

Hawaii

Climate Indicators Summary

June 2019

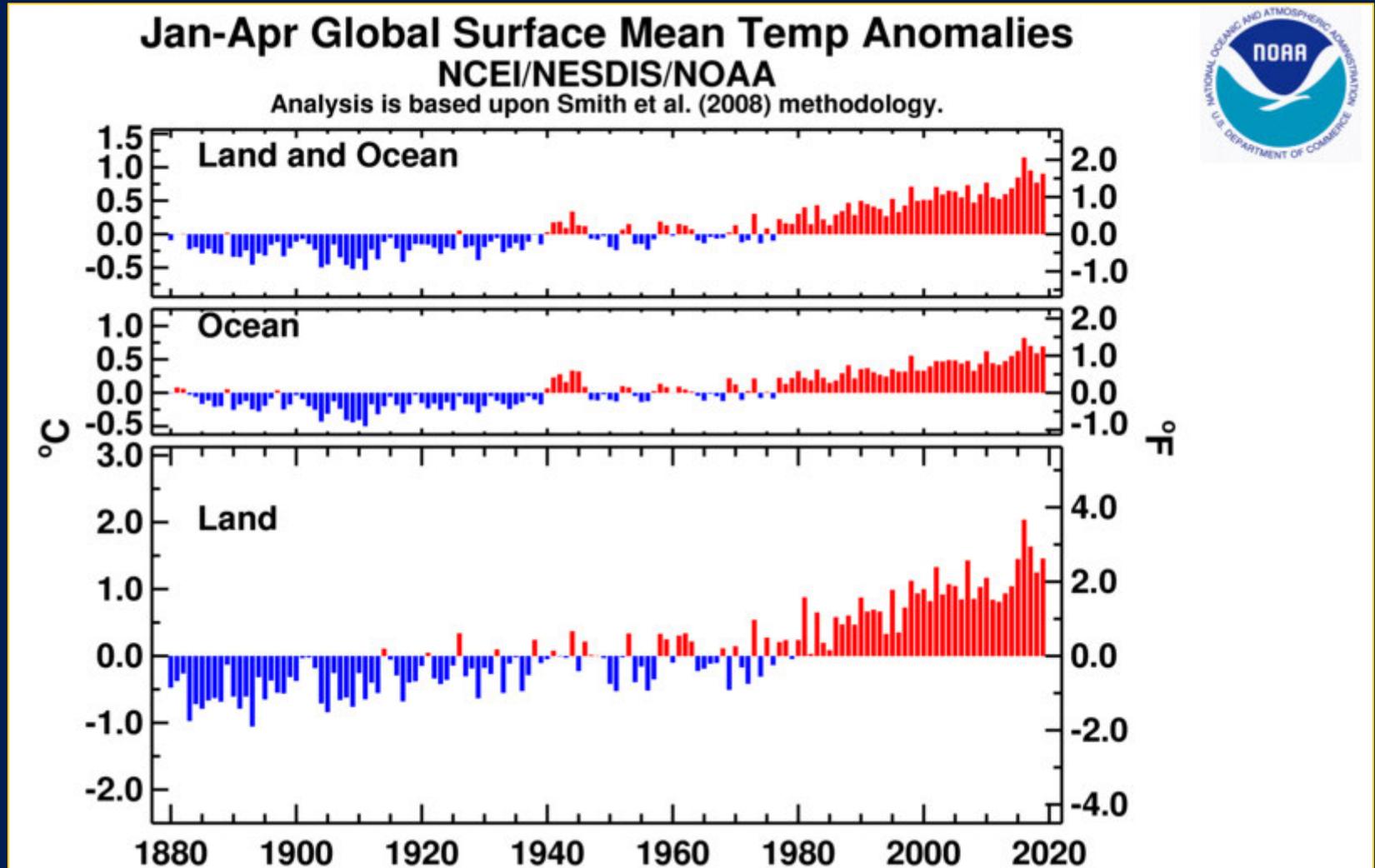
PMNM Climate Change Working Group

Dan A. Polhemus

U. S. Fish & Wildlife Service

Honolulu, HI

2019 has started out warmer than 2018 did

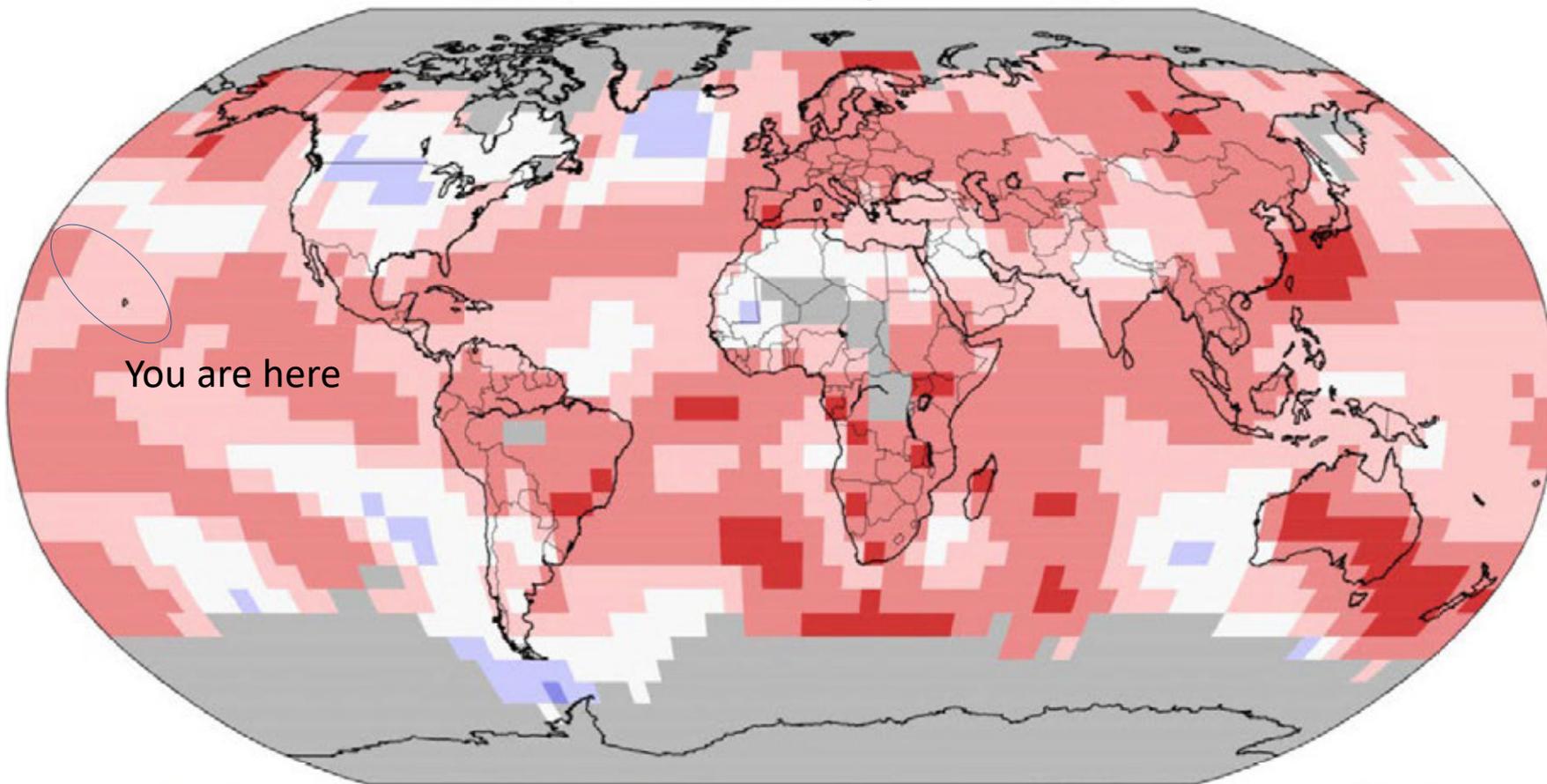


Third warmest late winter and spring season since 1880
Both land and oceans are warming again after three years of decline

Land & Ocean Temperature Percentiles Jan–Apr 2019

NOAA's National Centers for Environmental Information

Data Source: NOAA GlobalTemp v4.0.1–20190513



You are here



Record Coldest



Much Cooler than Average



Cooler than Average



Near Average



Warmer than Average



Much Warmer than Average

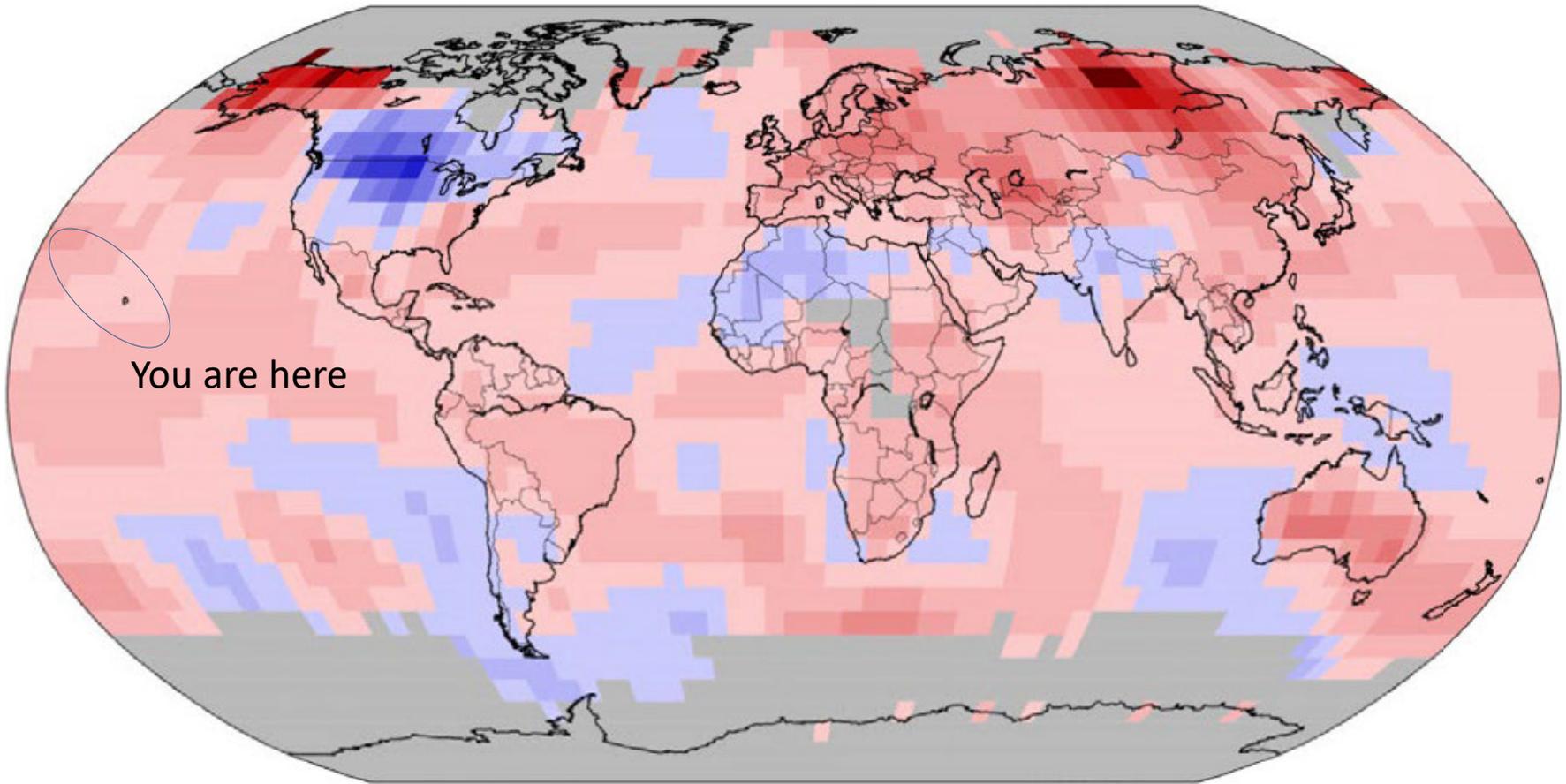


Record Warmest

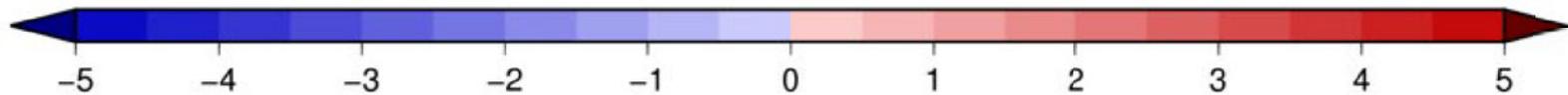


Land & Ocean Temperature Departure from Average Jan–Apr 2019 (with respect to a 1981–2010 base period)

Data Source: NOAA GlobalTemp v4.0.1–20190513



You are here



Degrees Celsius



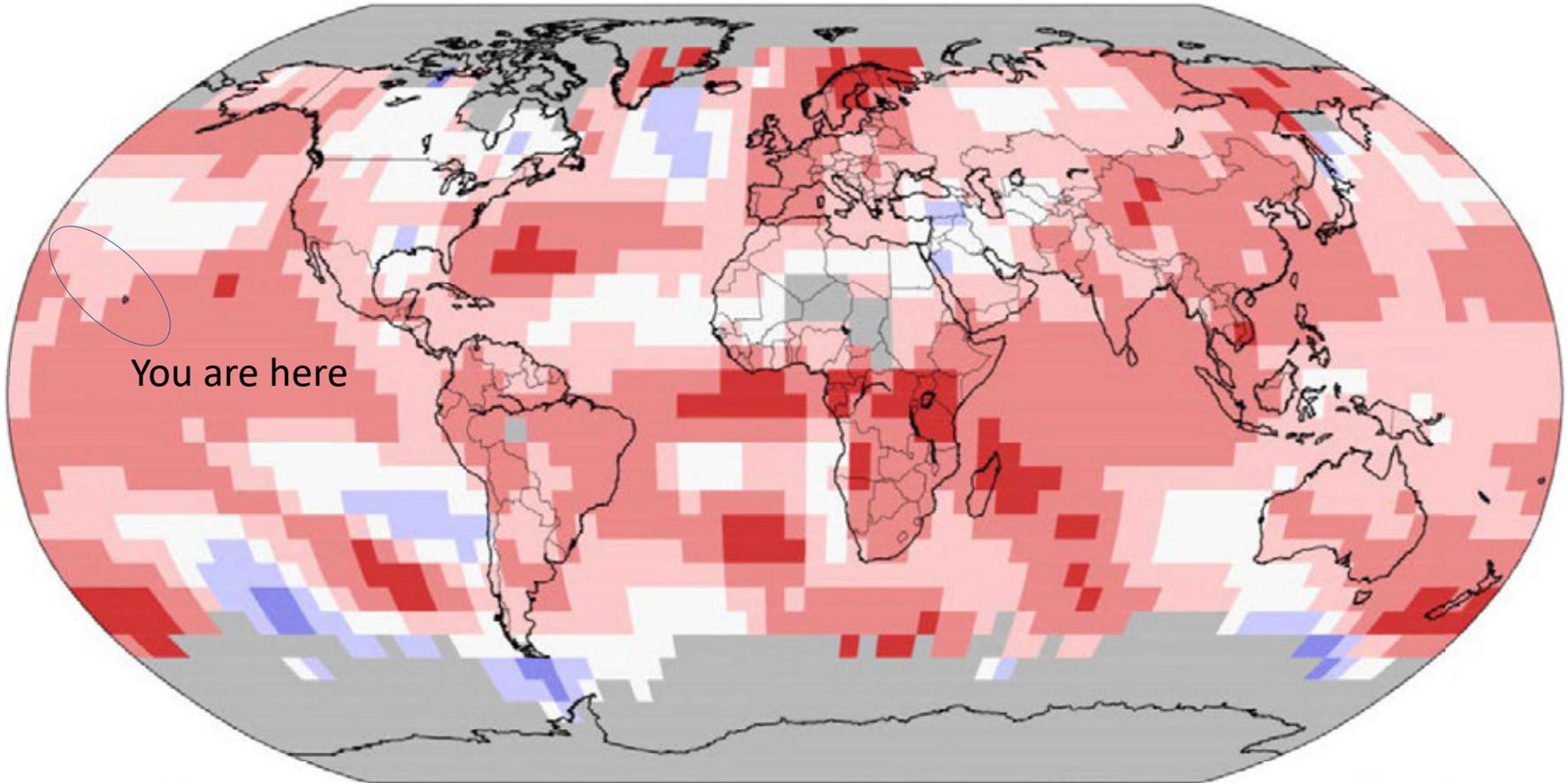
National Centers for Environmental Information
GHCNM v3.3.0.20190513.qca

Please Note: Gray areas represent missing data
Map Projection: Robinson

Land & Ocean Temperature Percentiles Apr 2019

NOAA's National Centers for Environmental Information

Data Source: NOAA GlobalTemp v4.0.1-20190513



You are here



Record Coldest



Much Cooler than Average



Cooler than Average



Near Average



Warmer than Average



Much Warmer than Average

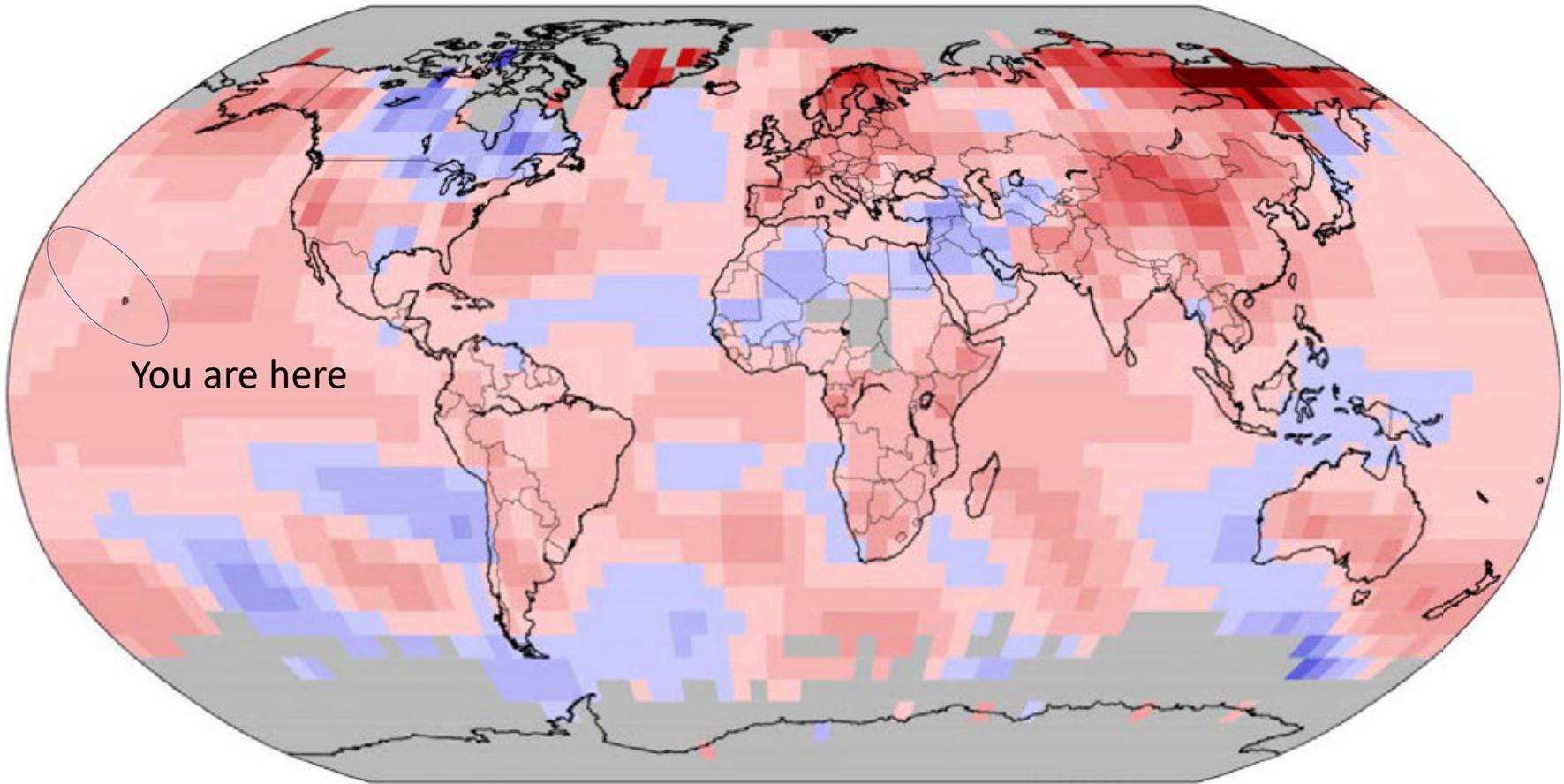


Record Warmest

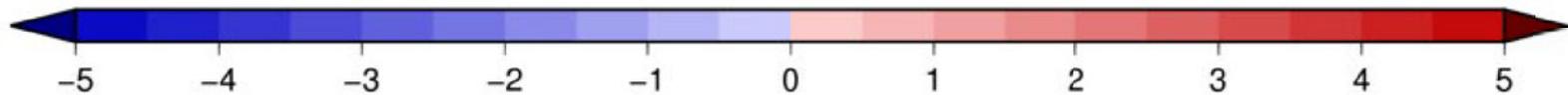


Land & Ocean Temperature Departure from Average Apr 2019 (with respect to a 1981–2010 base period)

Data Source: NOAA GlobalTemp v4.0.1–20190513



You are here



-5

-4

-3

-2

-1

0

1

2

3

4

5

Degrees Celsius



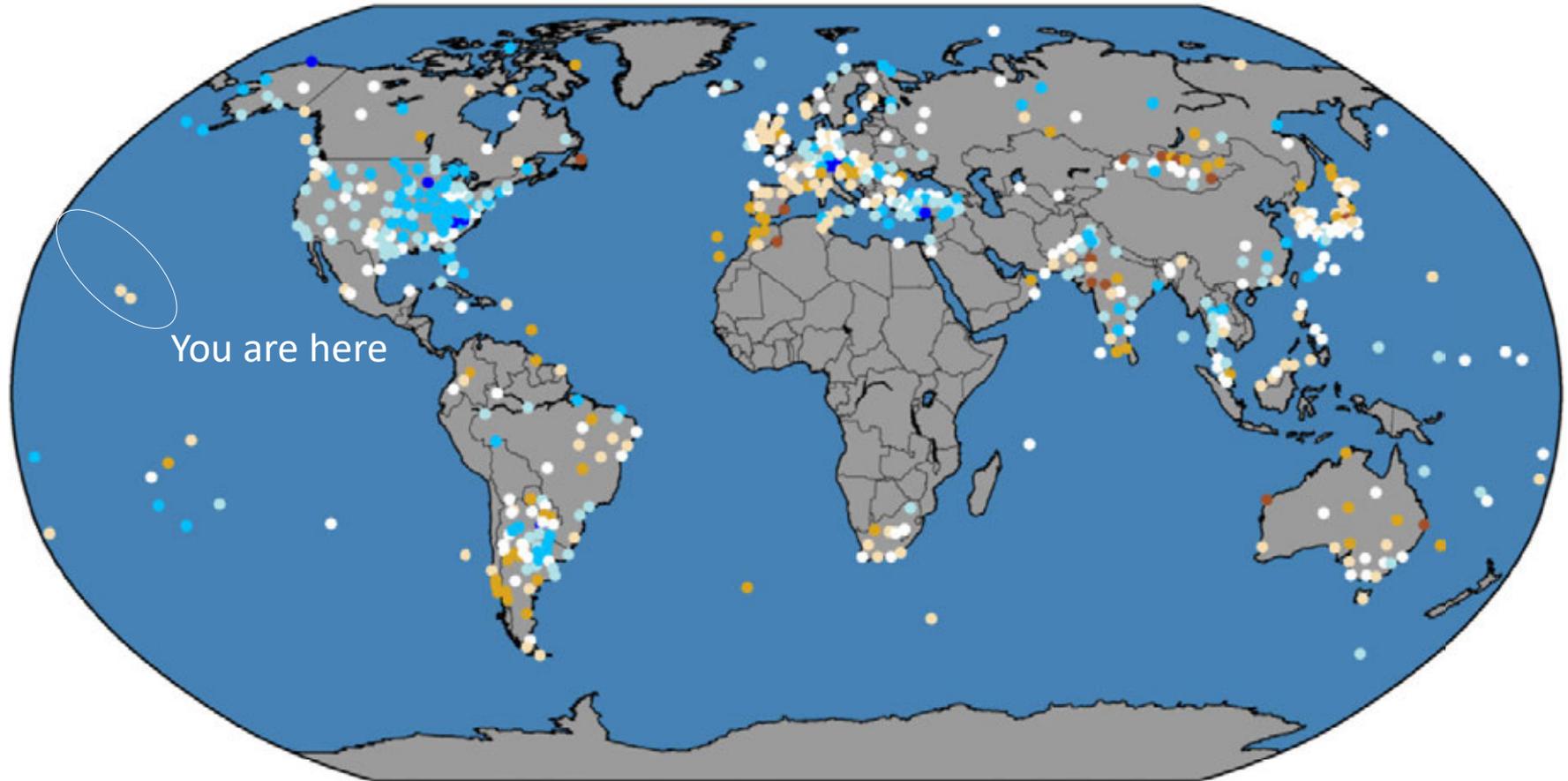
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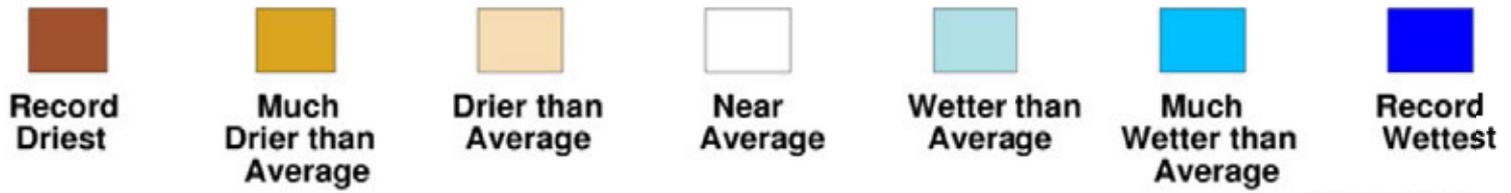
Land-Only Precipitation Percentiles Dec 2018–Feb 2019

NOAA's National Centers for Environmental Information

Data Source: GHCN-M version 2



You are here



Digression #1

A warmer atmosphere holds more water

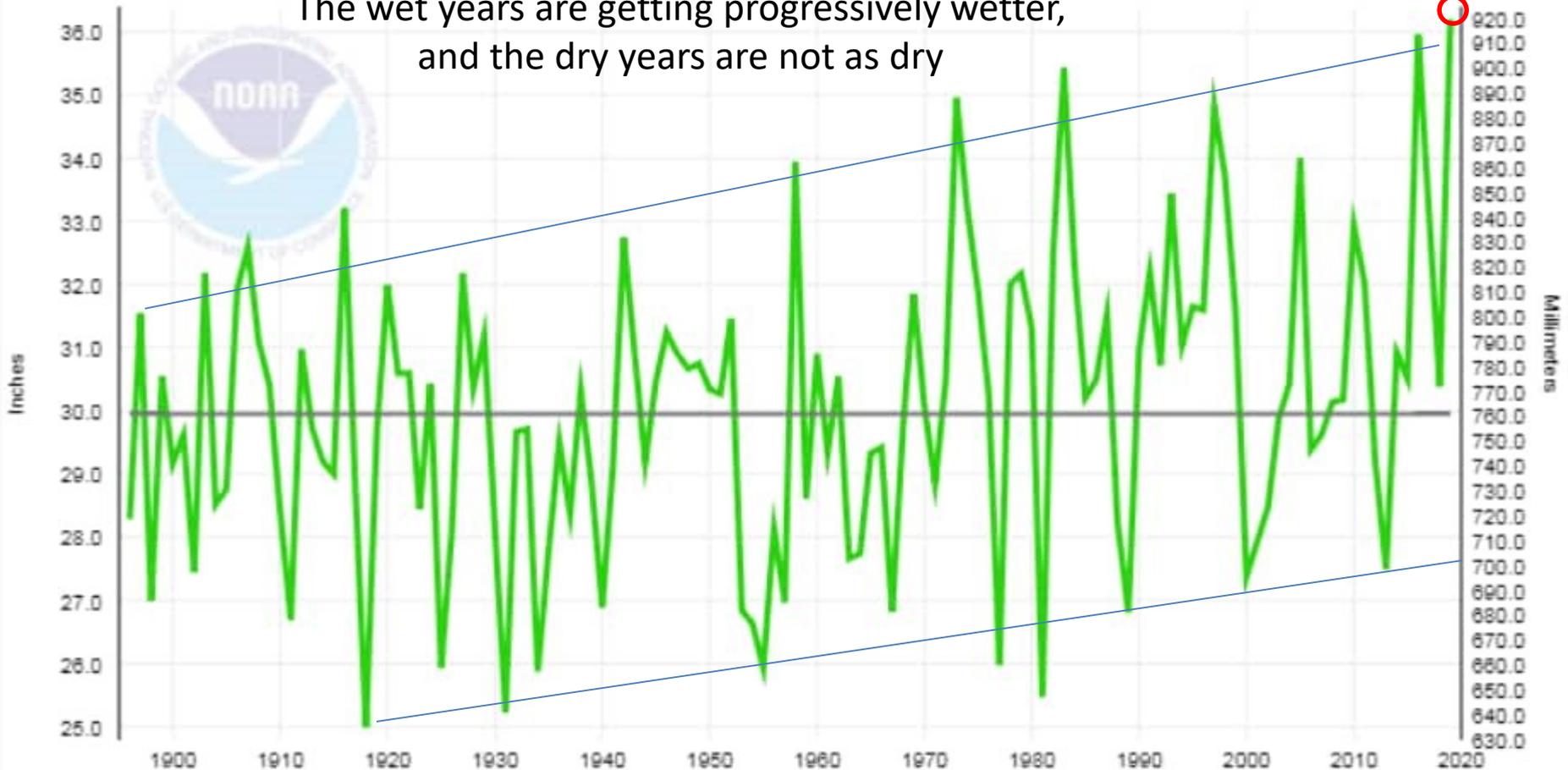
Contiguous U.S., Precipitation, May-April

Precip

1901-2000 Mean: 29.95"

You are here

The wet years are getting progressively wetter,
and the dry years are not as dry

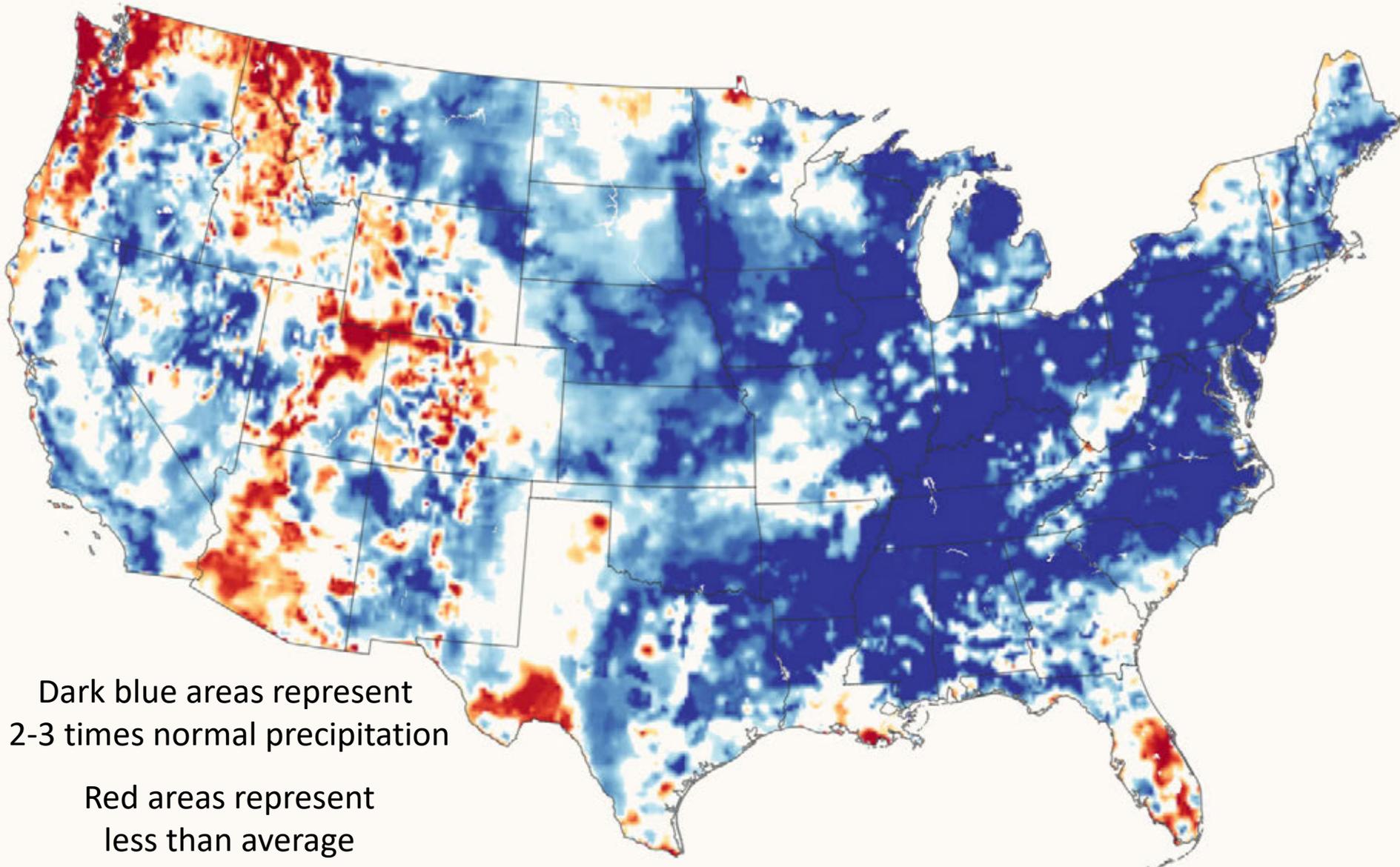


A steady increase in average yearly precipitation over the past 125 years

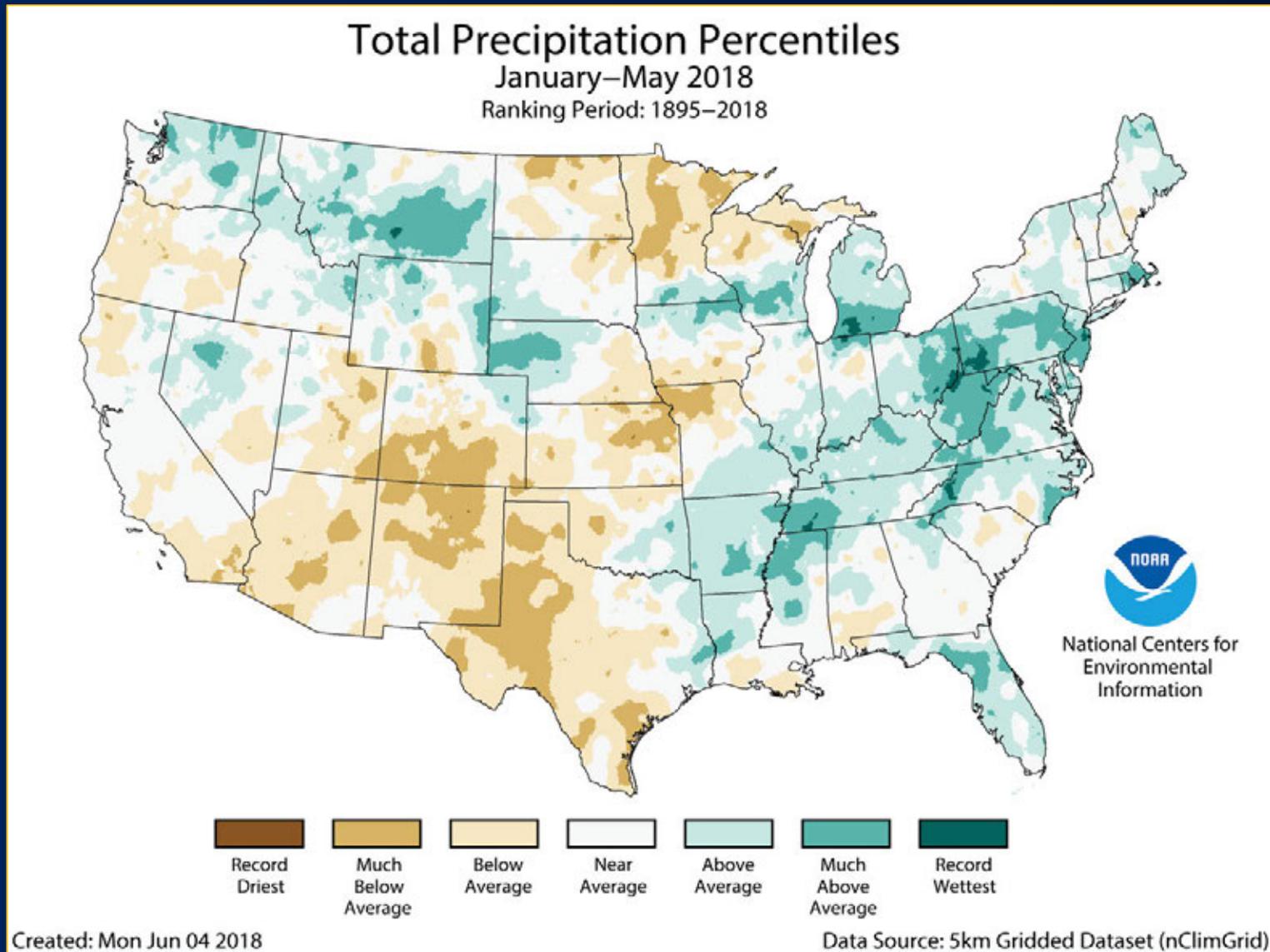
This leads to 1 May 2018 to 30 April 2019 being

The Wettest 12 Months Ever

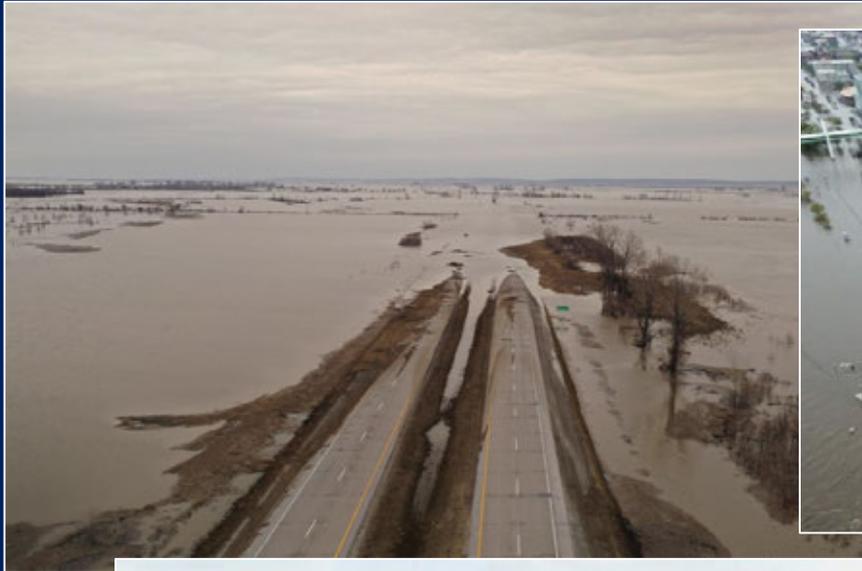
In the continental United States



Some areas have had their wettest spring on record



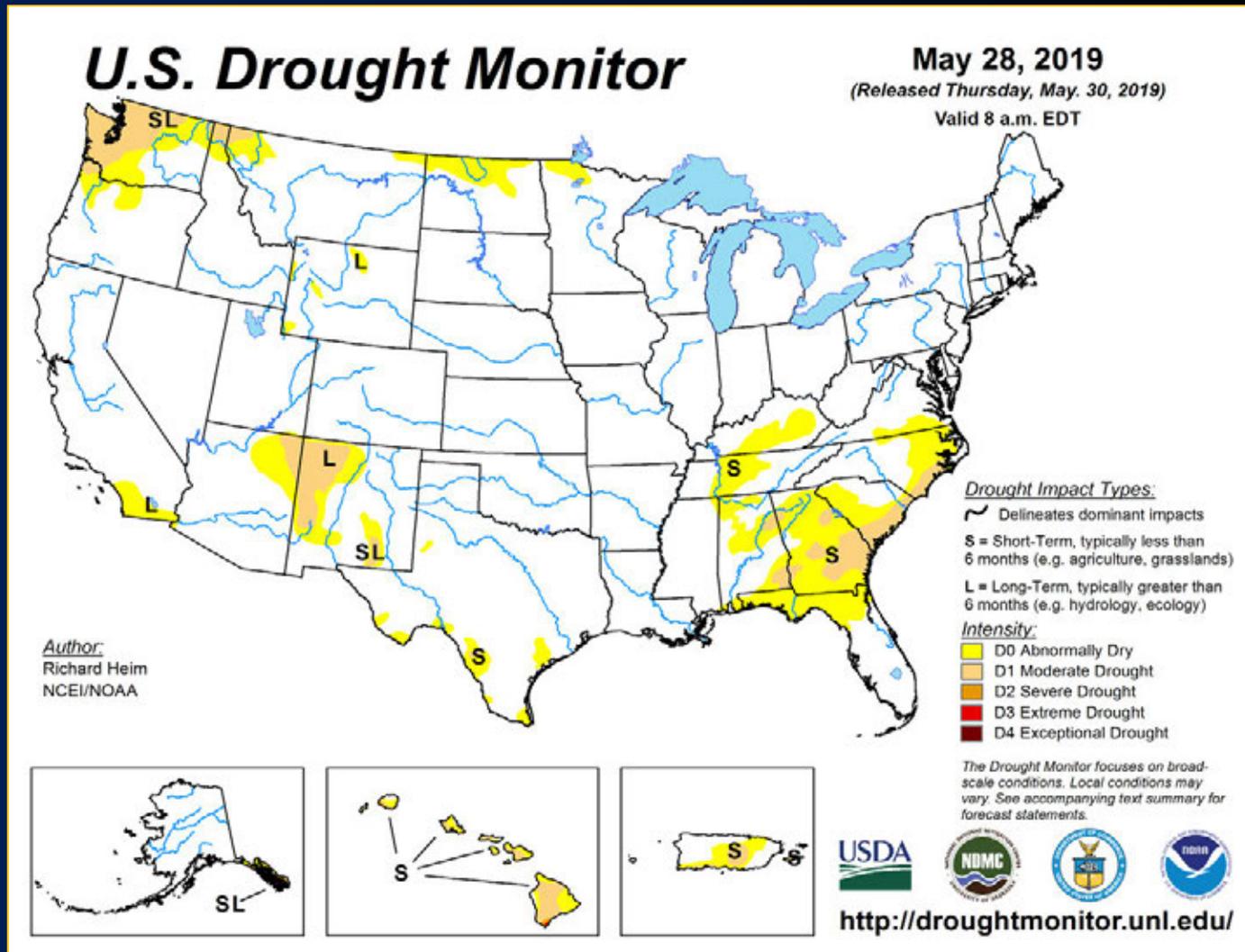
This has caused substantial flooding in the Midwest



This impacts us as well:
food prices will rise due crop losses

Climate is what you expect, weather is what you get

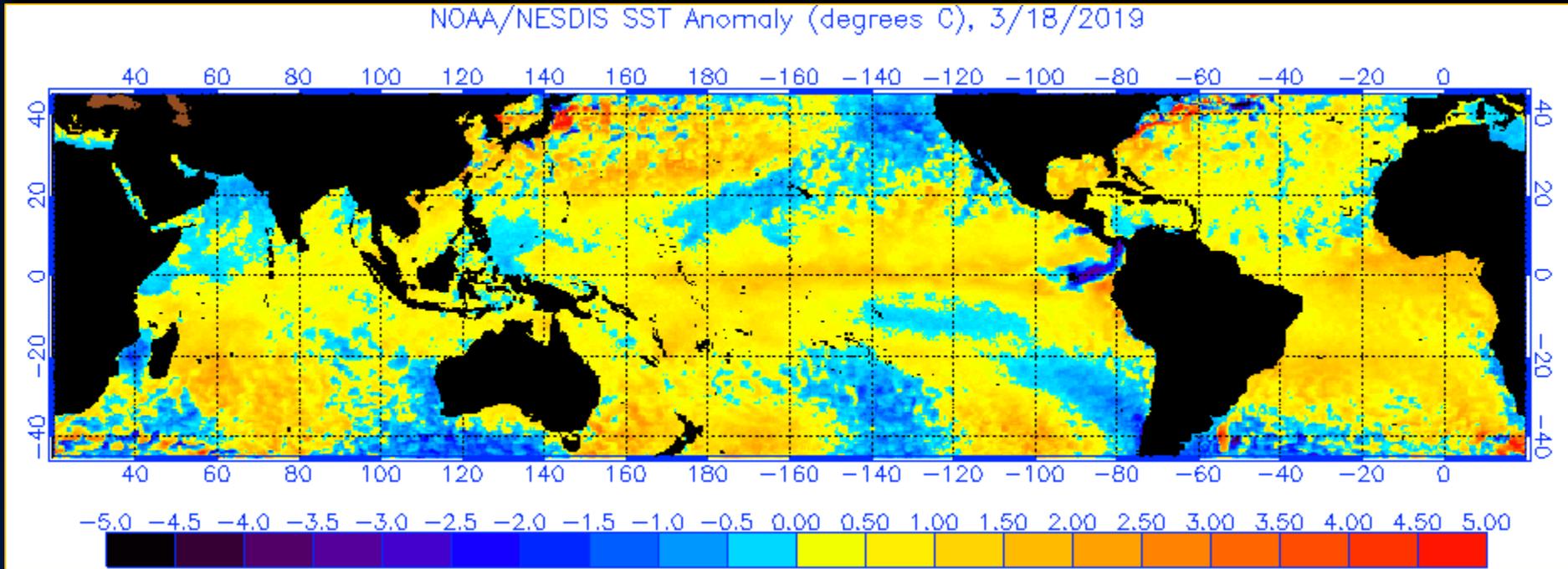
Despite the record rainfall, some areas are still in drought



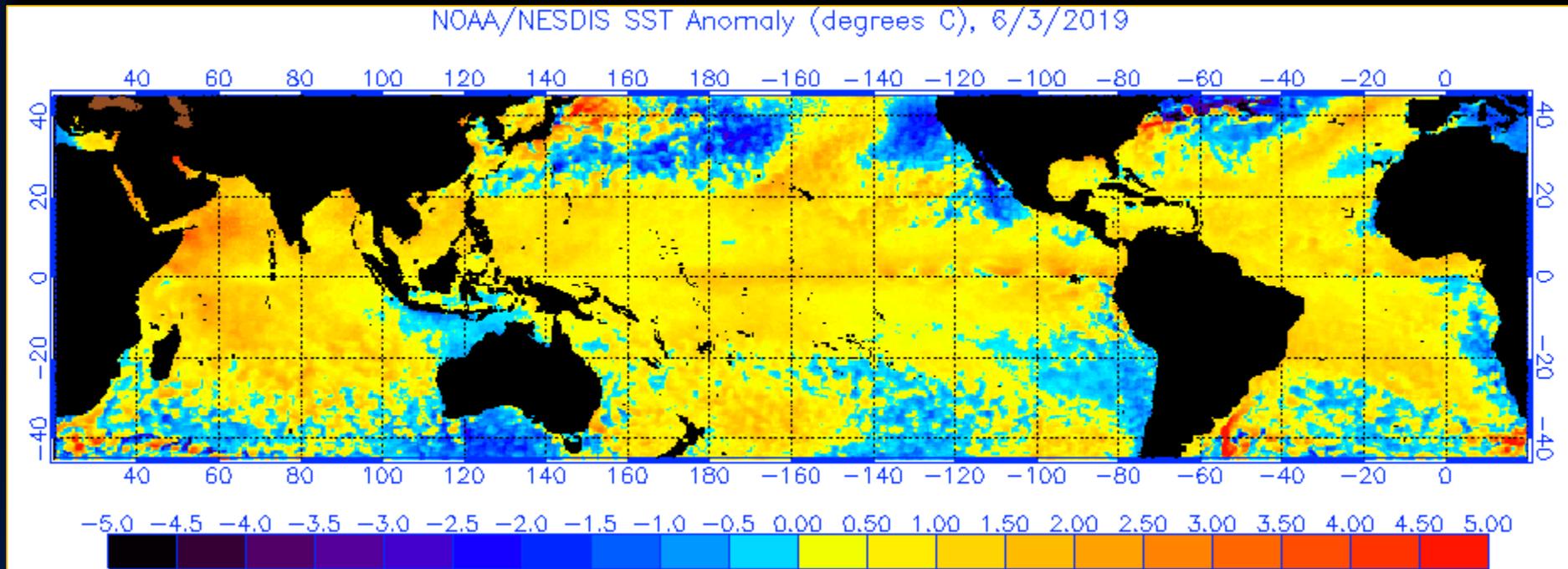
Drought in the US southeast is a typical El Niño pattern

Returning to the Pacific...

Global Sea Surface Temperature Anomaly – 18 March 2019



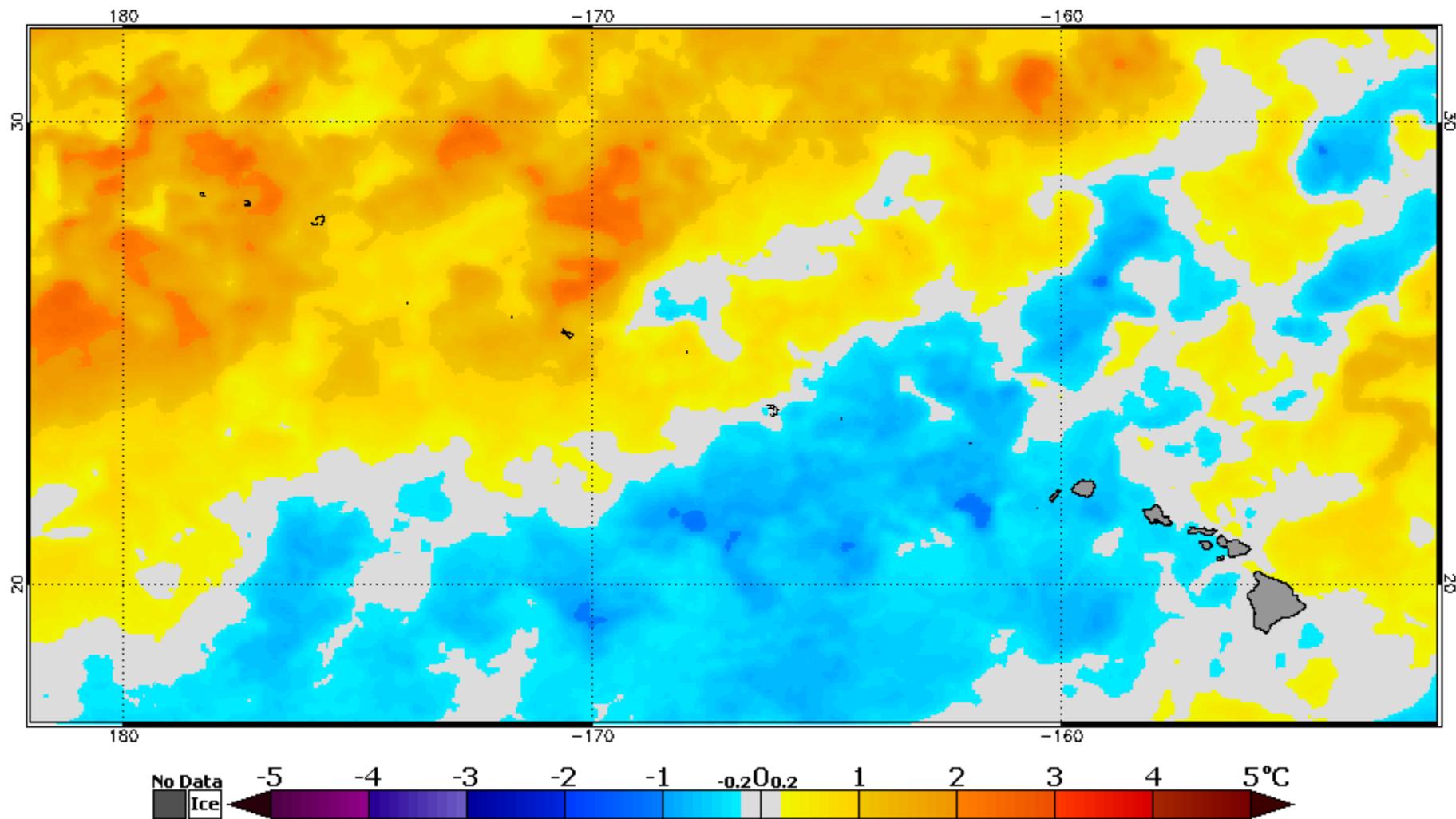
Global Sea Surface Temperature Anomaly – 3 June 2019



Since April there has been a persistent warm thermal anomaly between Hawaii and North America

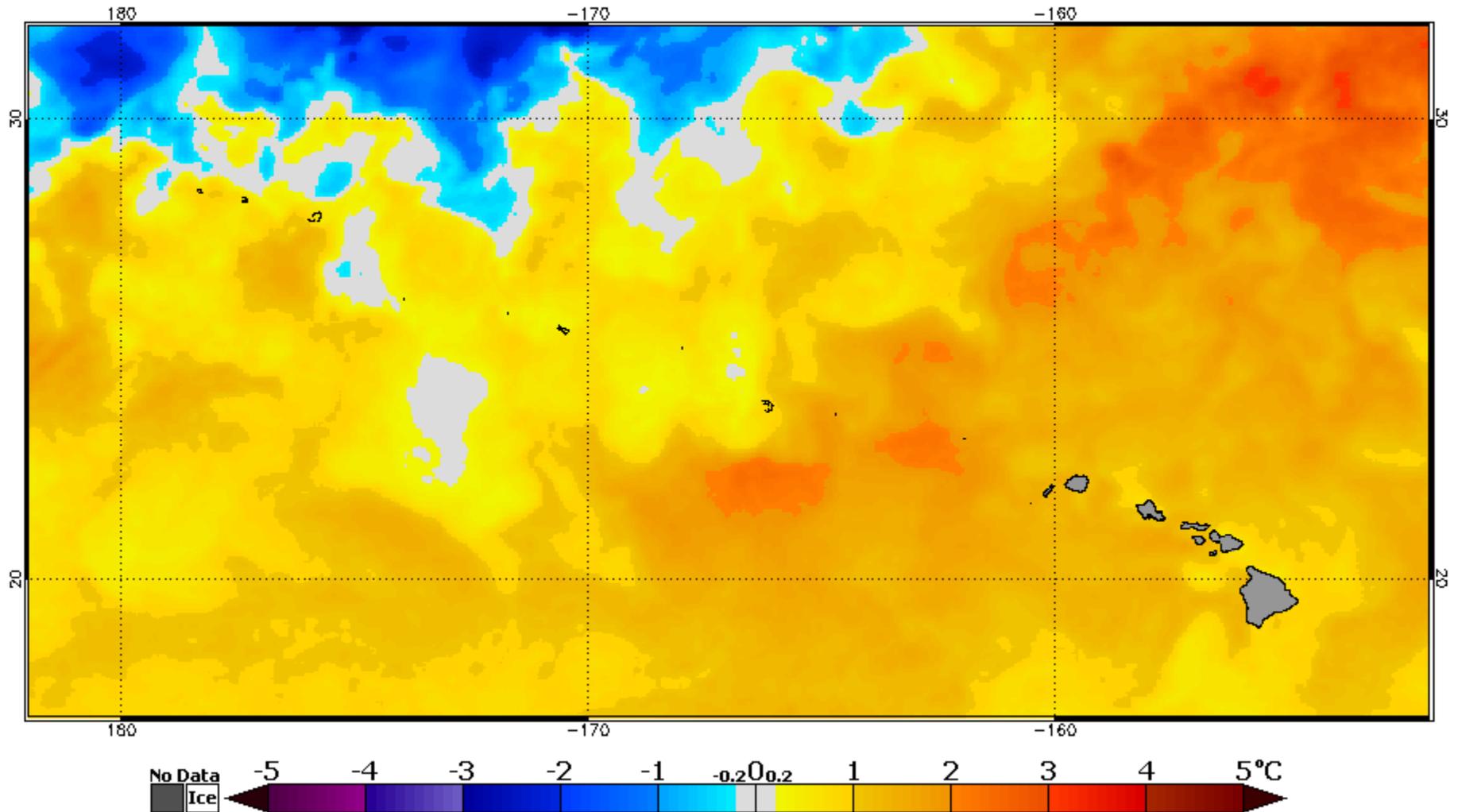
Sea Surface Temperature Anomaly, Hawaii Sector – 17 March 2019

NOAA Coral Reef Watch Daily 5km SST Anomalies (Version 3.1) 17 Mar 2019



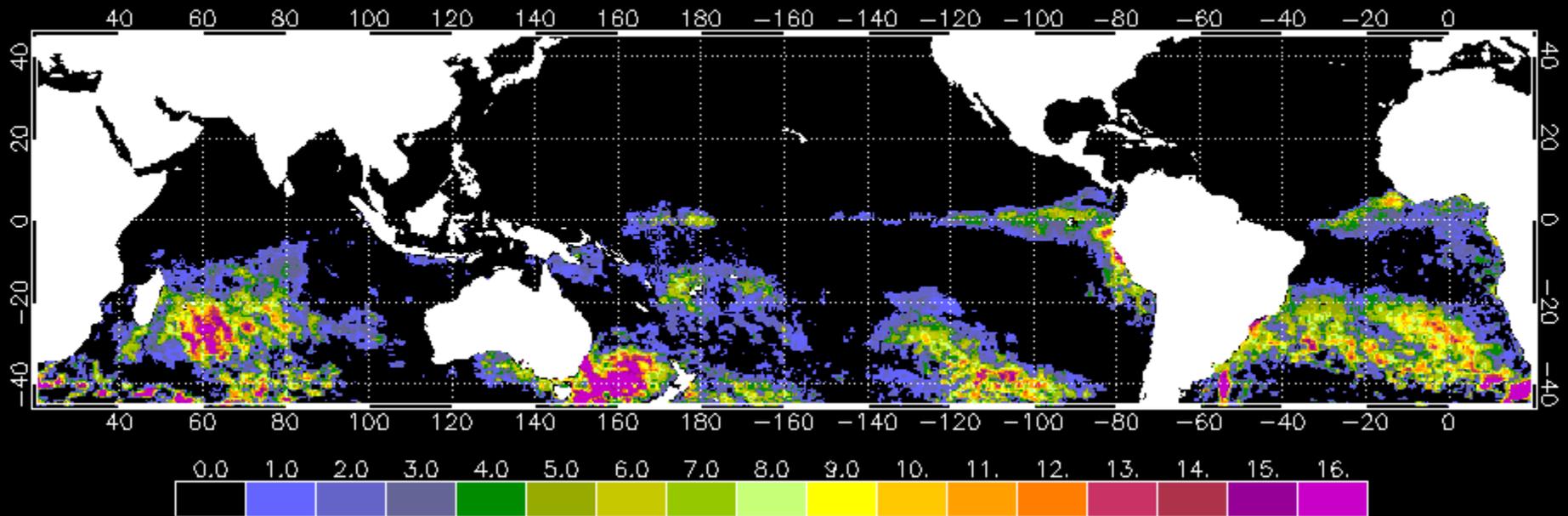
Sea Surface Temperature Anomaly, Hawaii Sector – 4 June 2019

NOAA Coral Reef Watch Daily 5km SST Anomalies (Version 3.1) 4 Jun 2019



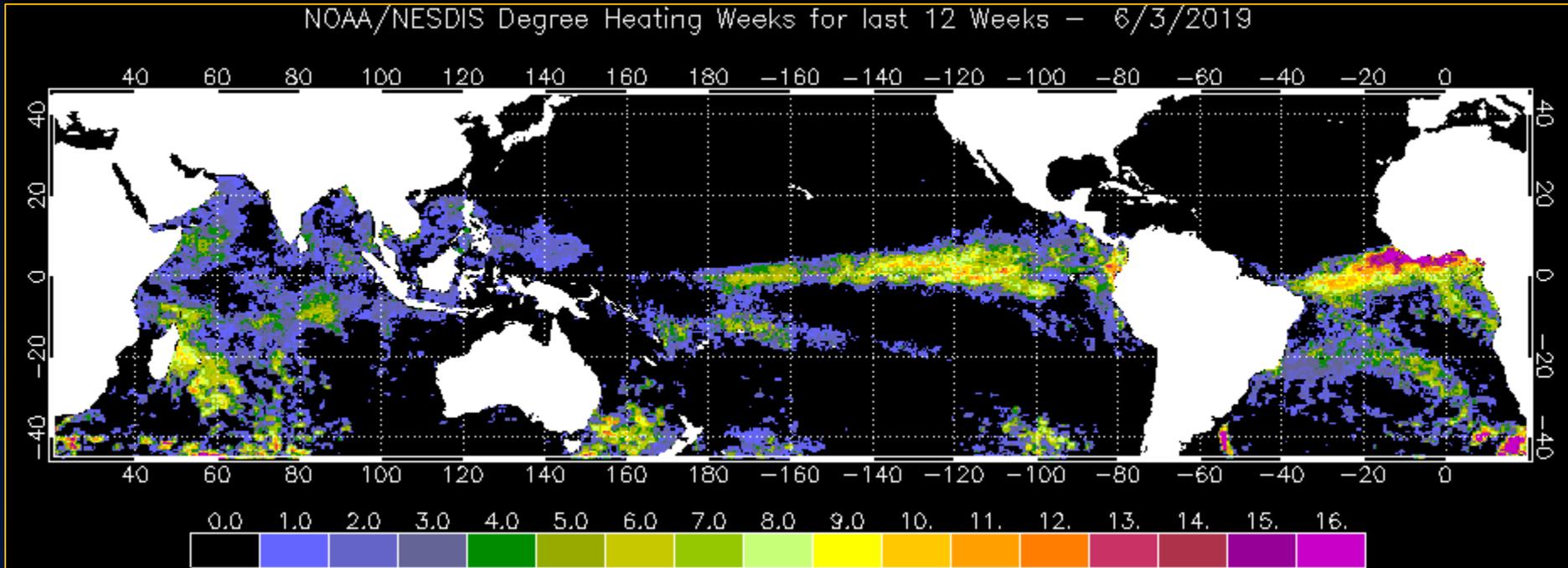
Degree Heating Weeks – 18 March 2019

NOAA/NESDIS Degree Heating Weeks for last 12 Weeks – 3/18/2019



Degree Heating Weeks – 25 October 2018

NOAA/NESDIS Degree Heating Weeks for last 12 Weeks – 6/3/2019



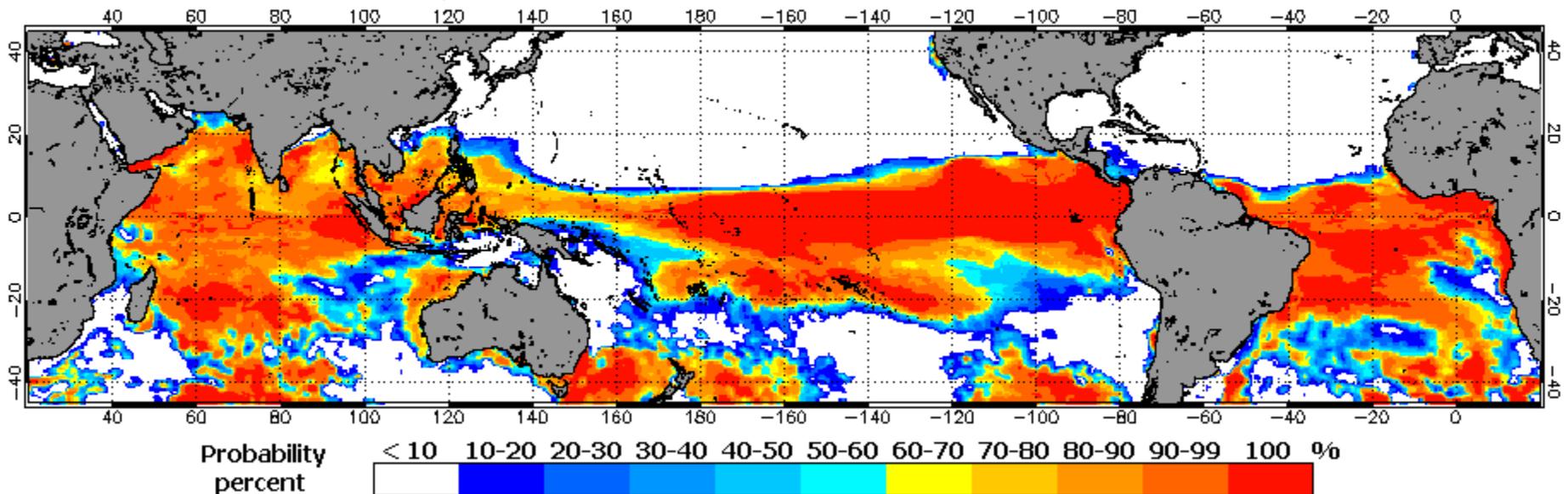
The mild El Niño signature is very obvious on this plot

Bleaching Stress Probability – March-June 2019

Prediction as of 12 March 2019

2019 Mar 12 NOAA Coral Reef Watch Bleaching Heat Stress Probabilities (Warning & Higher) for Mar–Jun 2019

Experimental, v5.0, CFSv2-based, 28 to 112 Ensemble Members

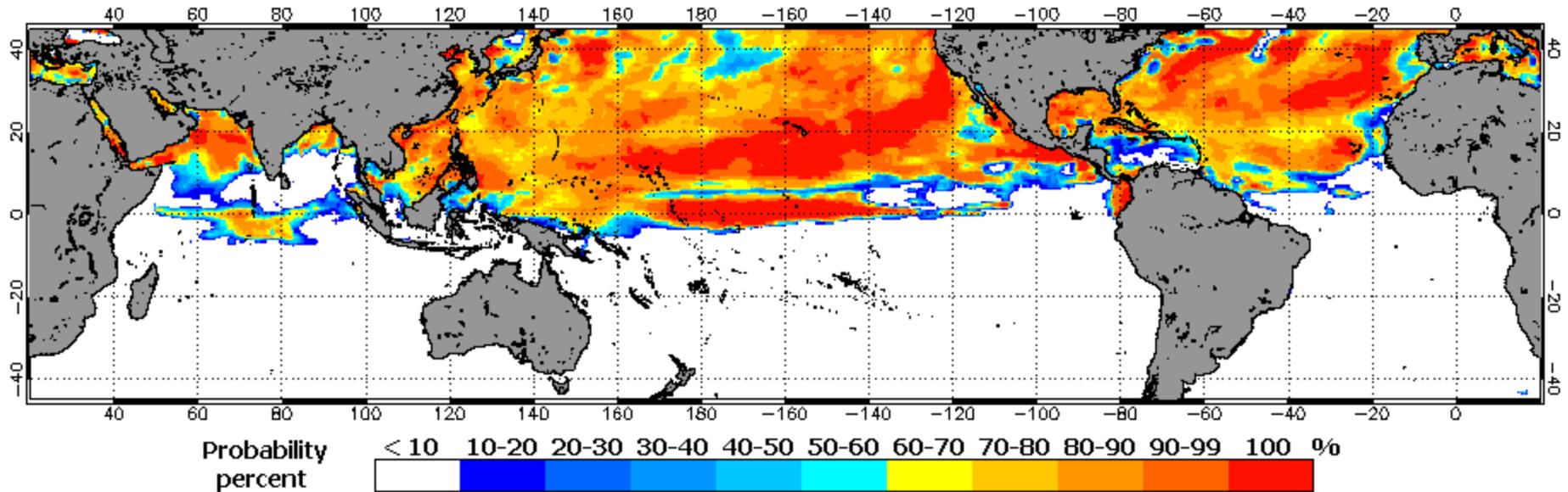


Bleaching Stress Probability – June-September 2019

Prediction as of 4 June 2019

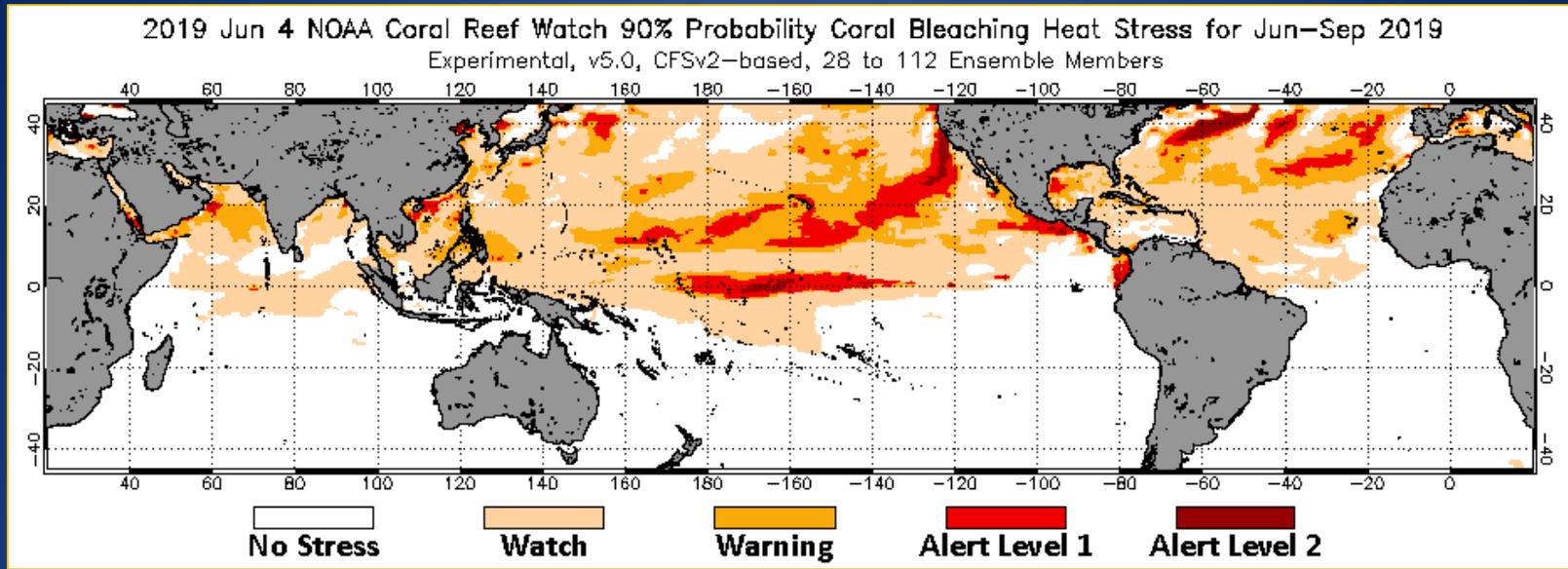
2019 Jun 4 NOAA Coral Reef Watch Bleaching Heat Stress Probabilities (Warning & Higher) for Jun–Sep 2019

Experimental, v5.0, CFSv2–based, 28 to 112 Ensemble Members

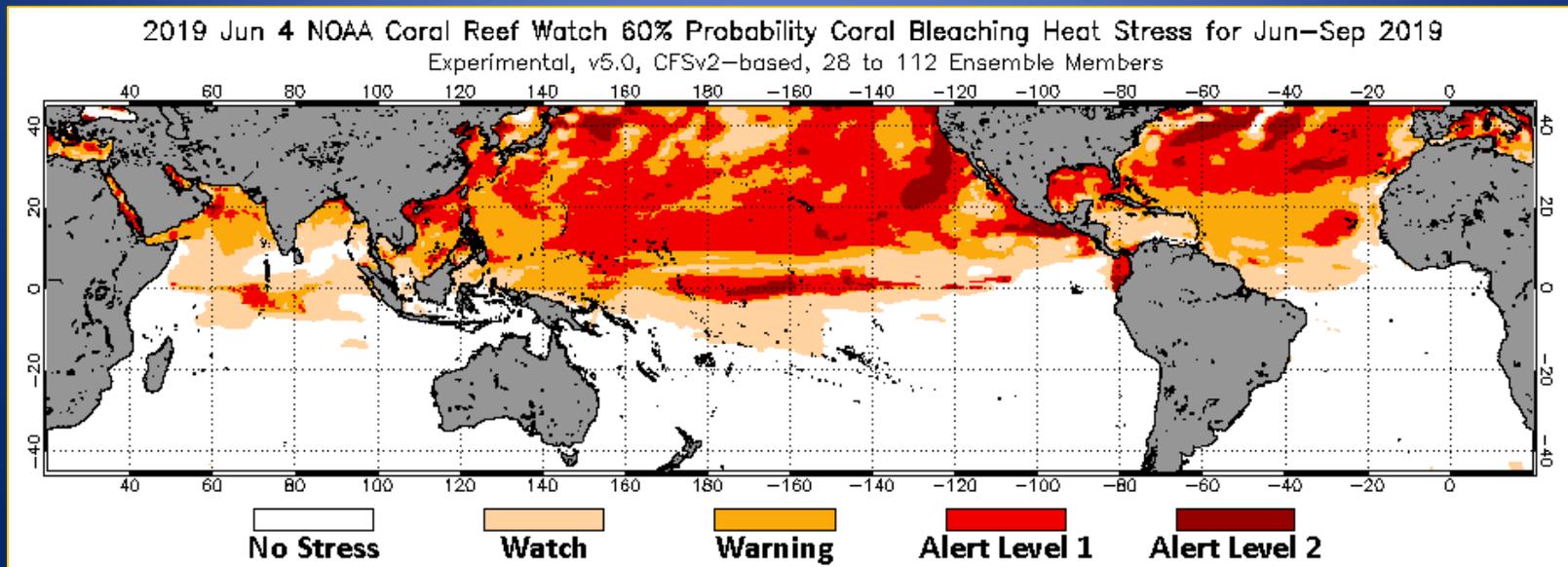


Experimental product indicates some degree of thermal stress is likely for Monument reefs from now through September 2019

90% Stress Level Probability – March-June 2019

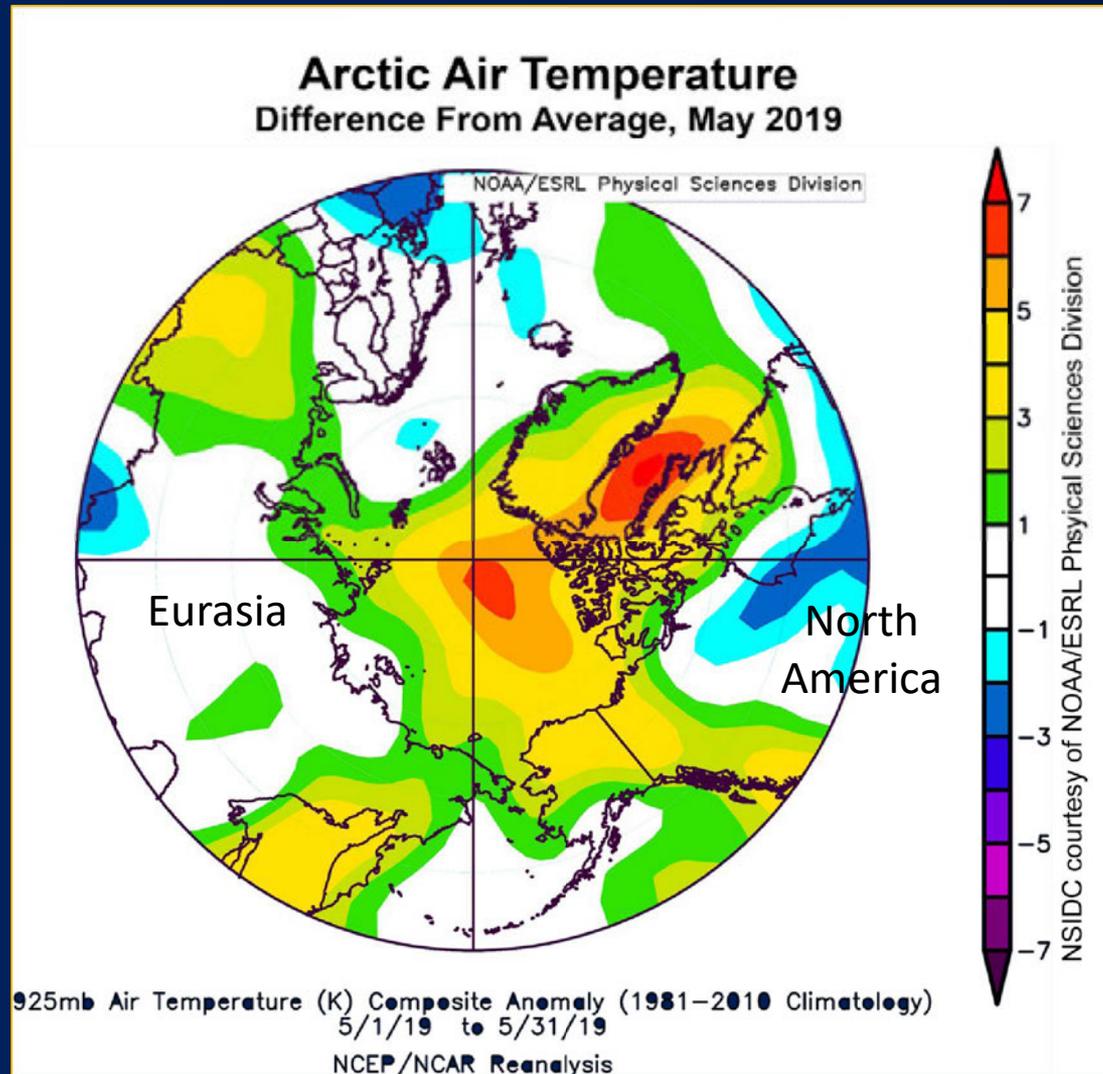


60% Stress Level Probability – March-June 2019



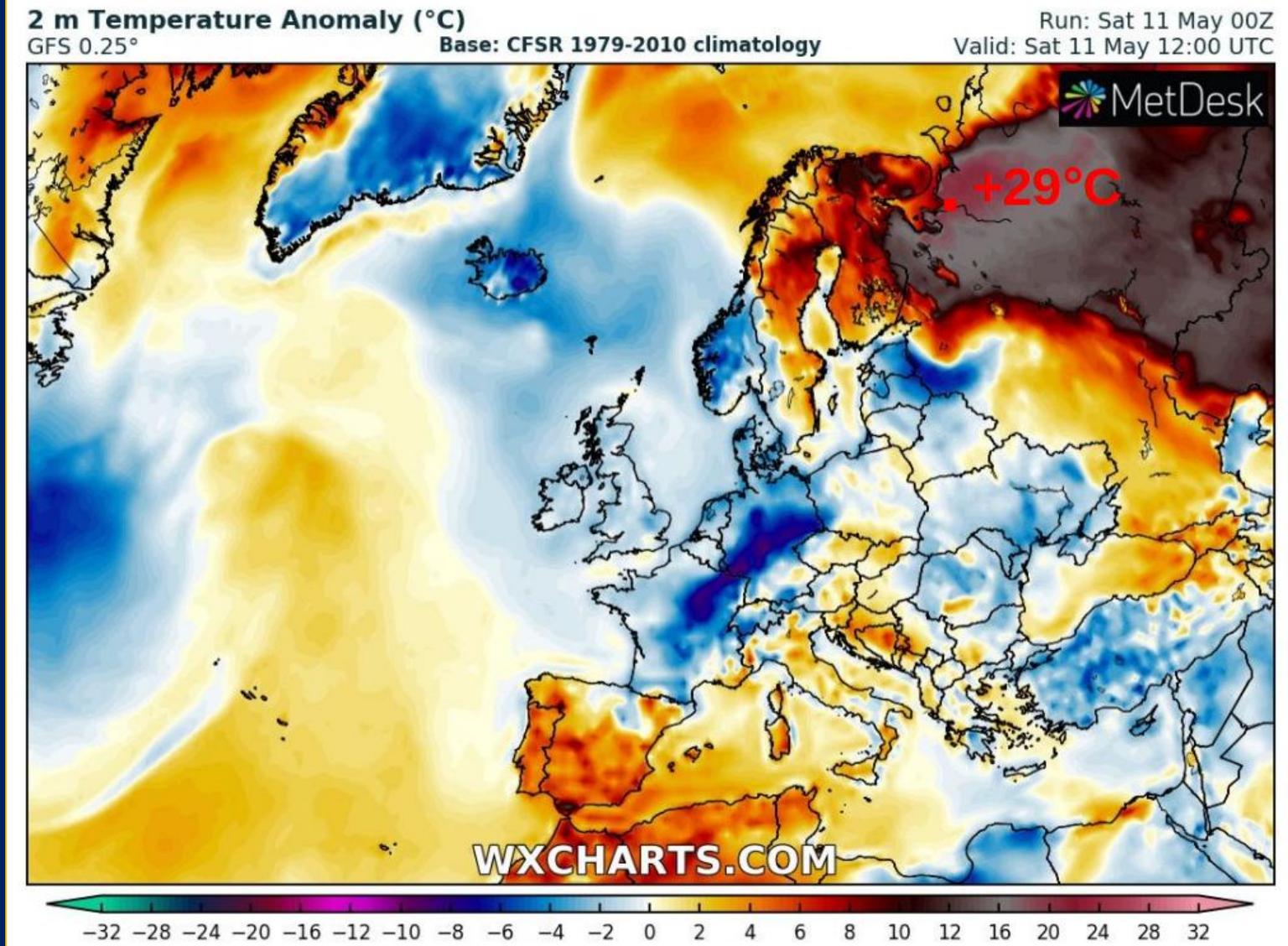
Digression #2

The warm poles, cold continents pattern persists into spring
While North America has been cool and wet, the arctic has been unusually warm



Anomalously warm air over the Arctic displaces cooler air southward into North America

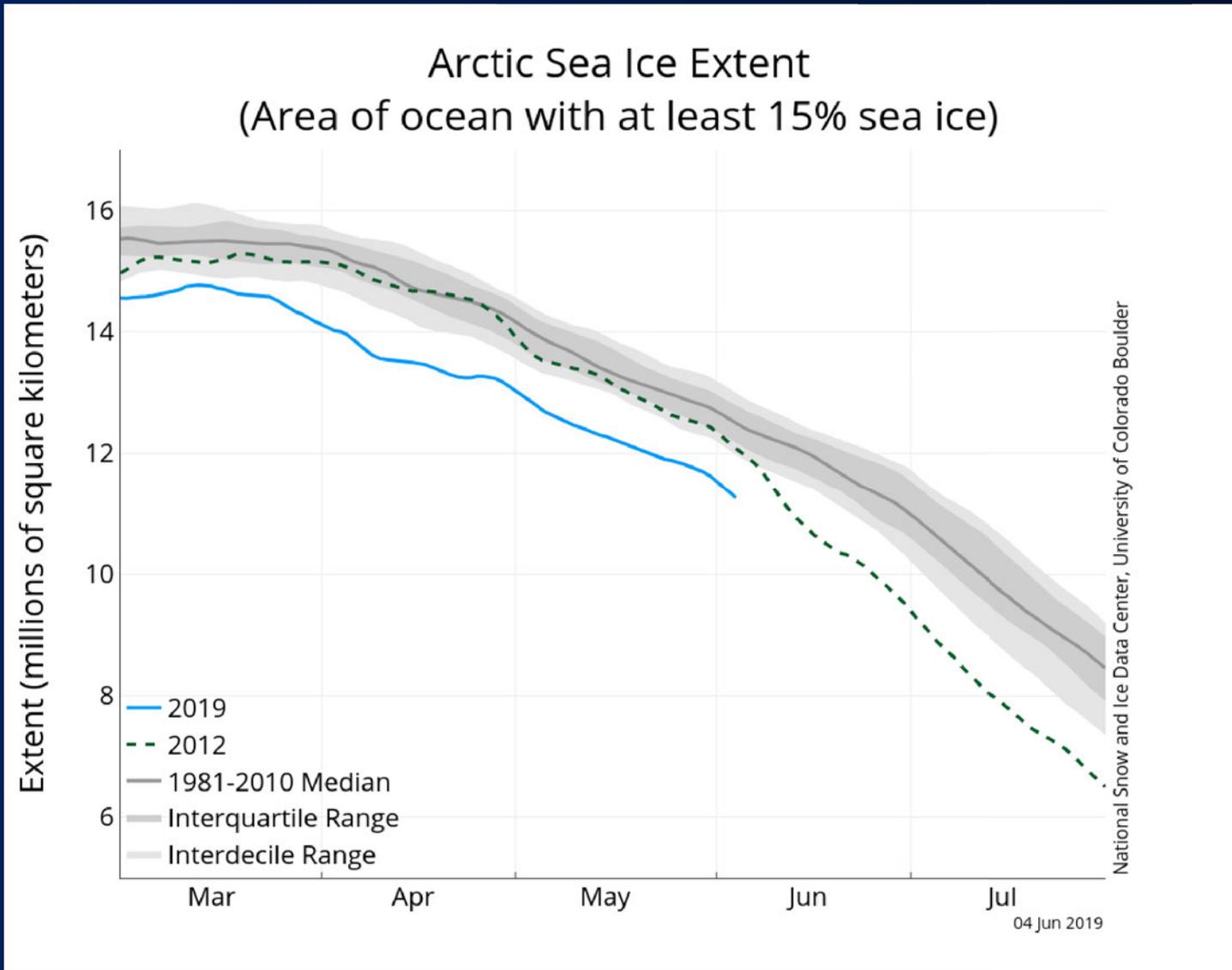
Exceptional warmth in the Russian Arctic



84 degrees F. in Arkhangelsk on 11 May – the same as Honolulu!

Arctic sea ice is at record lows for May and June

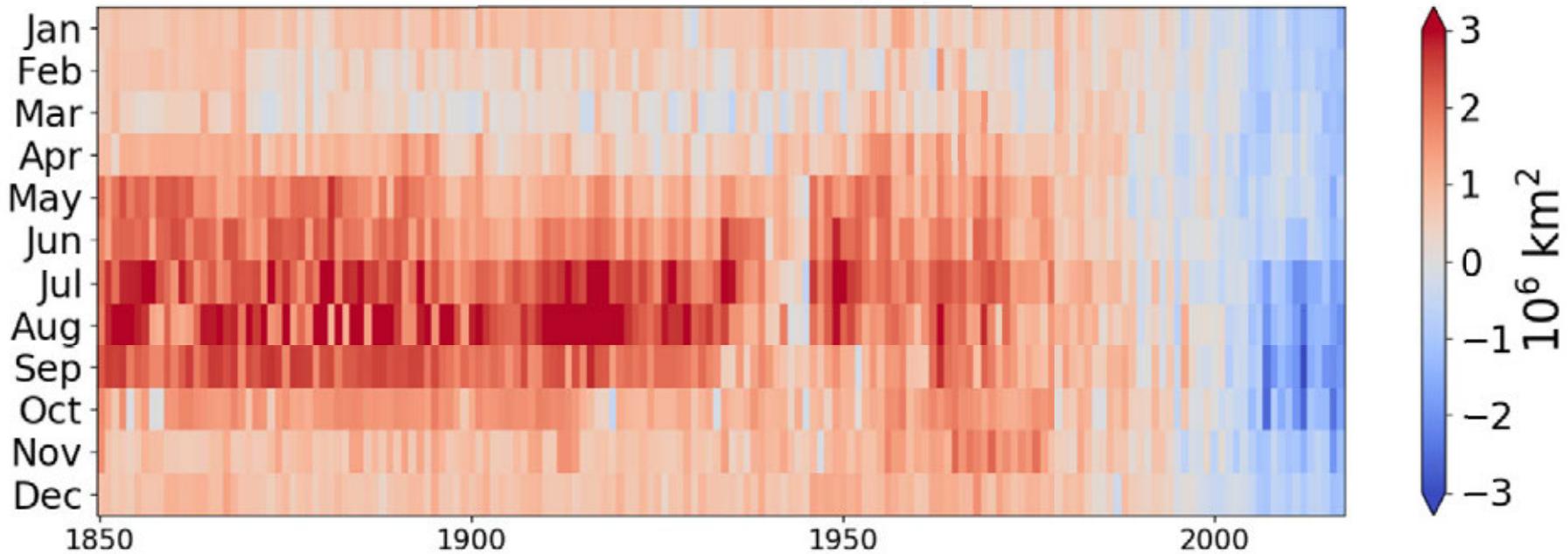
Potential to have the lowest Arctic ice extent ever by the end of summer



2012 is the reference year for the all-time low (until now?)

This is consistent with a long-term pattern of Arctic ice loss

Sea Ice Extent since 1850 Difference from Average

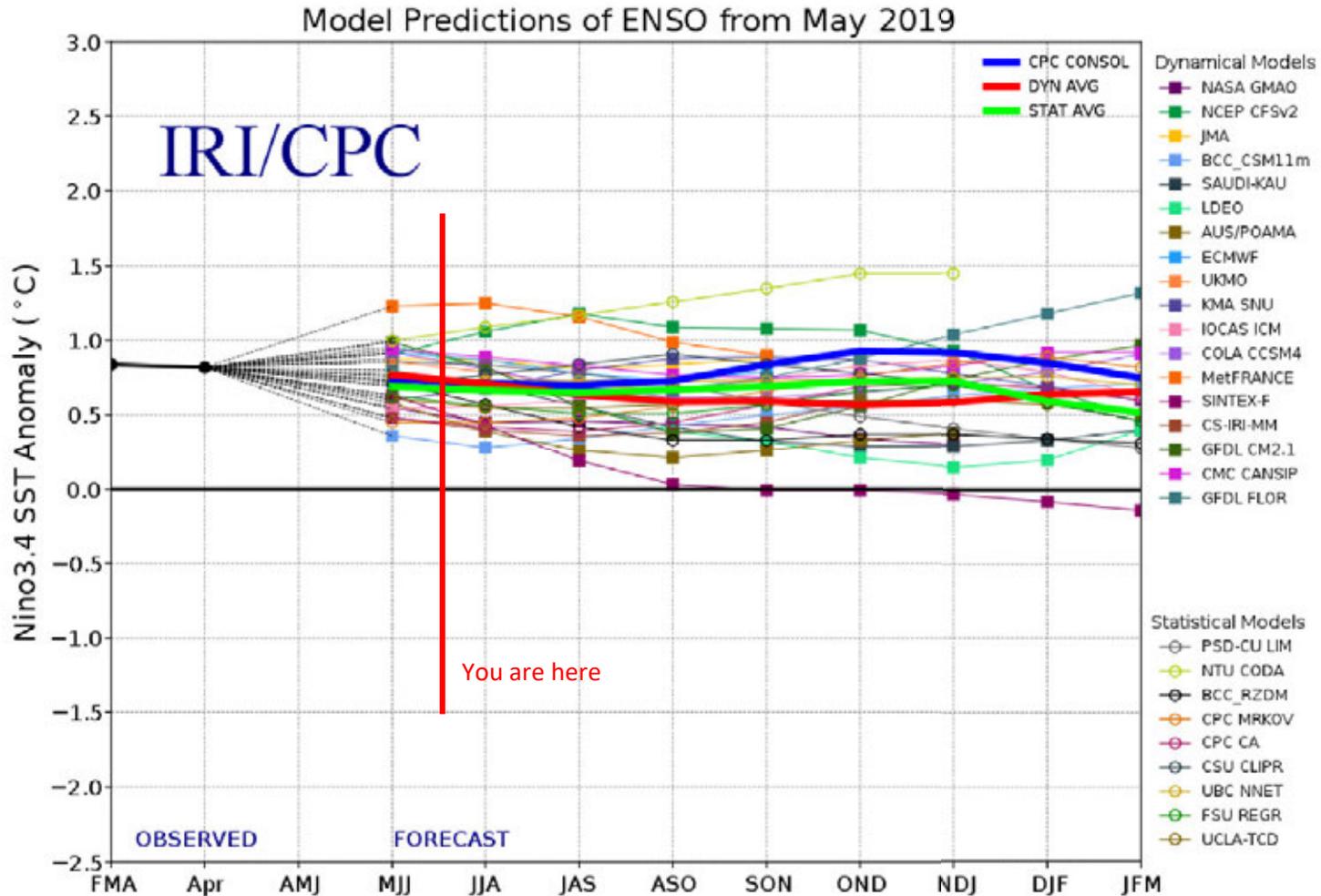


Credit: Walsh et al., 2015, Gridded Monthly Sea Ice Extent and Concentration, 1850 Onward, Version 1

A significant shift has occurred in recent decades

Looking Forward

An ensemble of 27 climate models predicts mild El Niño conditions through the remainder of 2019



Conclusions

2019 is starting out warmer than last year, returning to trend of increasingly hot years

The ocean surrounding Hawaii is gradually accumulating heat content

Mild El Niño conditions are present, with a 60% chance of persisting into fall

Hawaii did not experience the winter drought typical of such a pattern

There is a 90% chance of some thermal stress to Monument coral reefs, including a 60% chance of some bleaching from now through September 2019

The major risk appears to be in the main Hawaiian Islands, but there is a possibility for bleaching in the southeast portion of the Monument as well

Current prediction is for a 70% chance of a more active than normal hurricane season in the central and eastern Pacific, with 8-13 hurricanes

El Niño conditions also often correlate with higher rates of cyclogenesis in the Eastern Pacific as well...stay tuned

Sea level continues to rise at 3-5 mm per year

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?

