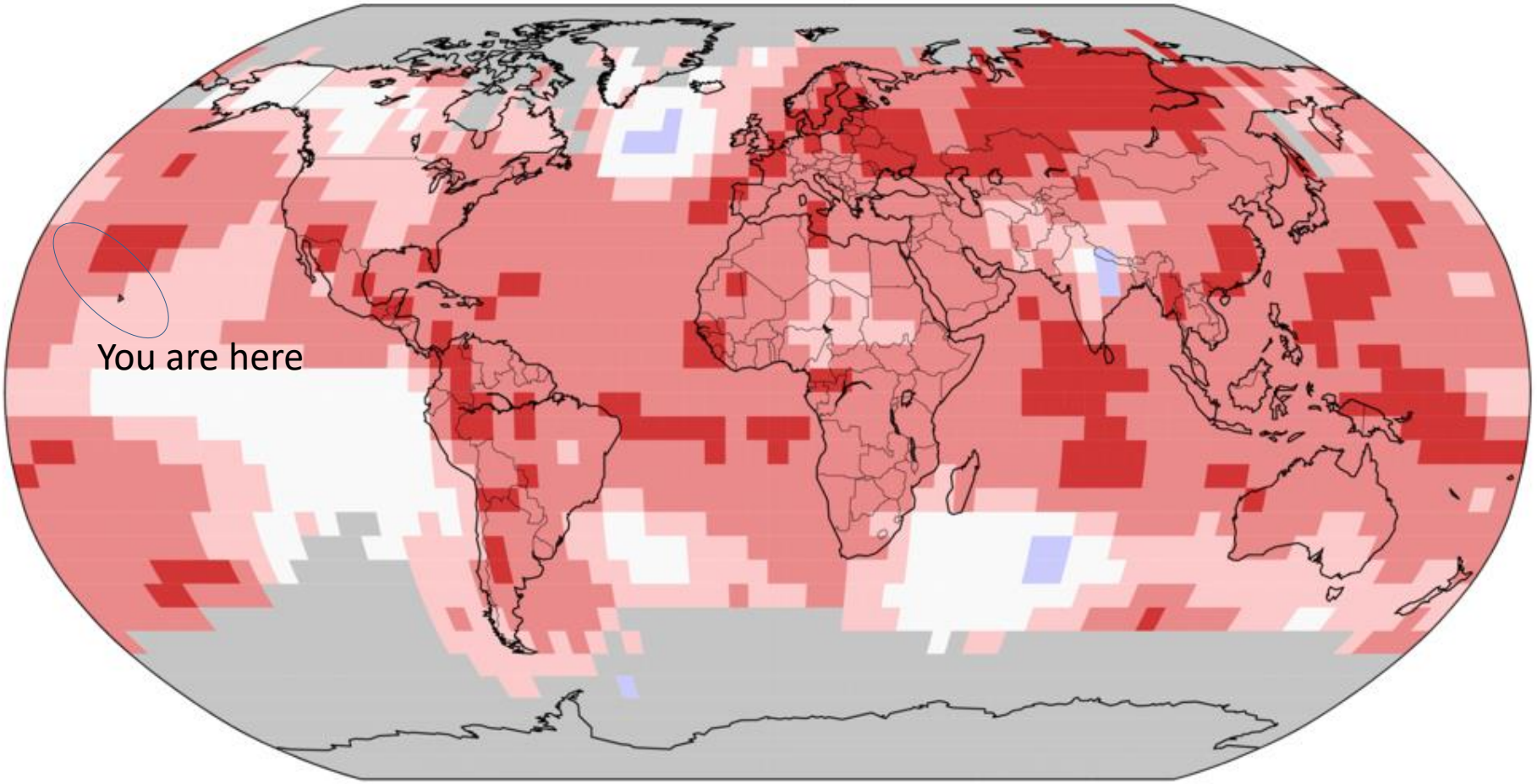
2020 will end up being the second warmest year on record



Land & Ocean Temperature Percentiles Jan–Oct 2020

NOAA's National Centers for Environmental Information

Data Source: NOAAGlobalTemp v5.0.0–20201108

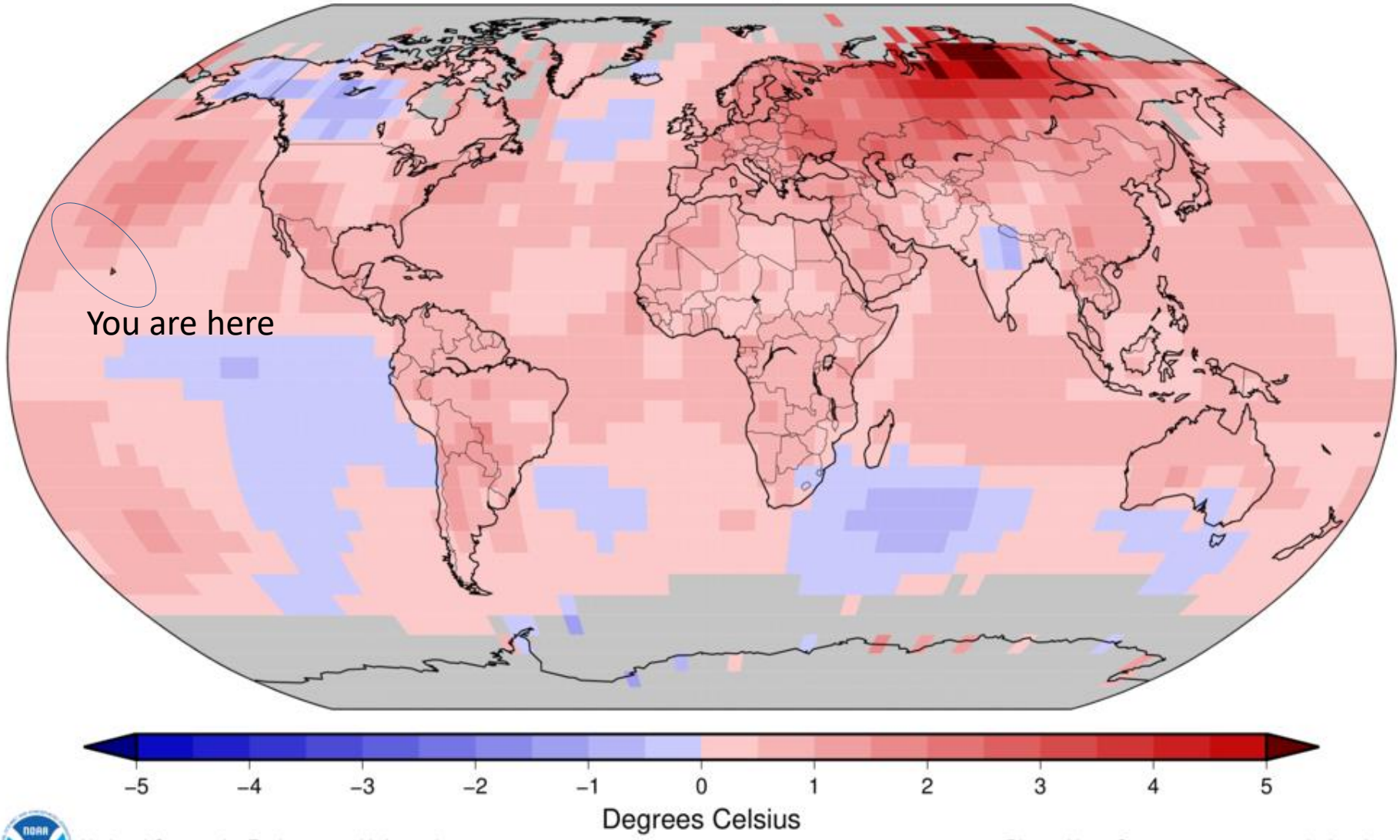


GHCNM v4.0.1.20201107.qfe

Land & Ocean Temperature Departure from Average Jan–Oct 2020

(with respect to a 1981–2010 base period)

Data Source: NOAAGlobalTemp v5.0.0–20201108



National Centers for Environmental Information

GHCNM v4.0.1.20201107.qfe

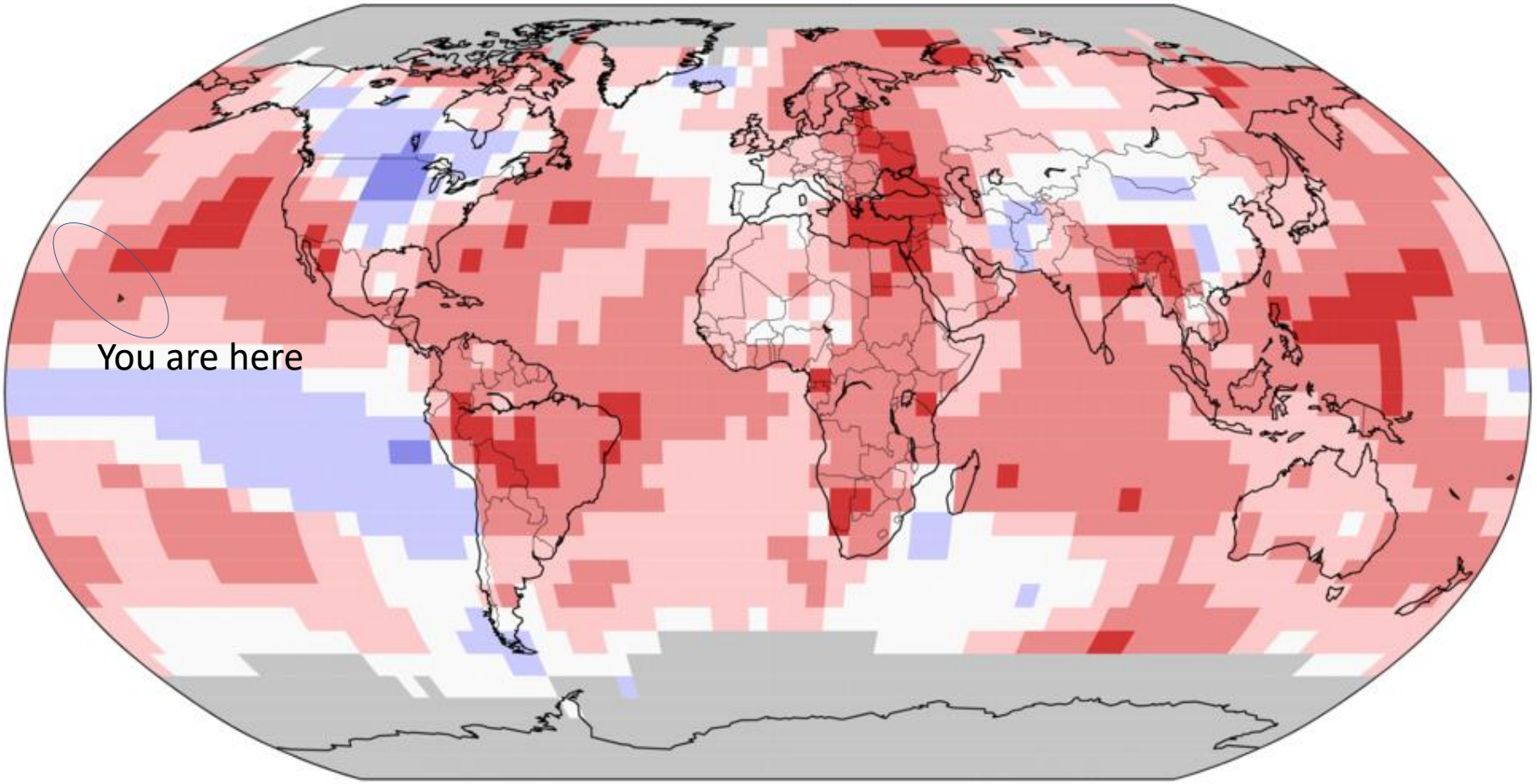
Please Note: Gray areas represent missing data

Map Projection: Robinson

Land & Ocean Temperature Percentiles Oct 2020

NOAA's National Centers for Environmental Information

Data Source: NOAAGlobalTemp v5.0.0–20201108



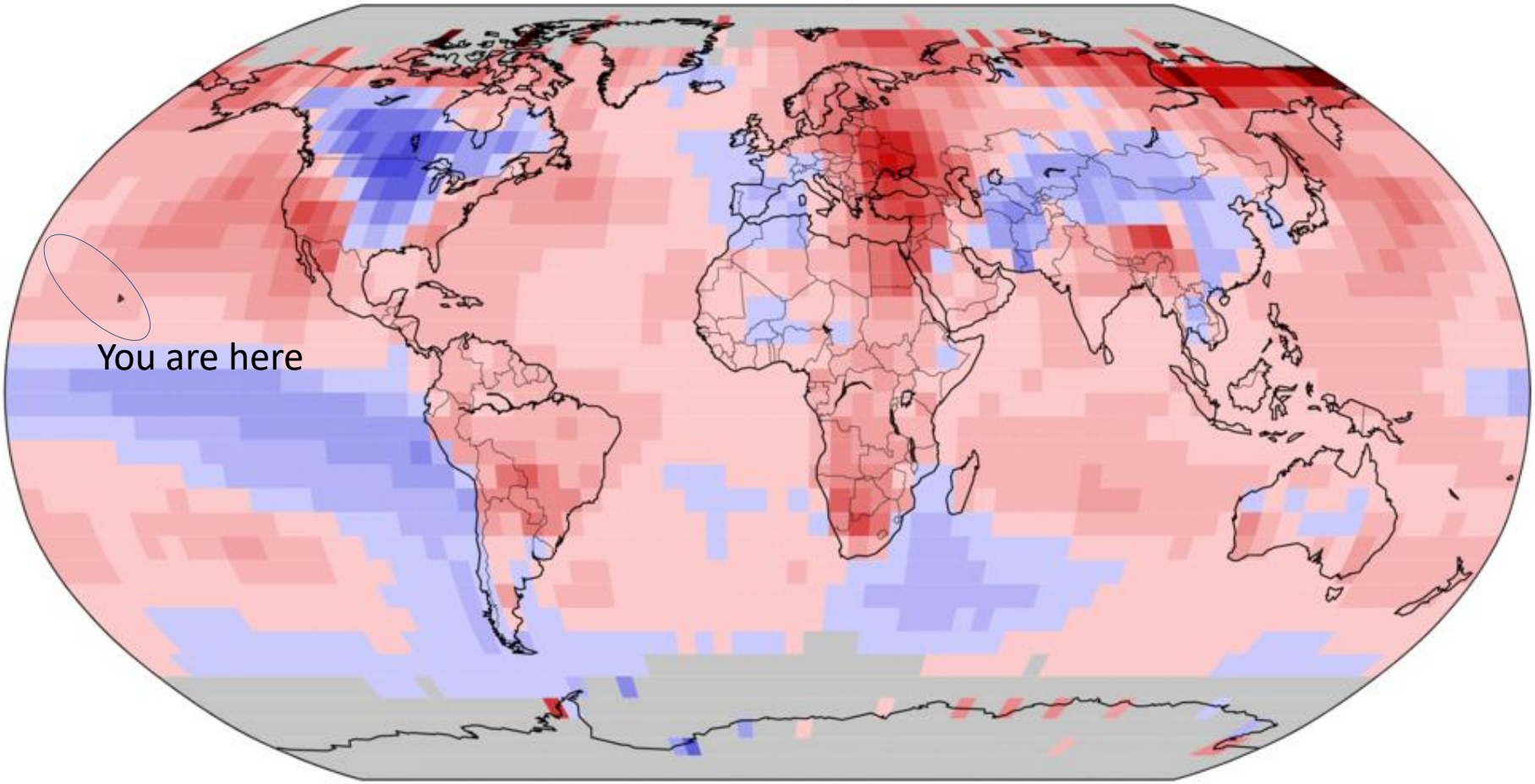
Record Coldest | Much Cooler than Average | Cooler than Average | Near Average | Warmer than Average | Much Warmer than Average | Record Warmest

GHCNM v4.0.1.20201107.qfe

Land & Ocean Temperature Departure from Average Oct 2020

(with respect to a 1981–2010 base period)

Data Source: NOAAGlobalTemp v5.0.0–20201108



National Centers for Environmental Information

GHCNM v4.0.1.20201107.qfe

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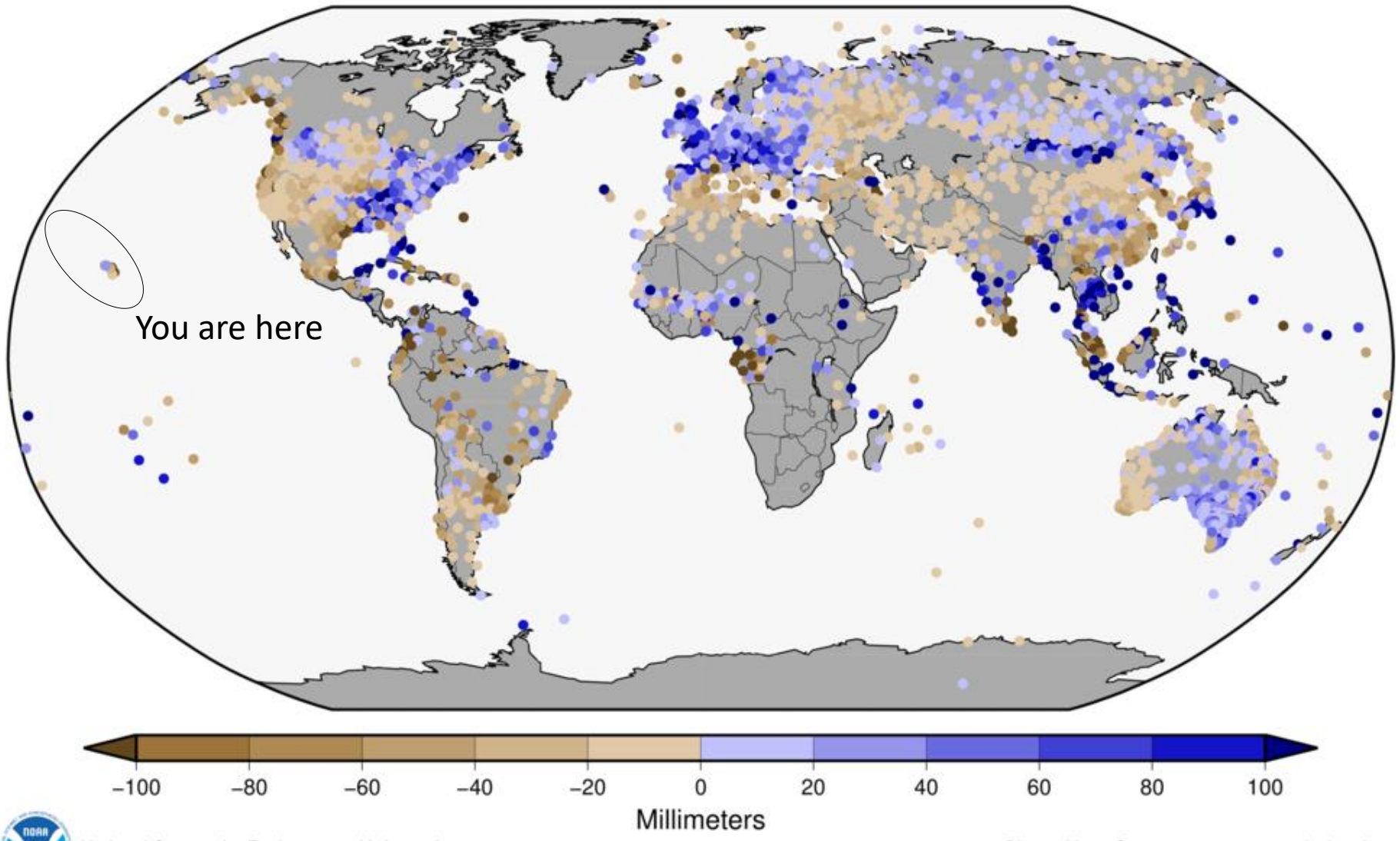
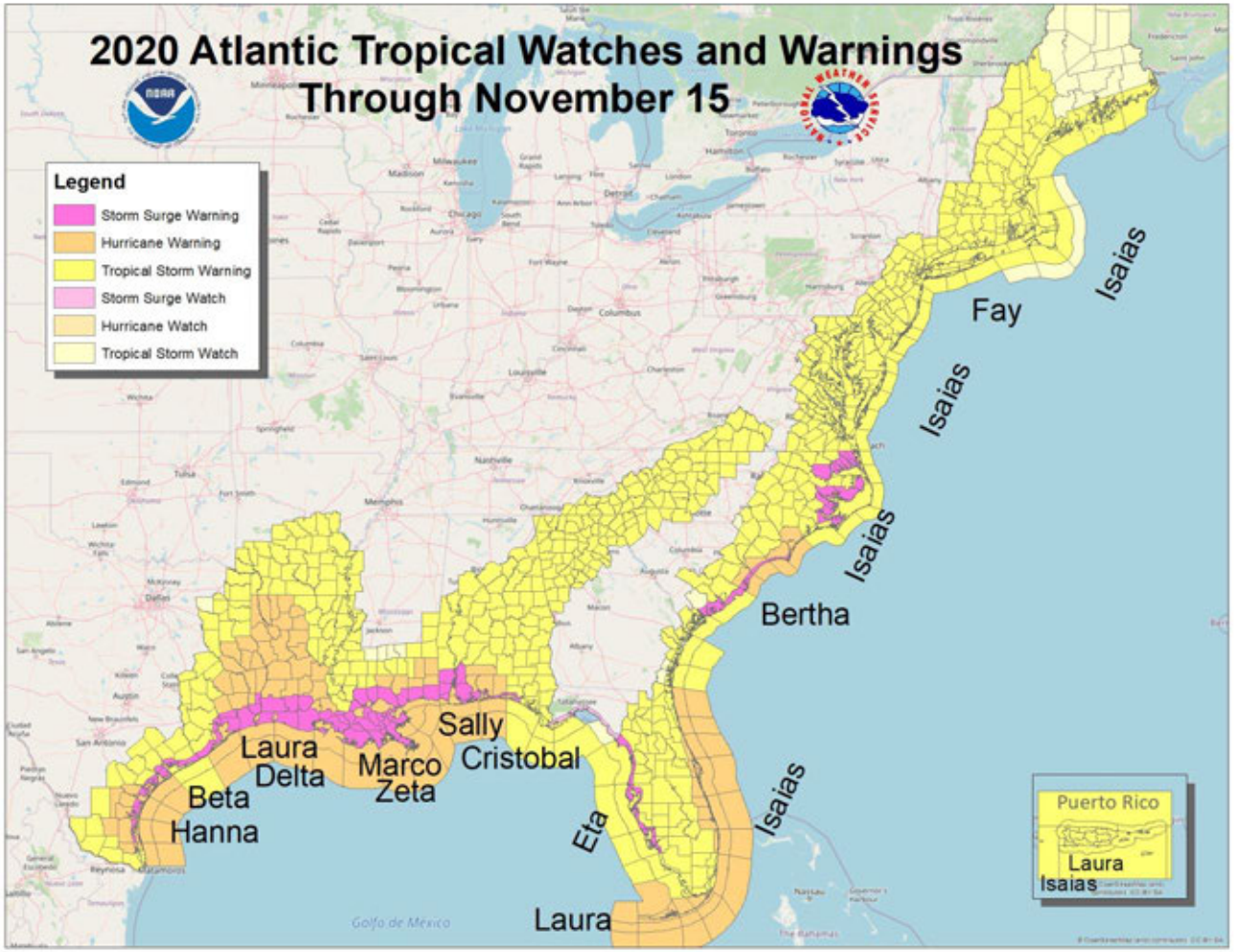
Map Projection: Robinson


Land–Only Precipitation Anomalies Oct 2020
(with respect to a 1961–1990 base period)
Data Source: GHCN–M version 4beta
You are here
–100
–80
–60
–40
–20
0
20
40
60
80
100
Millimeters
National Centers for Environmental Information
Please Note: Gray areas represent missing data
Map Projection: Robinson

Digression #1

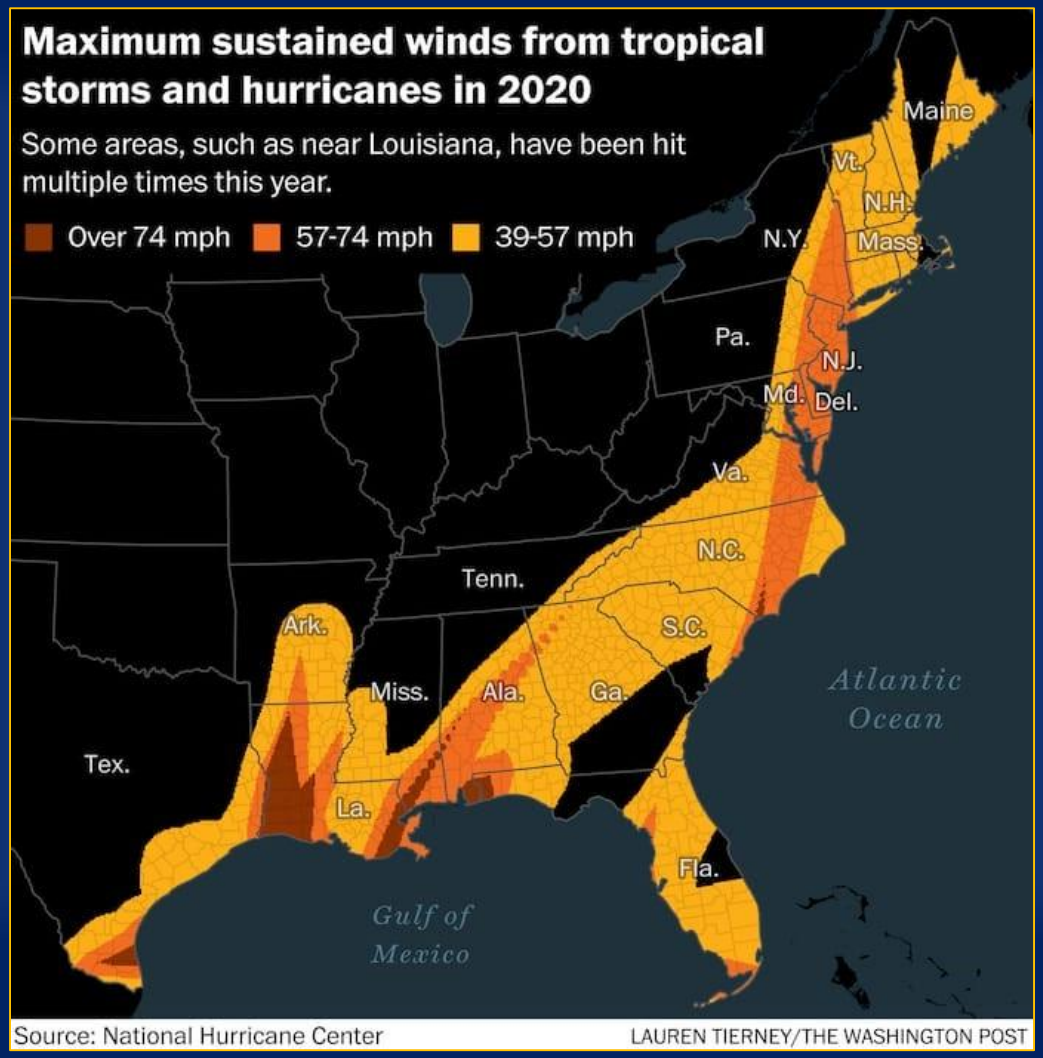
It was a very busy hurricane season for the East Coast and Gulf



Every county on the Atlantic coast had a watch or warning this year

Digression #1

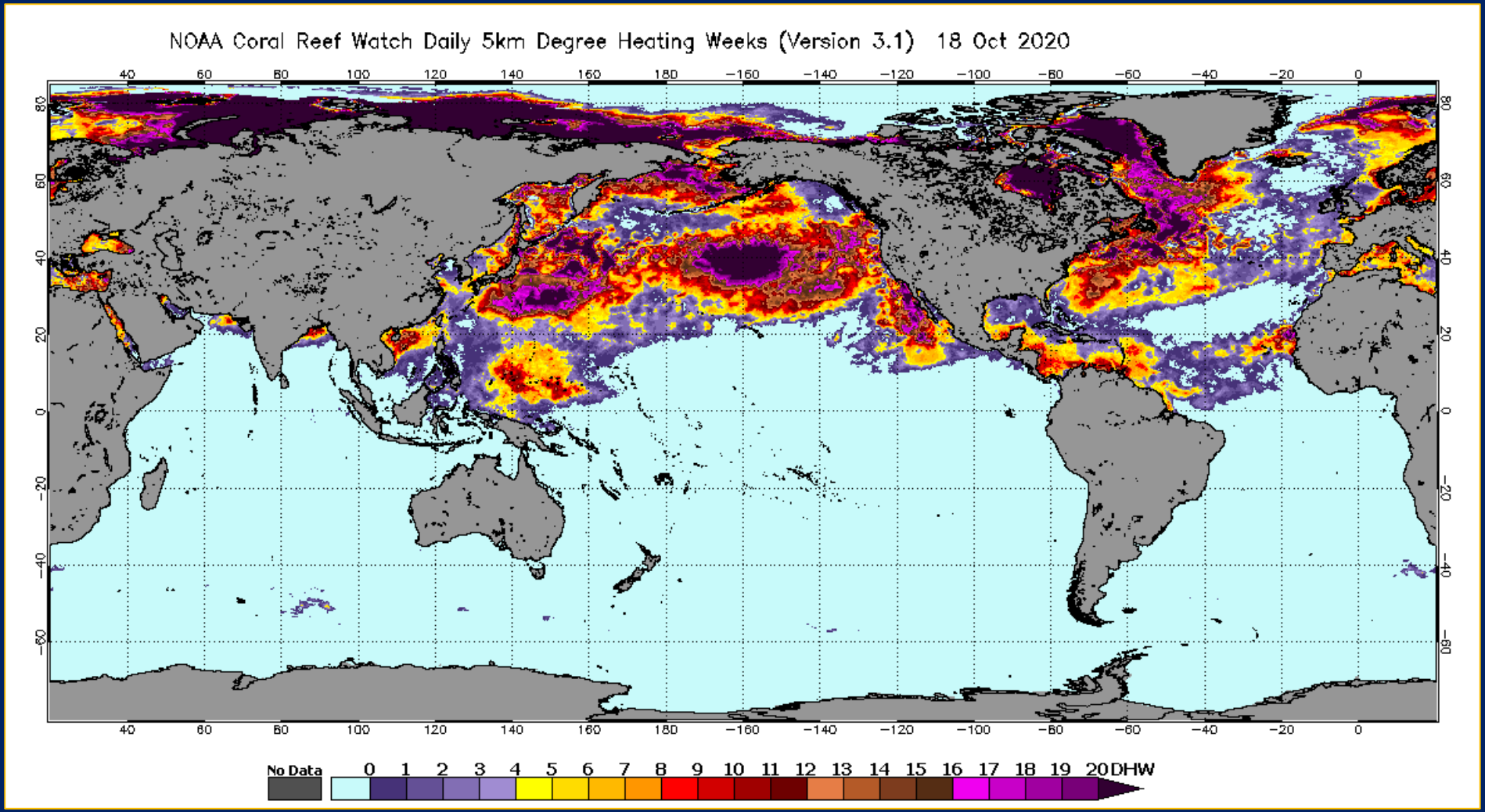
And the associated wind impacts were similarly widespread



Only a few local sectors avoided tropical storm force winds or higher

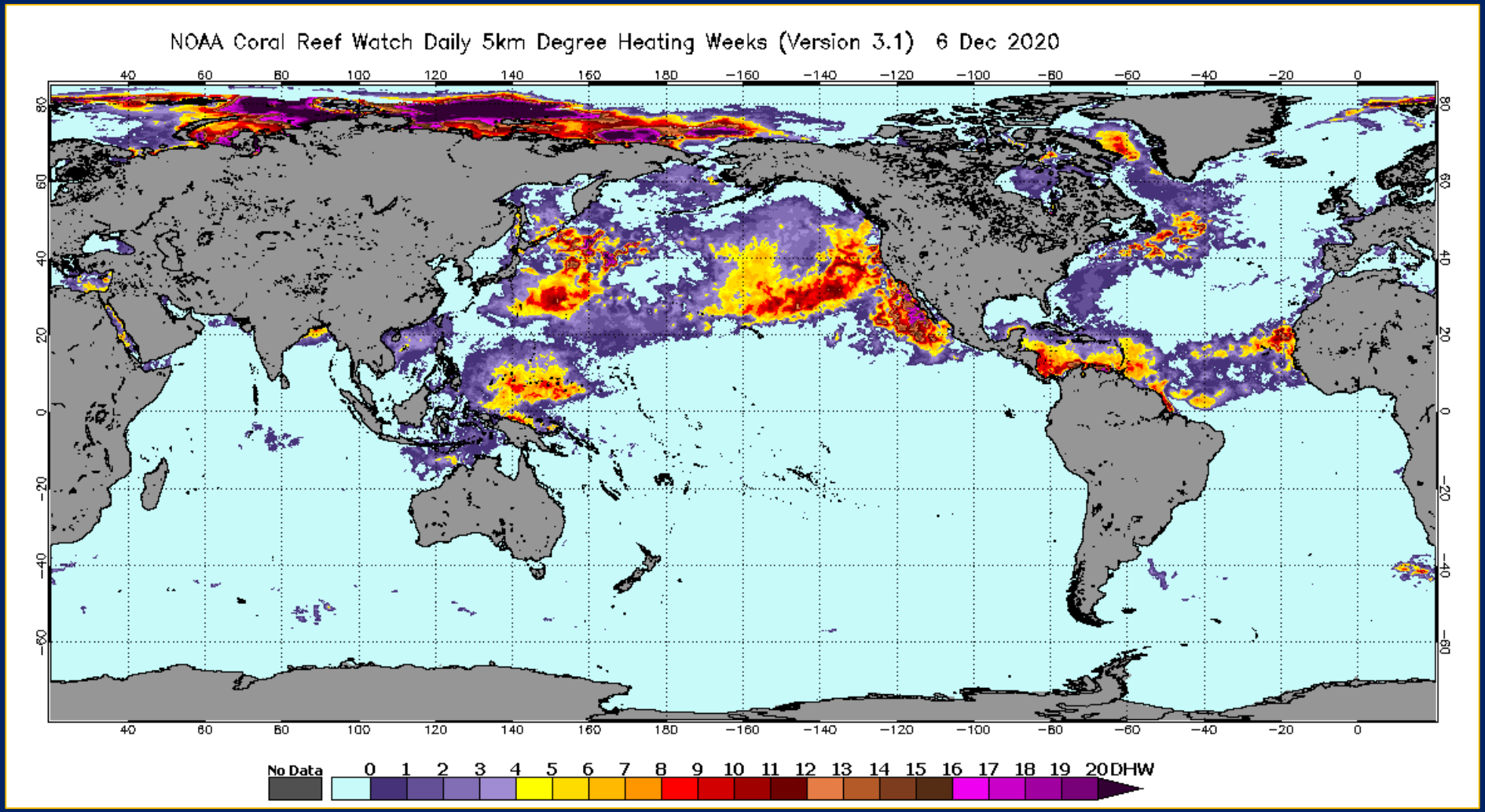
Back here in the Pacific

Degree Heating Weeks – 18 October 2020



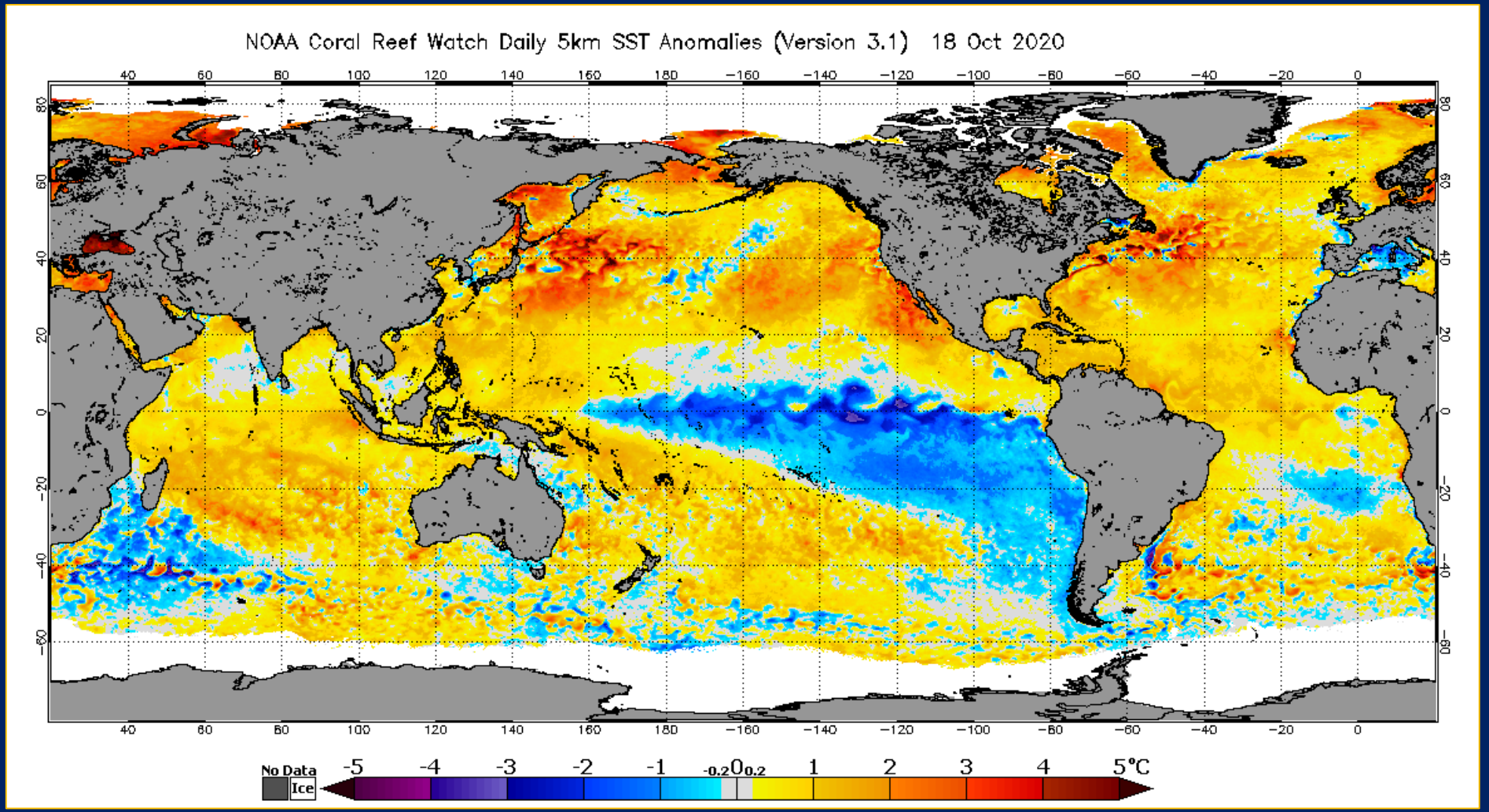
A large amount of heat accumulated to the northeast of the Monument

Degree Heating Weeks – 6 December 2020



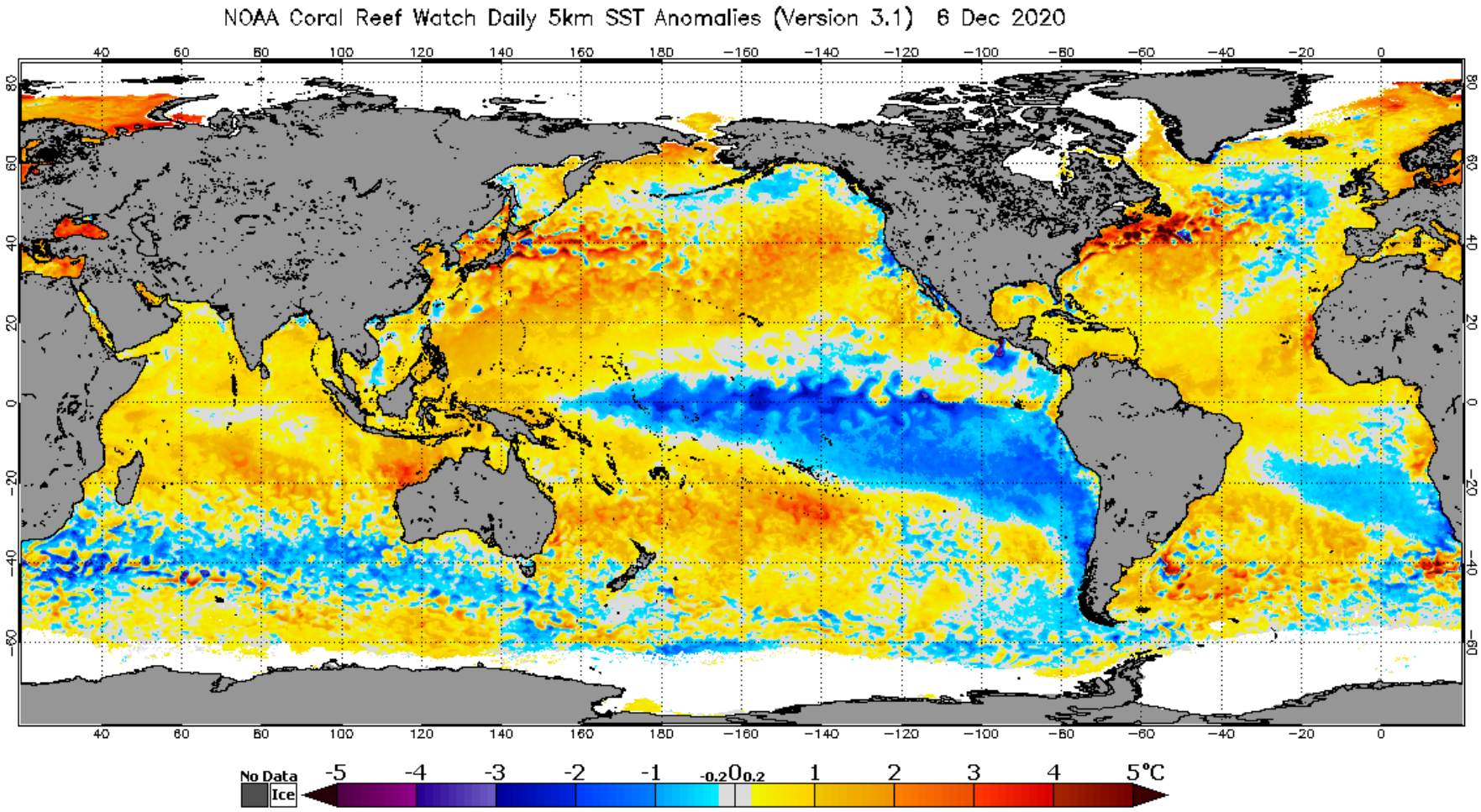
This had largely dissipated by December, but residual heat still lingers to the northeast of the main islands

Global Sea Surface Temperature Anomaly – 18 October 2020



An SST heat anomaly was present to the northeast of the Monument in October

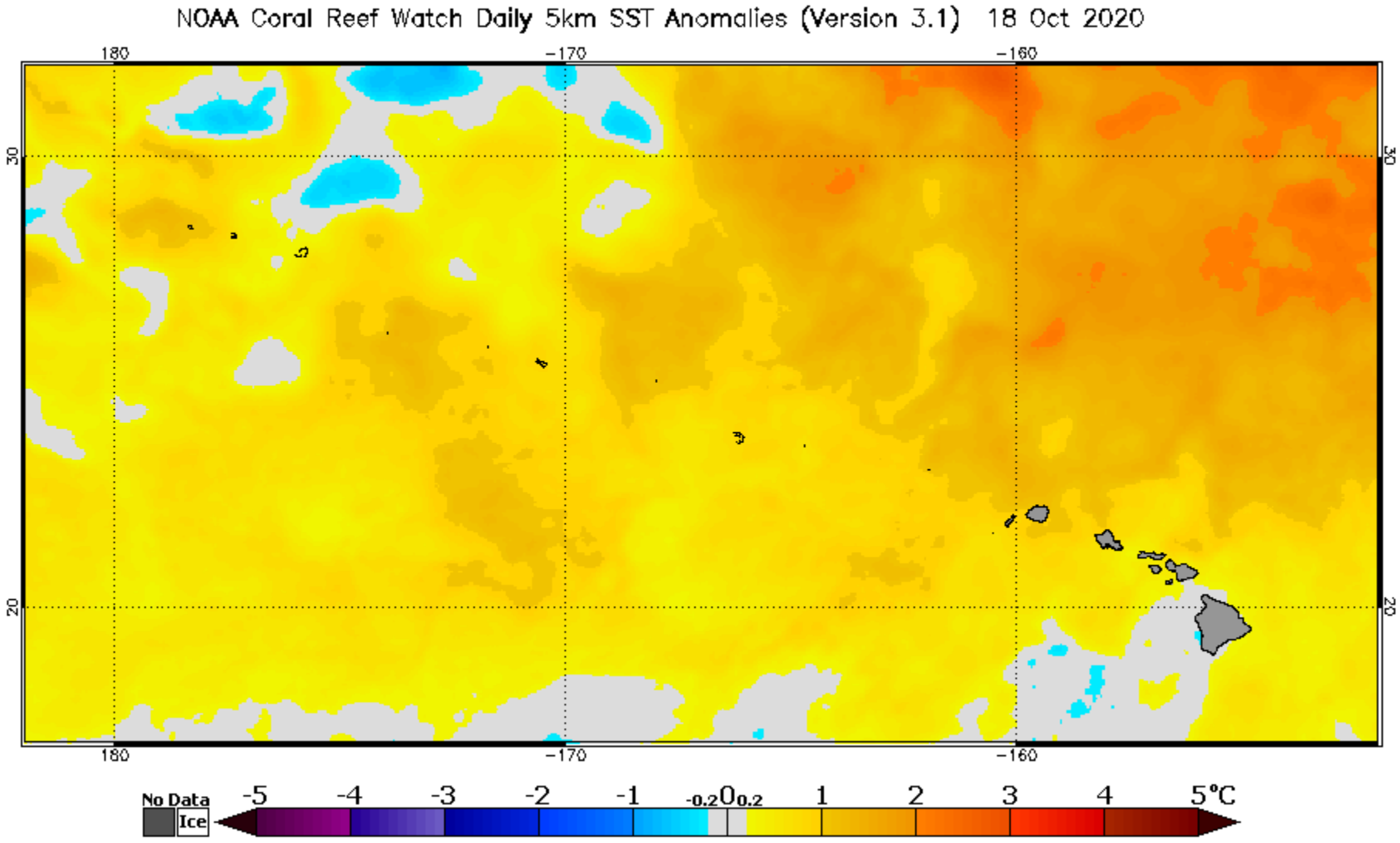
Global Sea Surface Temperature Anomaly – 6 December 2020



This SST anomaly was still present into early December

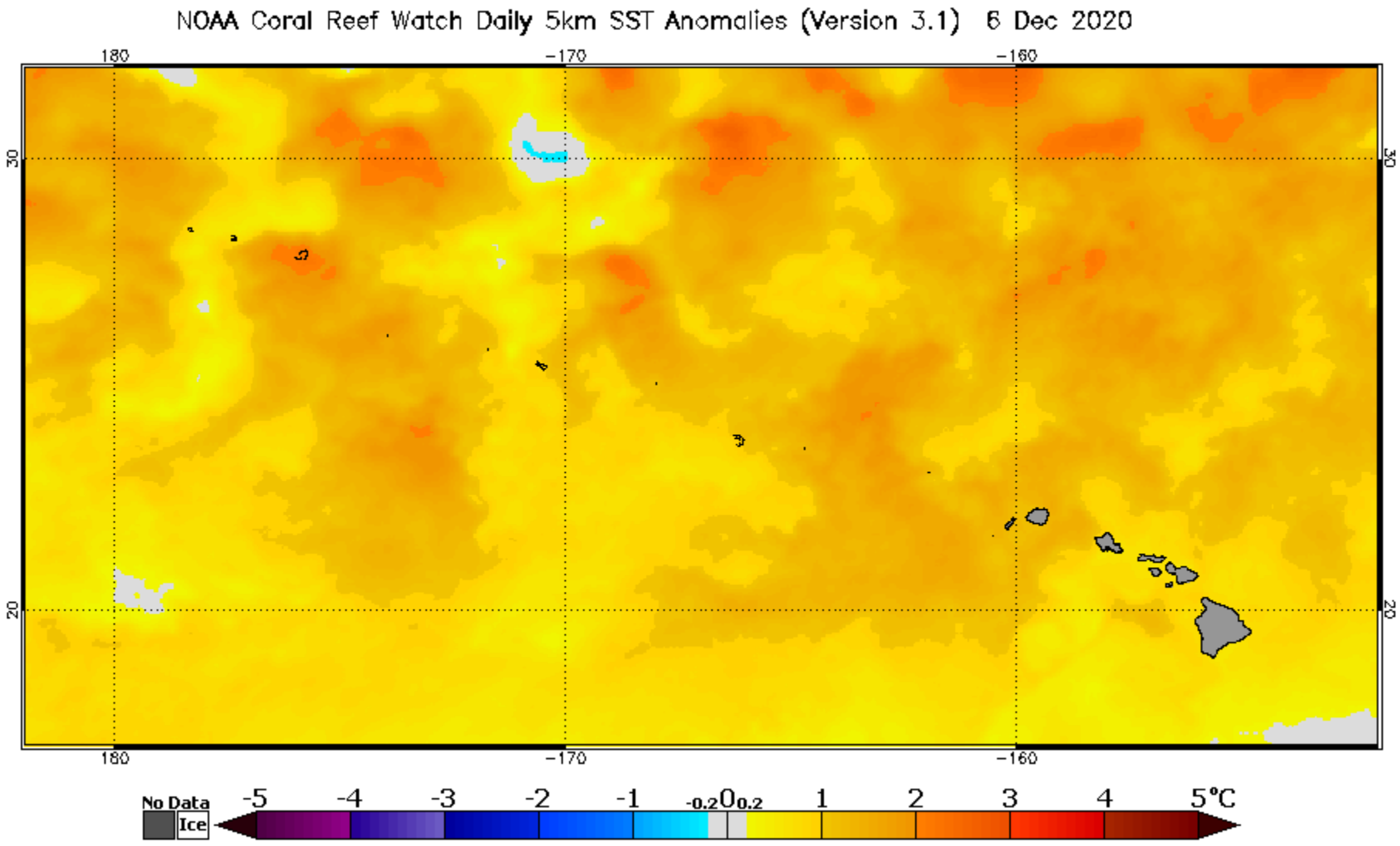
Also note the continued development of a strong La Niña pattern in the equatorial Pacific

Sea Surface Temperature Anomaly, Hawaii Sector – 18 October 2020



In October, the Midway sector was returning to more normal conditions

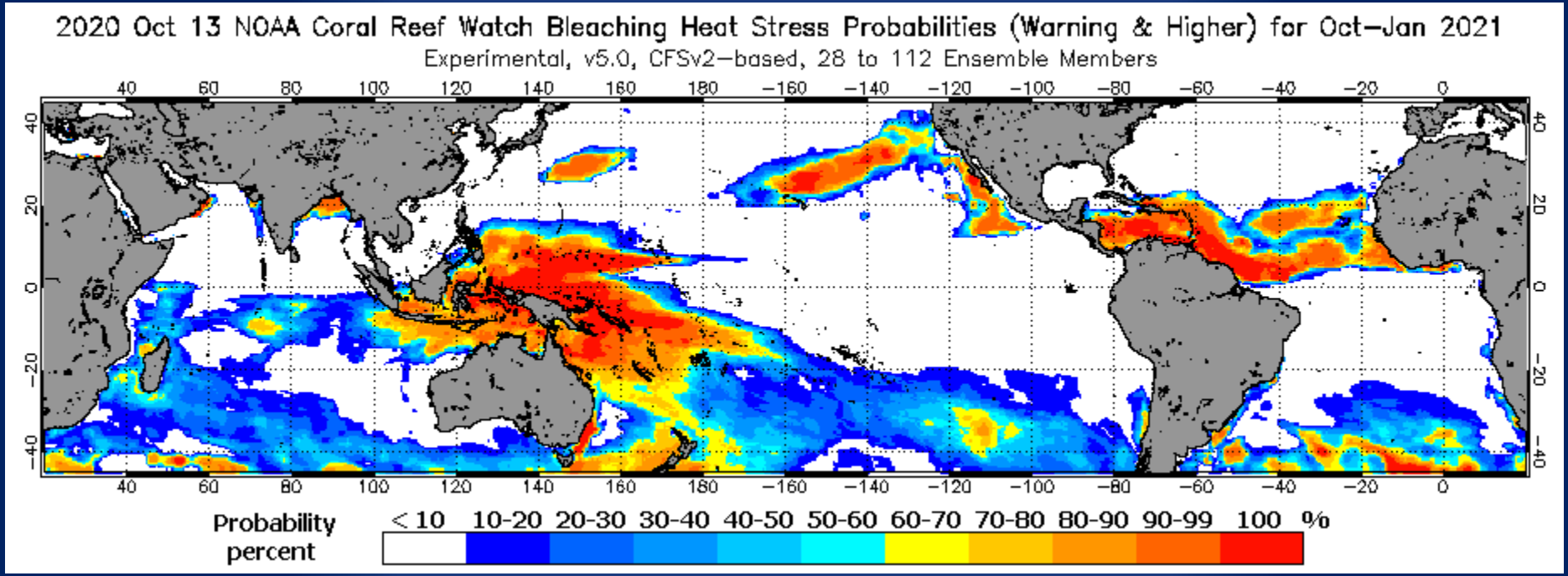
Sea Surface Temperature Anomaly, Hawaii Sector – 6 December 2020



But by December the entire Monument was warmer than long-term average again

Bleaching Stress Probability – October 2020 – January 2021

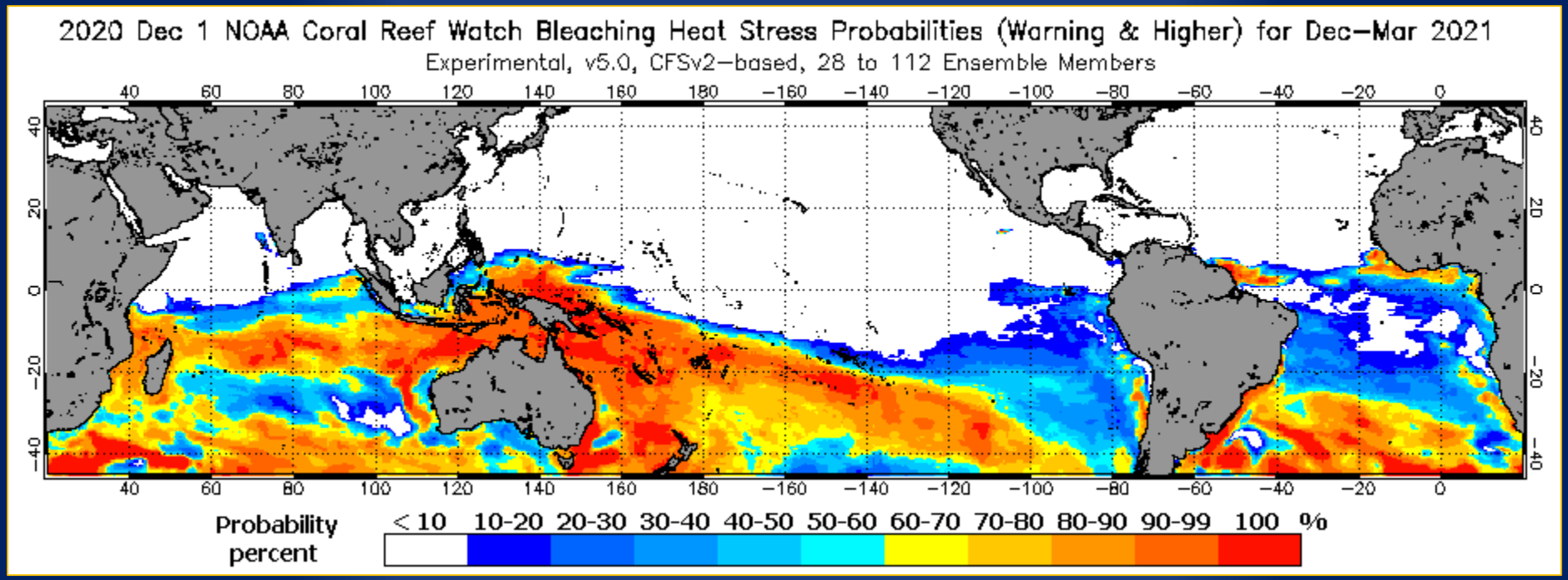
Prediction as of 13 October 2020



By October, the potential for heat stress had significantly receded as seasons changed

Bleaching Stress Probability – Dec. 2020 - March 2021

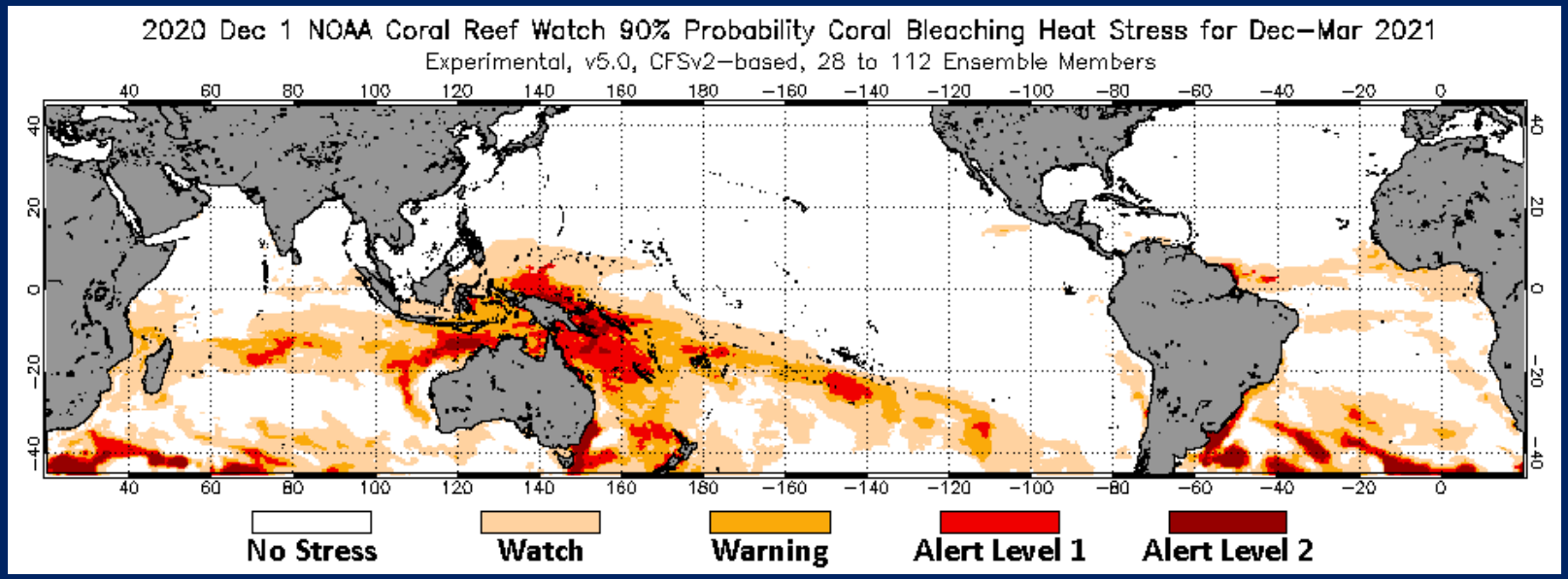
Prediction as of 1 December 2020



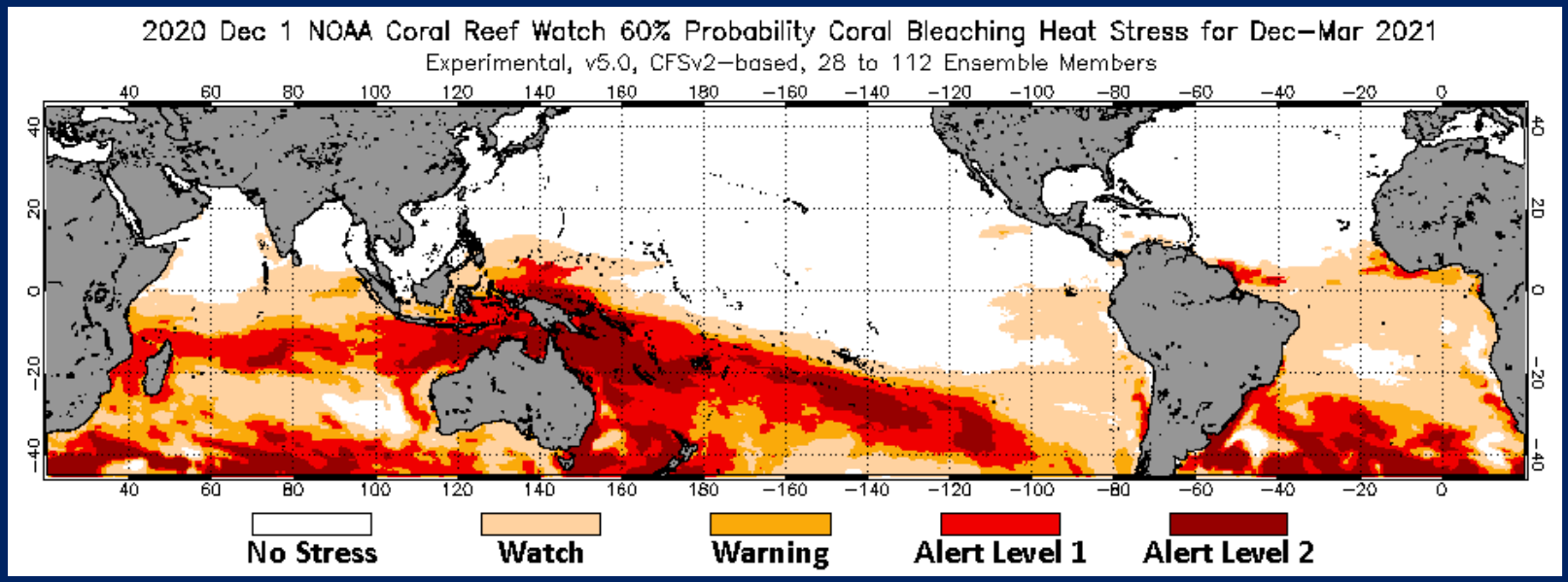
And by December, the probability of heat stress to Monument reefs had abated for the year and into early 2021

However, the Great Barrier Reef will likely be hit hard again during Southern Hemisphere summer

90% Stress Level Probability – Dec. 2020 – Mar. 2021



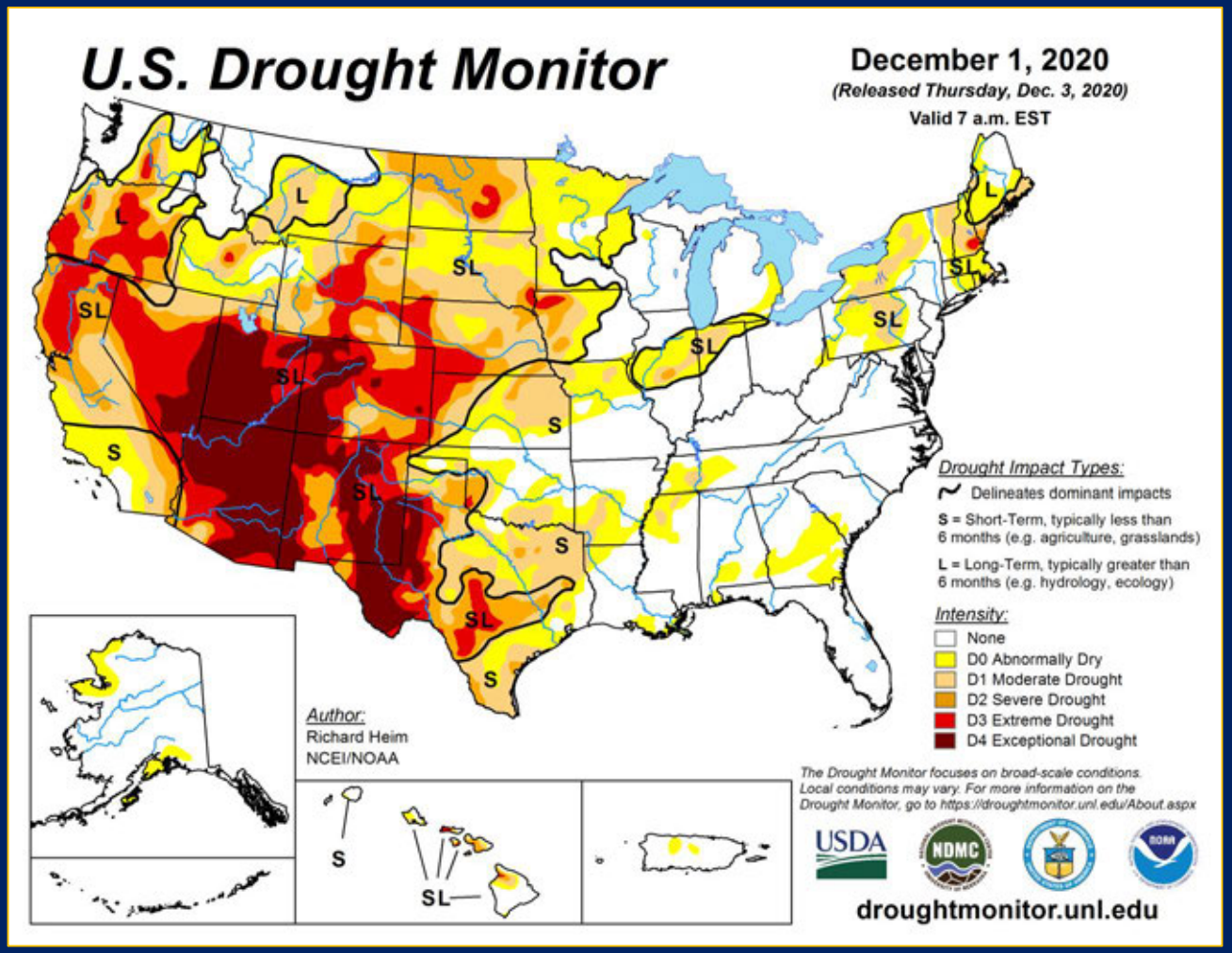
60% Stress Level Probability – Dec. 2020 – Mar. 2021



There is zero probability of bleaching conditions in the Monument through March 2021

Digression #2

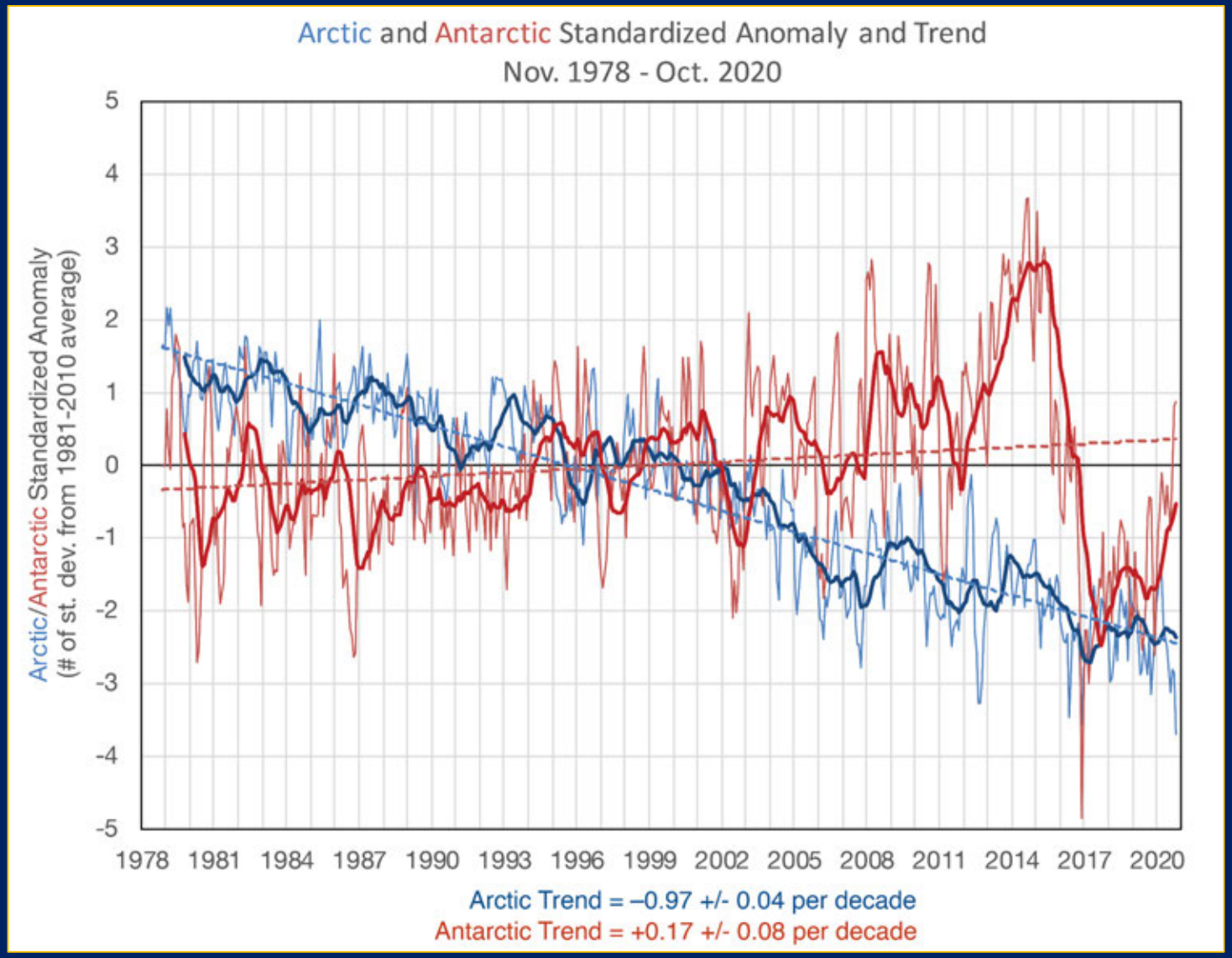
La Niña typically produces a dry winter in the Western US



So far, that prediction is holding

Digression #3

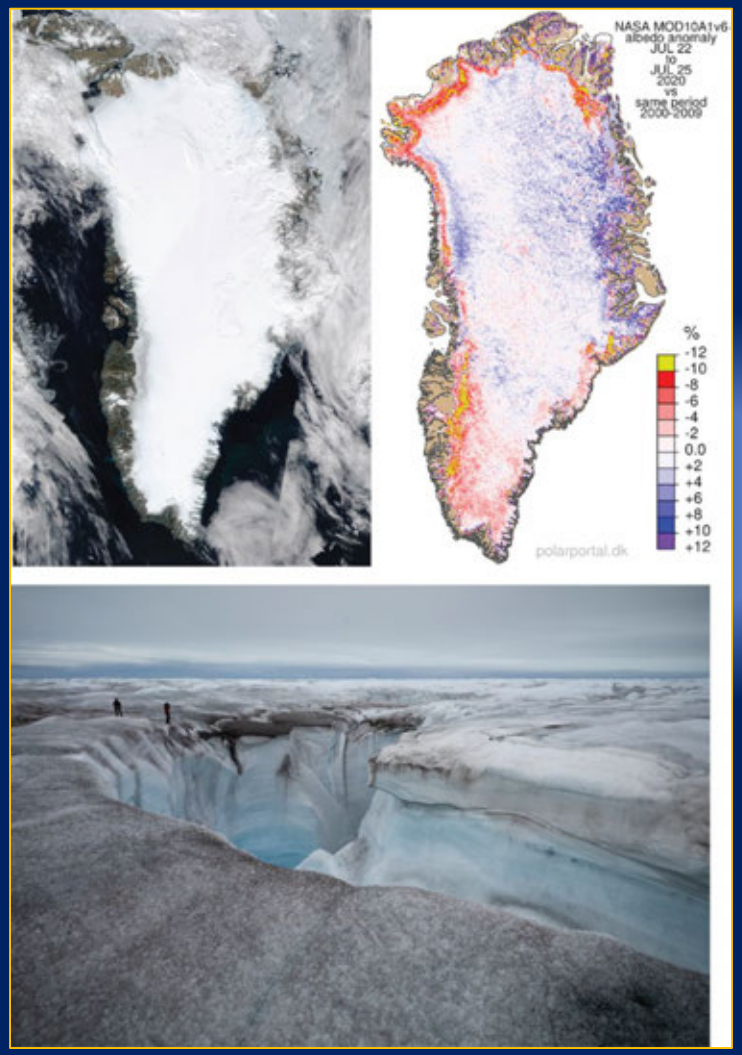
And at the poles the Arctic loses ice while the Antarctic gains

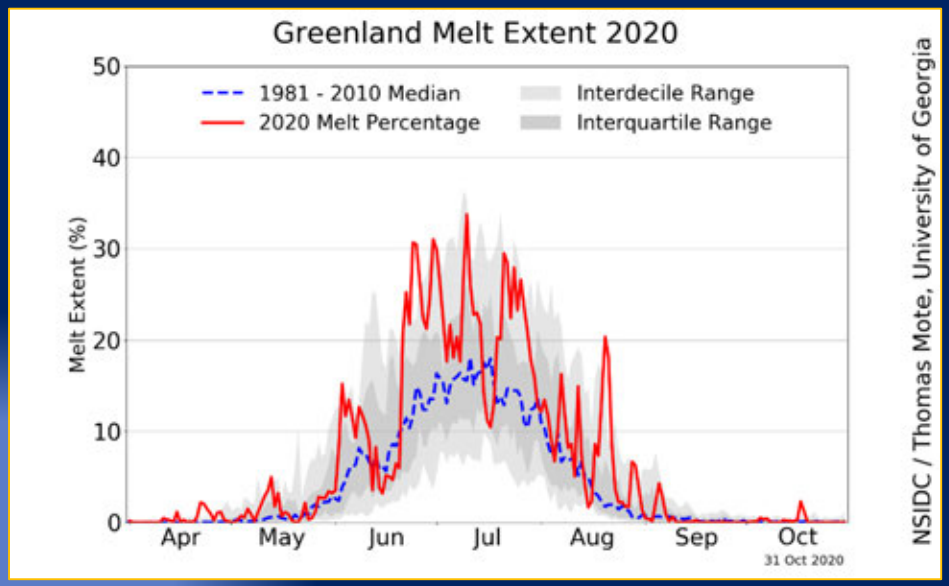


Obvious differences between being underlain by water versus land

Digression #3

Meanwhile, in Greenland the ice is getting darker



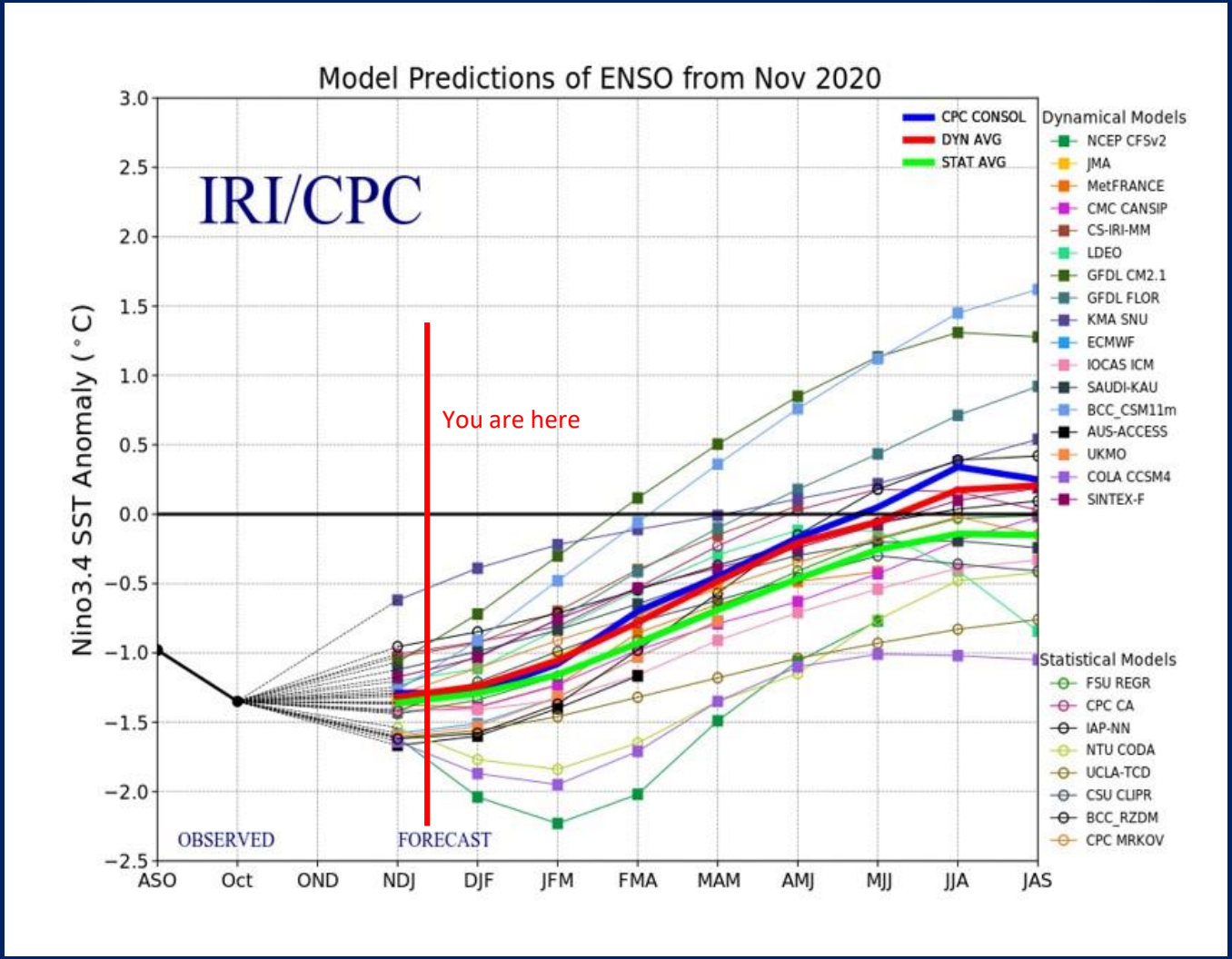


Continued melting reveals dirt trapped in the ice over thousands of years of deposition

This changes the albido (reflectance) of the ice surface, making it darker and leading to more rapid melting, in a continuous feedback loop

Looking Forward

An ensemble of 27 climate models predicts
La Niña conditions from now through spring 2020



Conclusions

2020 will end up as the second hottest year on record, and this string of warm years shows no signs of abating

- As a result, the Northern Pacific Ocean is carrying excess heat content through into the winter, with most of this lying to the east of the Monument

La Niña conditions are present, and expected to persist through spring of 2021

- This generally leads to cooler and wetter than average winters in Hawaii

There is a zero % probability of thermal stress to Monument coral reefs this winter, and through spring of 2021

- Monument reefs will not experience any thermal stress until April 2021 at the earliest.

No tropical cyclone events have occurred in the Monument this year, and the cyclone season is now over until next summer

- A La Niña pattern is not a favorable for Eastern Pacific cyclone formation

Sea level continues to rise at 3-5 mm per year, and this trend is increasing

- Inundation is a long-term problem that will not go away, and may increase over time depending on future melting trends in Greenland and Antarctica

Questions?