Use of SST for monitoring coral stress

Looking forward while keeping an eye on the past.

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NOAA CORAL REEF CONSERVATION PROGRAM

NOAA CORAL REEF WATCH

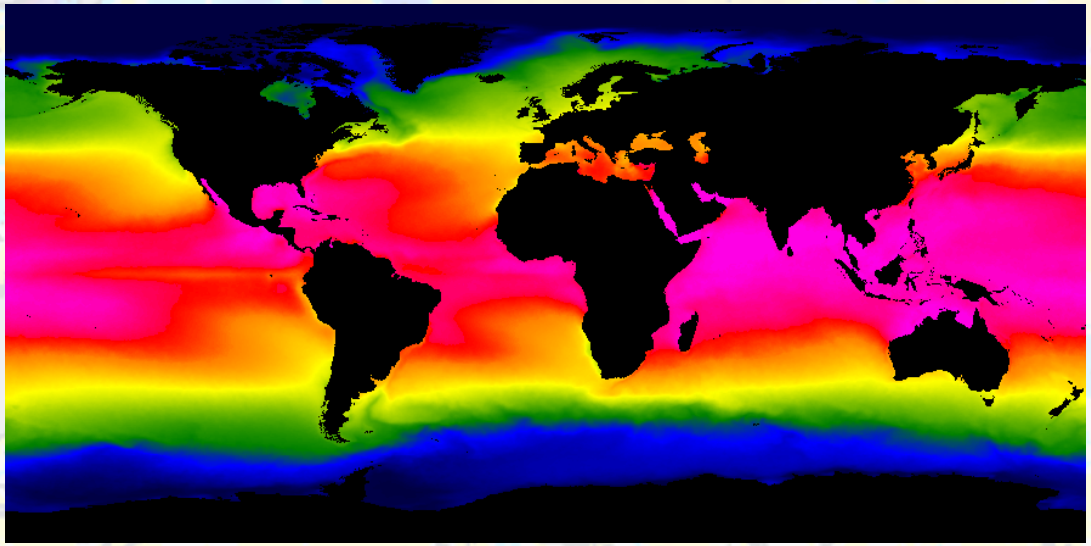
NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

Talk Overview

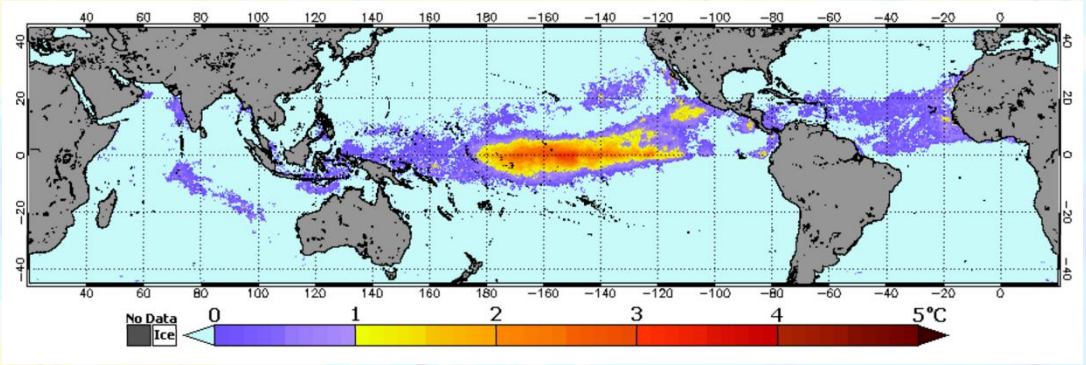
- The DHW algorithm and why climatologies are important
- Introducing CoralTemp
- Bleaching extent through time – CoralTemp vs CCI
- Which of CoralTemp and CCI are likely to be more consistent
- Effect of cool CoralTemp bias on MMM
- The extent of global coral bleaching through time

Degree Heating Week Product

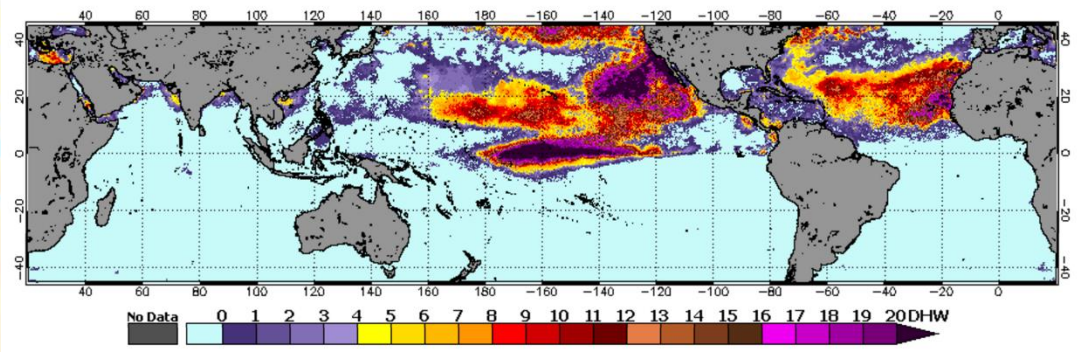
MMM = Maximum of the Monthly Means
(1985 – 2012)



HotSpot = daily SST – MMM
where Hotspot ≥ 0



DHW = ∑ HotSpot, for HotSpot ≥ 1



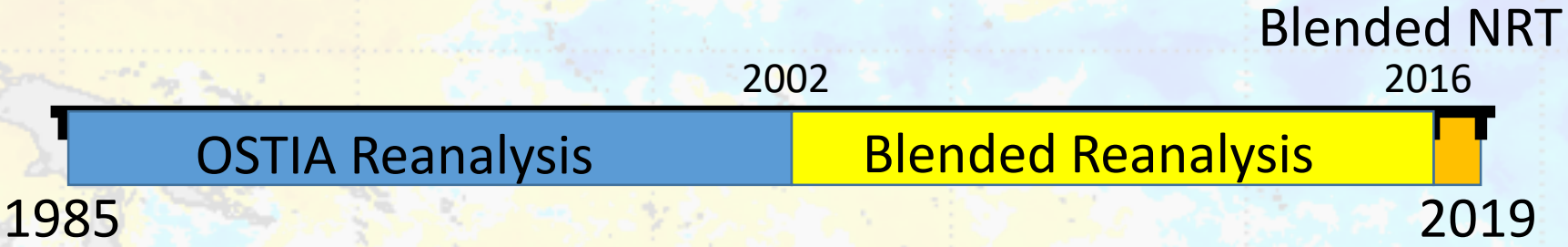
Previously

- *Climatology from AVHRR Pathfinder*
- *Near-Real Time SST (NOAA Goes/Poes Blended SST)*
- *HotSpot and DHW*
  - *derived with Apples and Pears*
  - *accumulated bias*

CoralTemp

A consistent SST product spanning 1985-present

Daily, gap-free 0.05 degree resolution SST

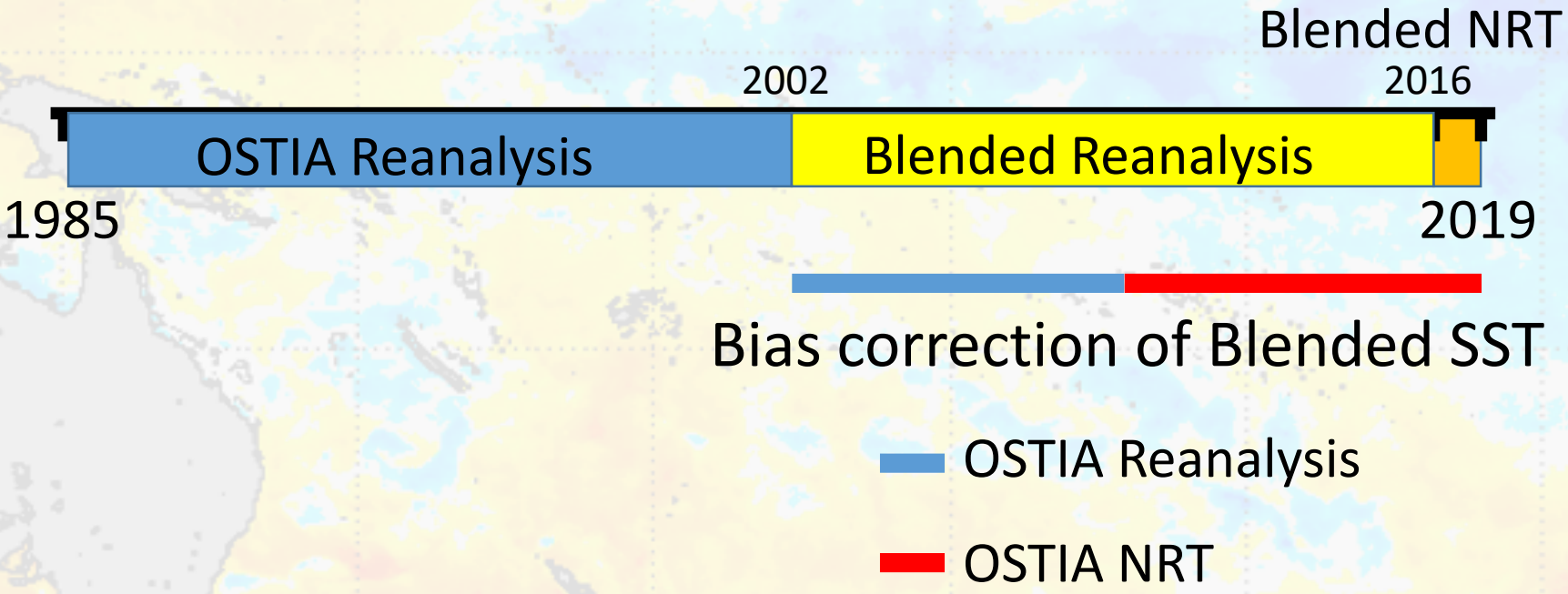


Temporal consistency provided via OSTIA

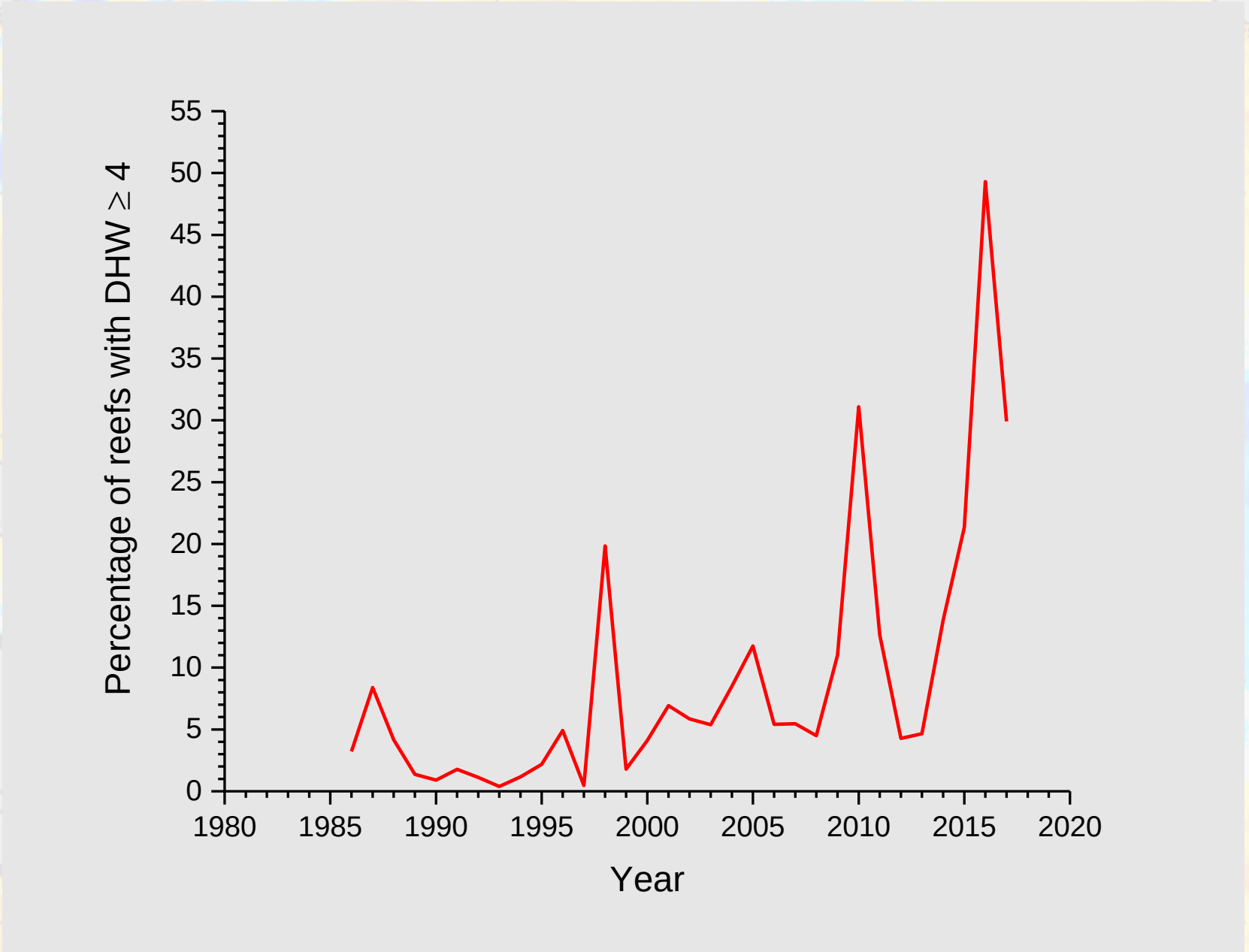
CoralTemp

A consistent SST product spanning 1985-present

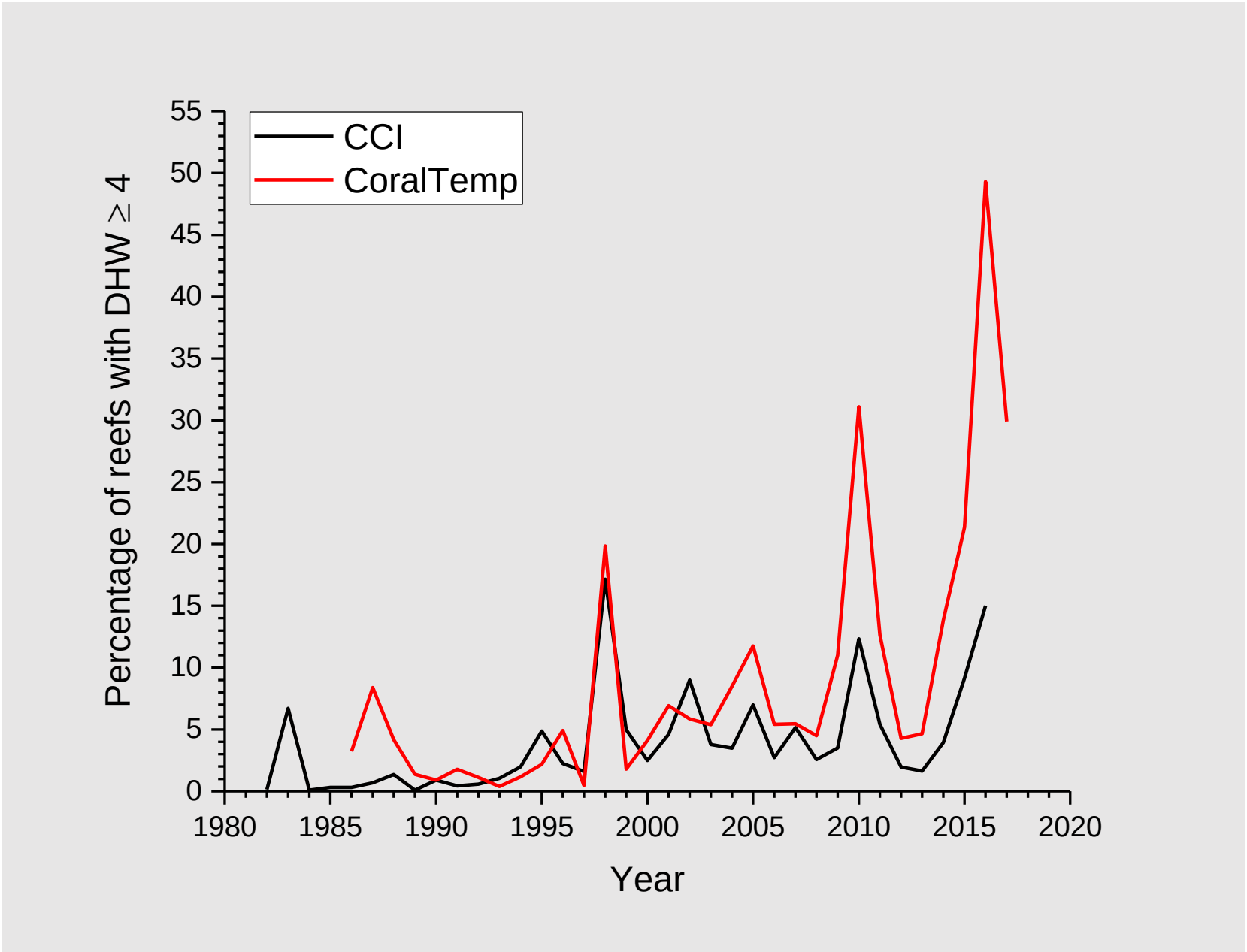
Daily, gap-free 0.05 degree resolution SST



Extent of Global Coral Reef Heat Stress Through Time

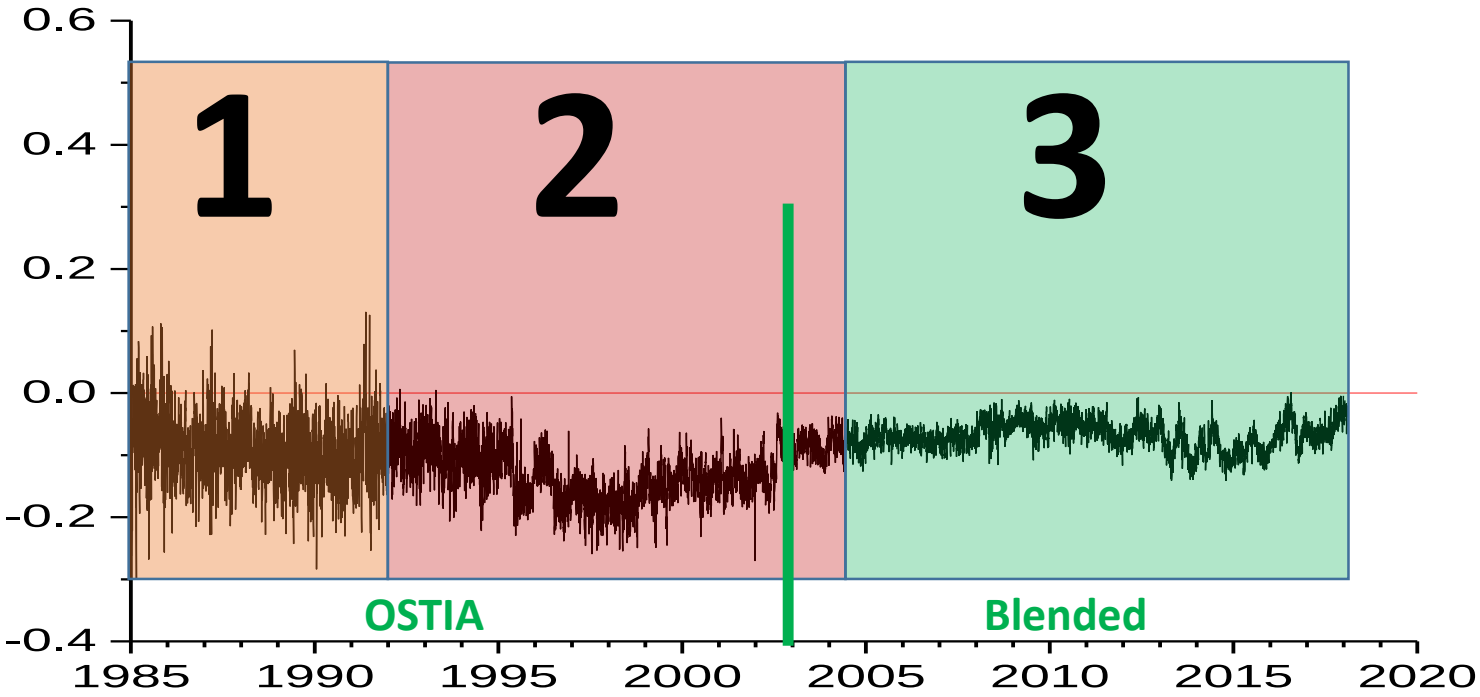


Extent of Global Coral Reef Heat Stress Through Time



Daily Mean Bias (ºC)

Against Drifting Buoys + Moored Arrays using SQUAM



Ave Bias

All: -0.095

OSTIA: -0.117

Blended: -0.070

Number of Buoys

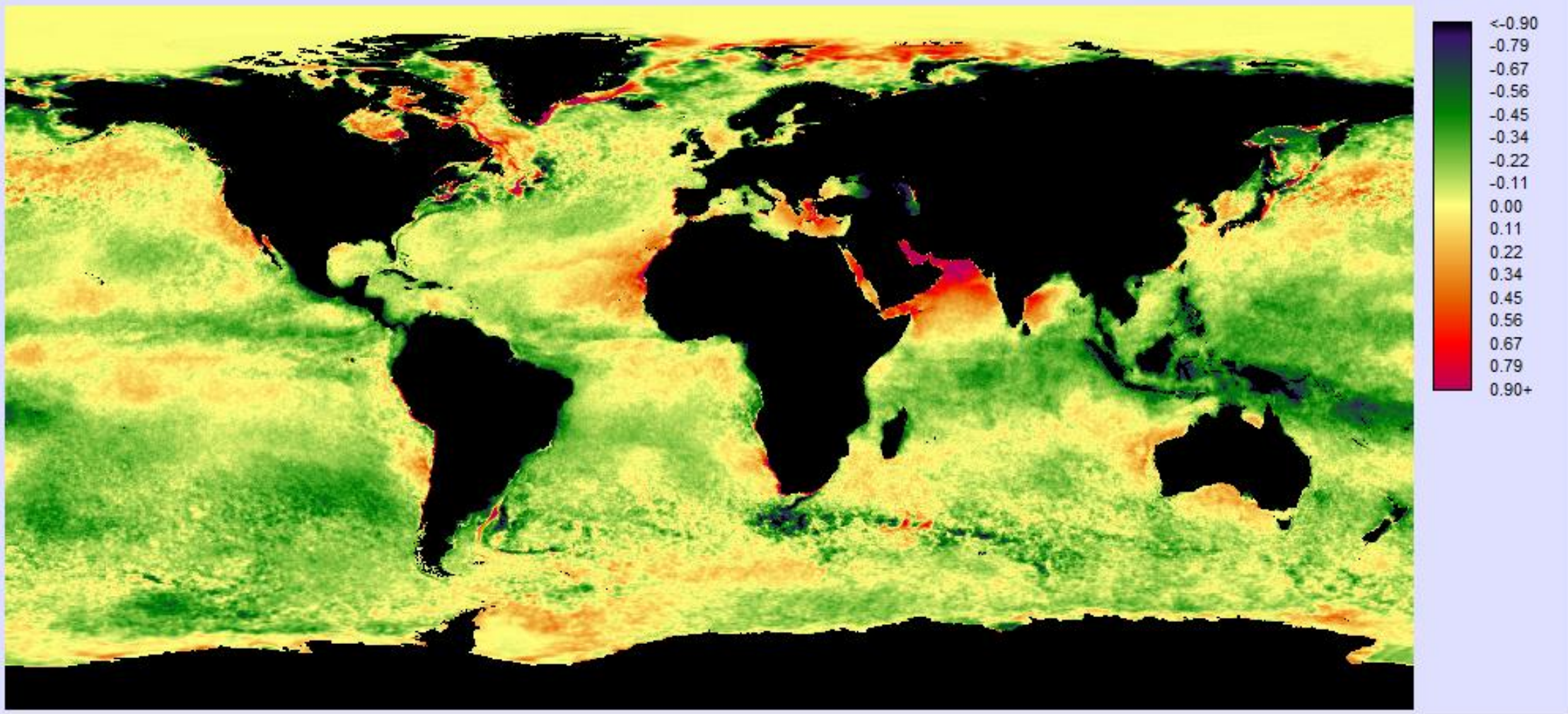
1) <200

2) 400 – 700

3) >1000

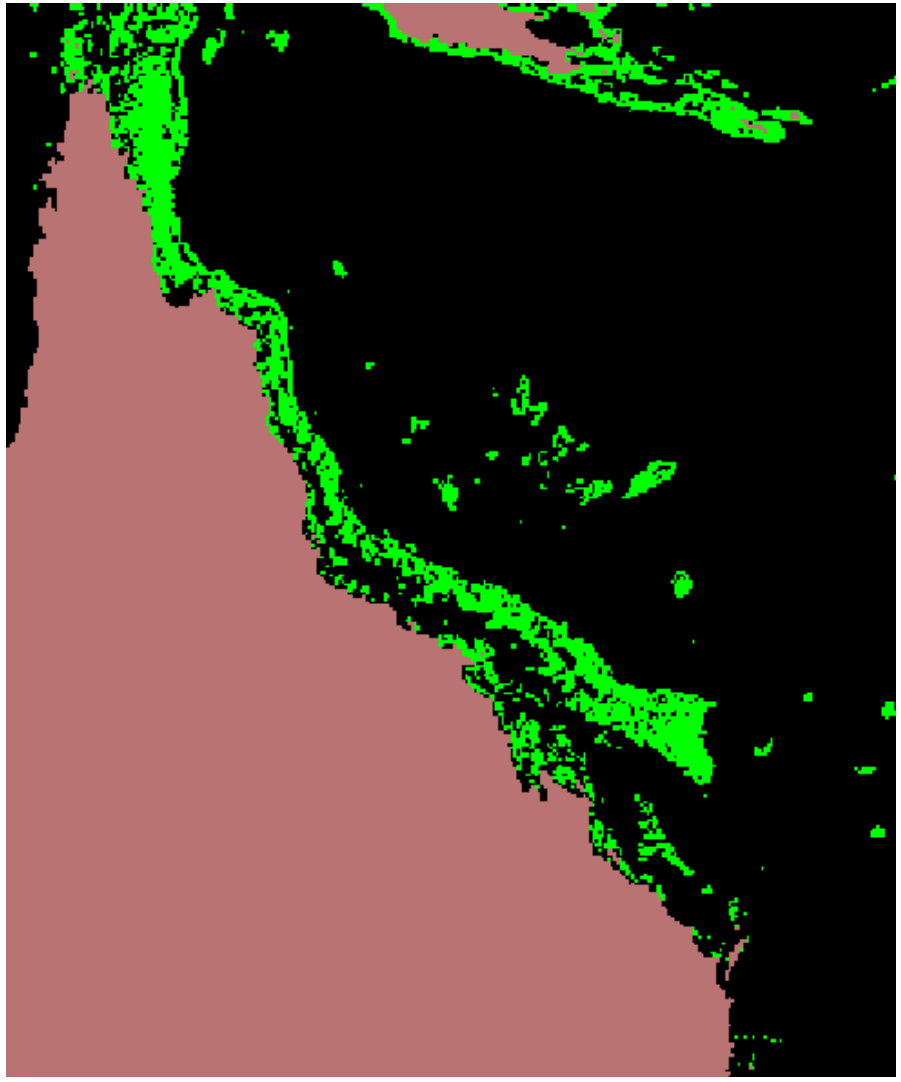
CoralTemp MMM – CCI MMM

1985-2012



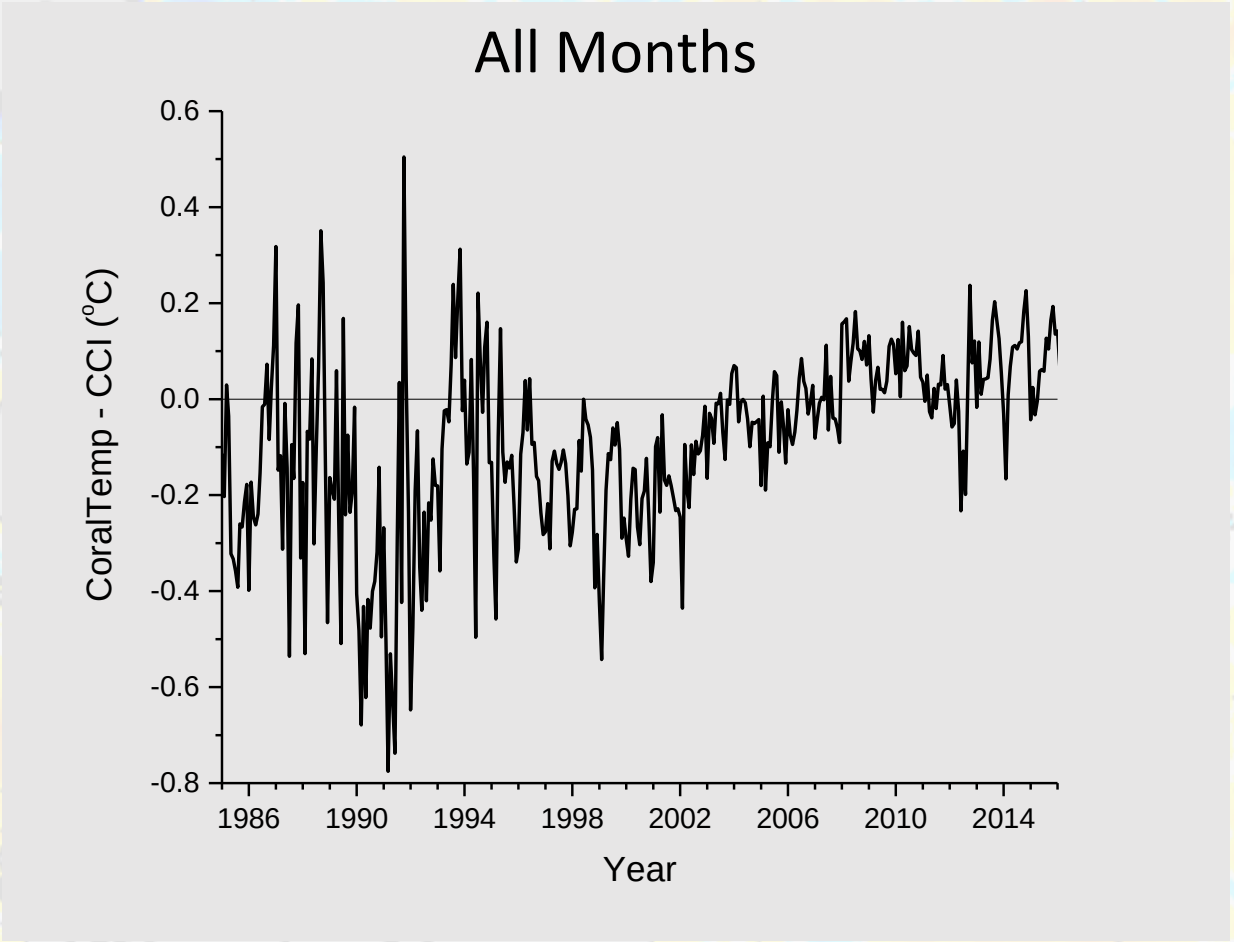
Pixels with Coral Reefs

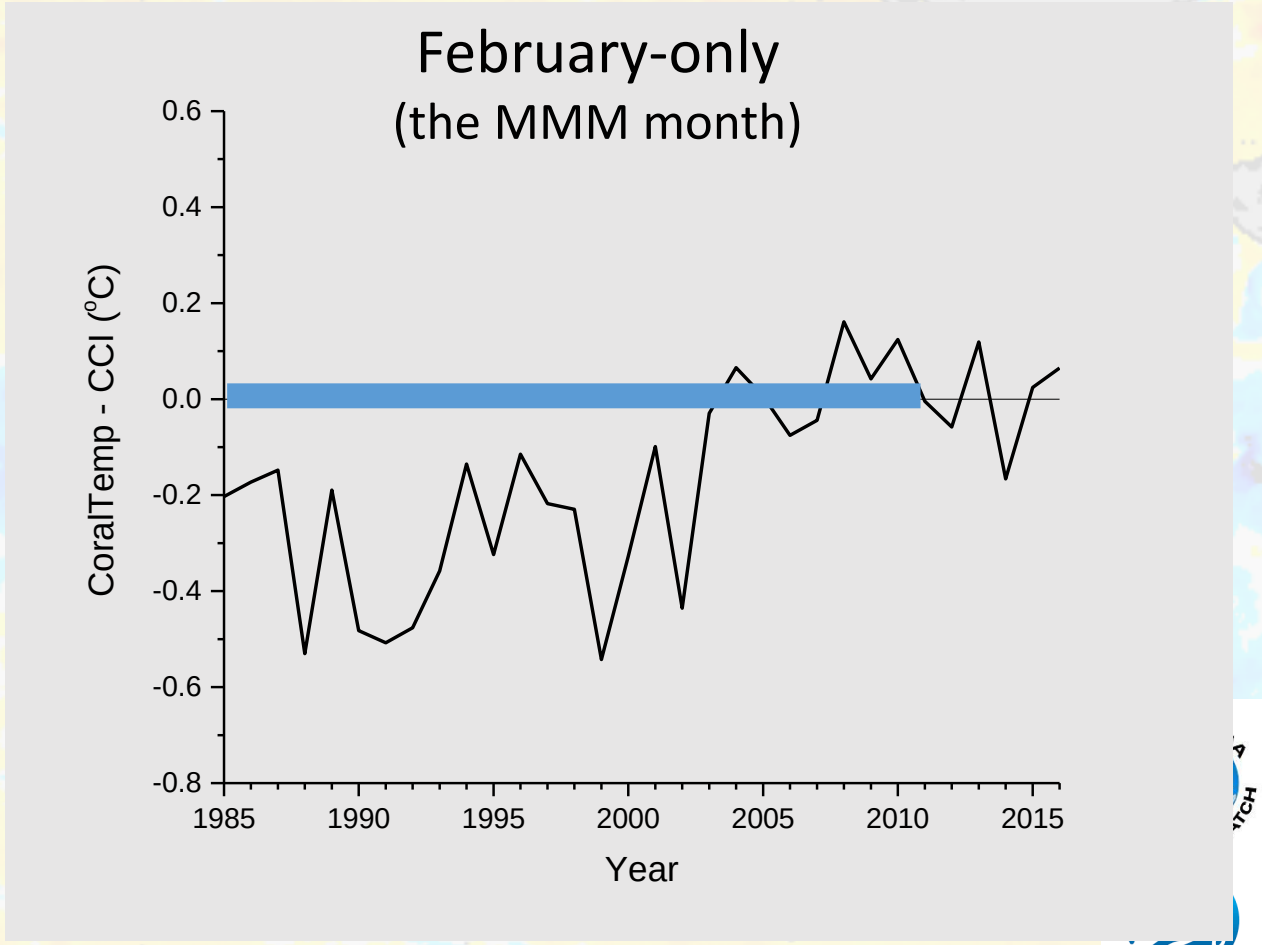
over the Great Barrier Reef, Australia



CoralTemp vs CCI

1985-2016 (Great Barrier Reef)

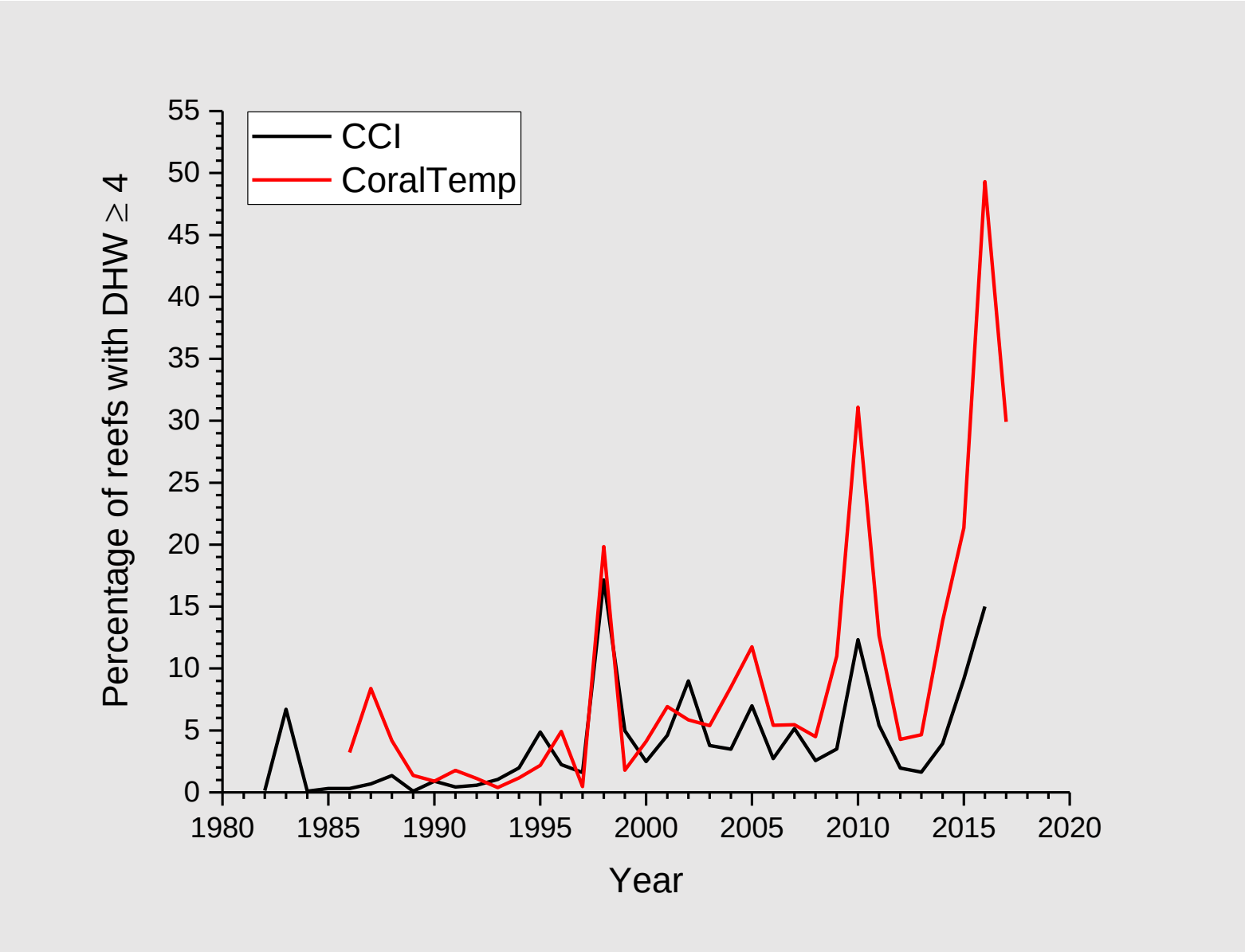




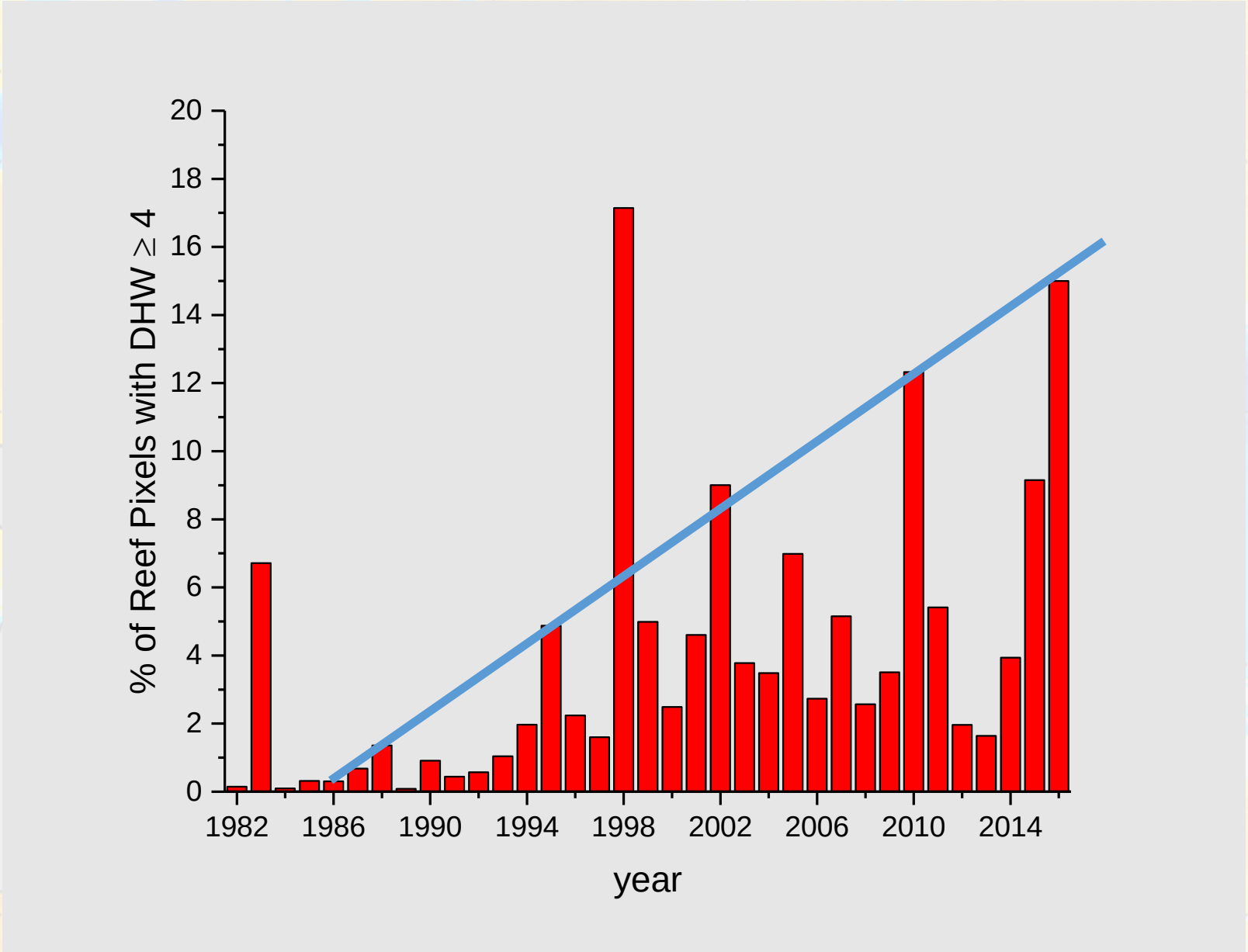
1985 to 2012 average diff = -0.11 °C

1985 to 2012 average diff = -0.19 °C

Extent of Global Coral Reef Heat Stress Through Time



Extent of Global Coral Reef Heat Stress Through Time



Take Home Messages

- Consistent bias through time
- New products need to be related to historic products or should be able to be reprocessed back through time
- CCI looks very consistent through time compared to CoralTemp
- Satellite SST is EXTREMELY important for Coral Reef Management
  Why? Because mass coral bleaching only began in the 80s!
  So, satellite SST data covers the entire history of mass bleaching.