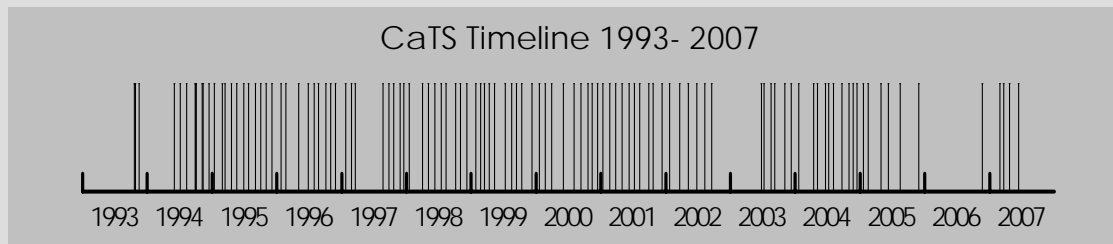
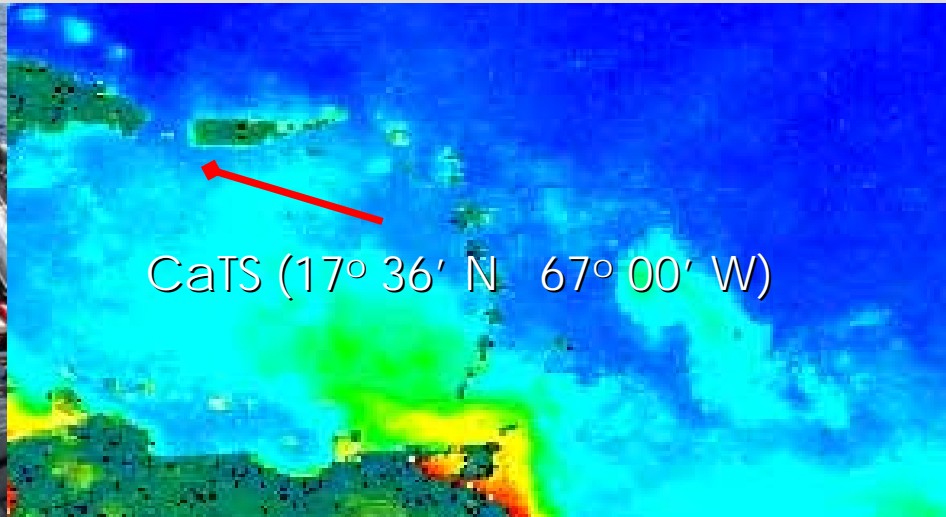


Responsiveness of water mass properties to climate forcing at the Caribbean Time Series Station in the northeastern Caribbean basin



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University of Puerto Rico Mayagüez
Department of Marine Sciences



Research sponsored by:



Relevance

Sea surface temperature (SST)

Ecosystem:

- Coral bleaching
- Nitrogen cycling (nitrification/denitrification coupling)

Climate:

- Hurricane intensification

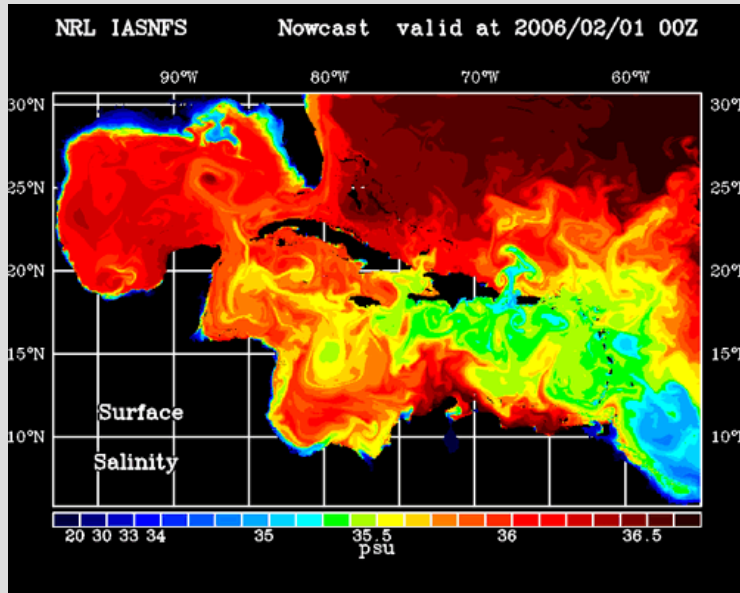
Carbon dynamics

- River plumes (Orinoco, Amazon) promote C exchange

Meridional Overturning Circulation

- “Thermocline water” circulation patterns can “shortcircuit” MOC

Caribbean Surface Water Seasonality

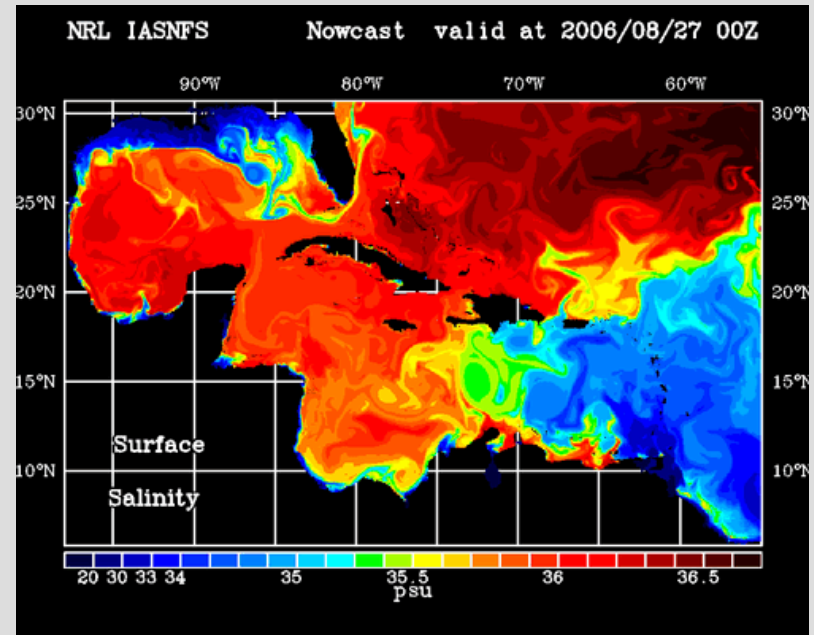


WINTER/SPRING:

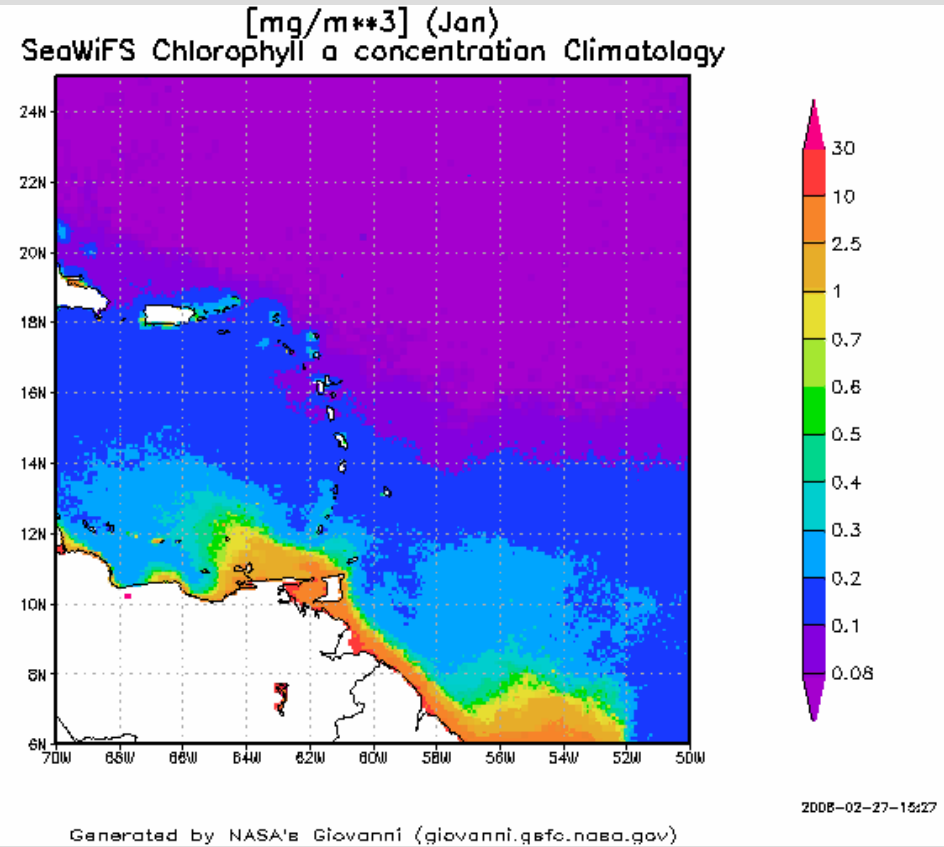
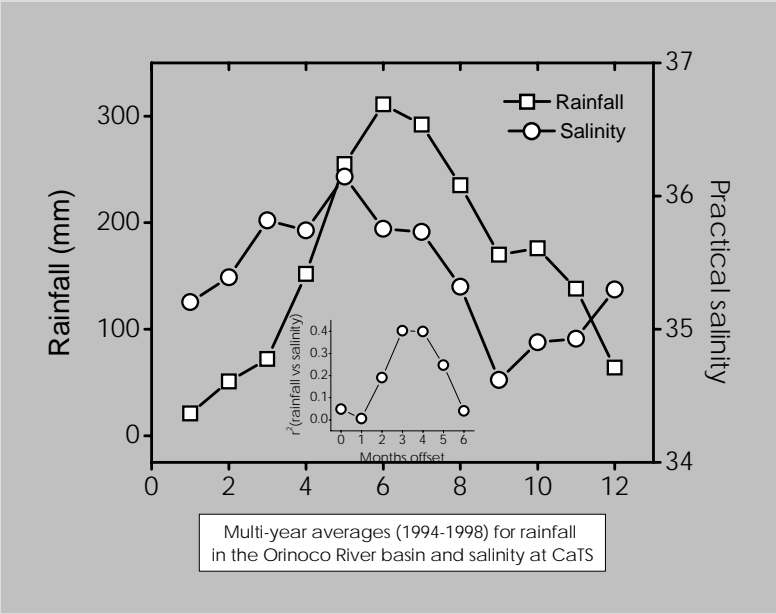
- Riverine influence is at its minimum
- Upwelling of SUW dominates Southern margin
- eddies transport upwelled waters to N. margin

SUMMER/FALL:

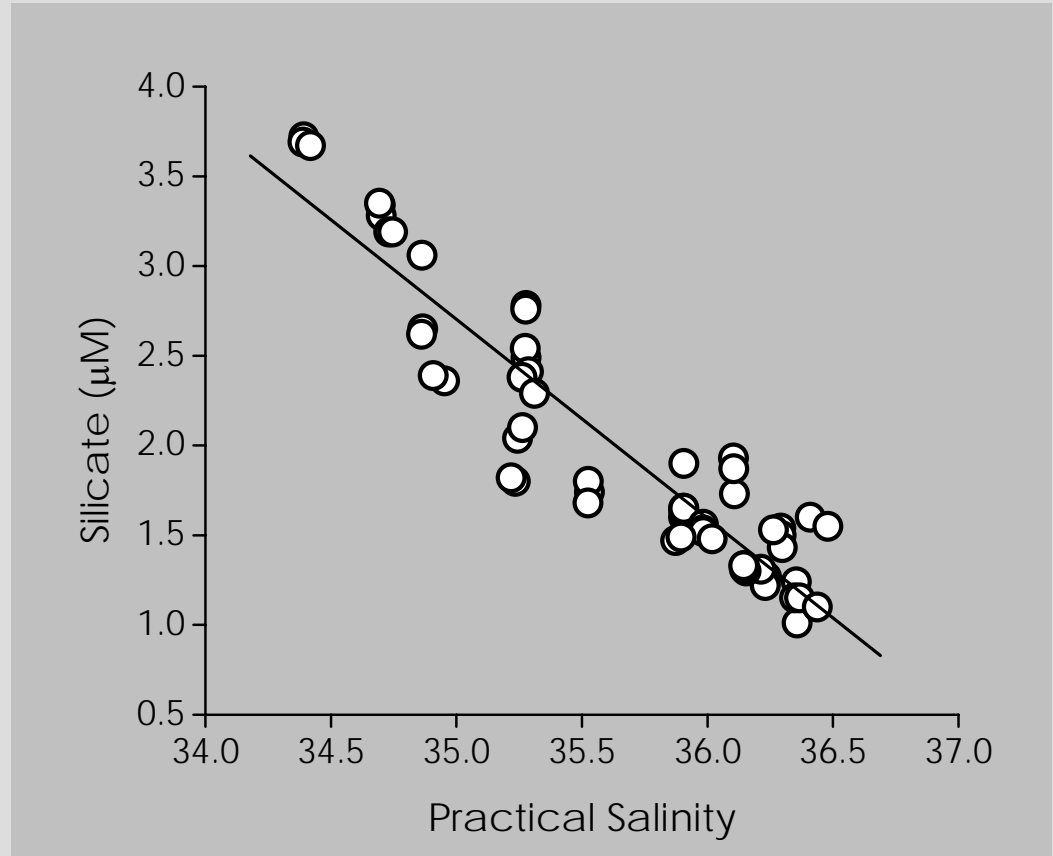
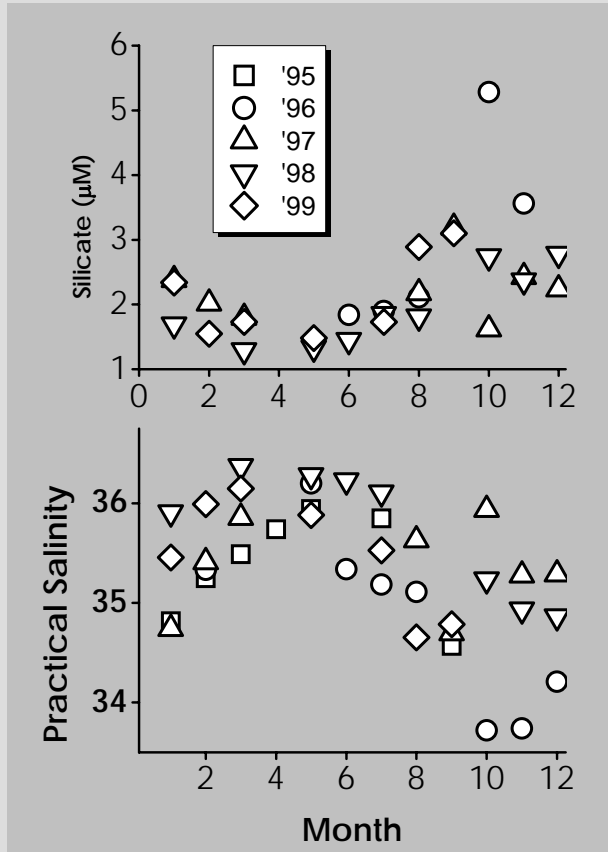
- Amazon & Orinoco dominate E. Caribbean
- Eddies steer & stir



Caribbean Surface Water Seasonality

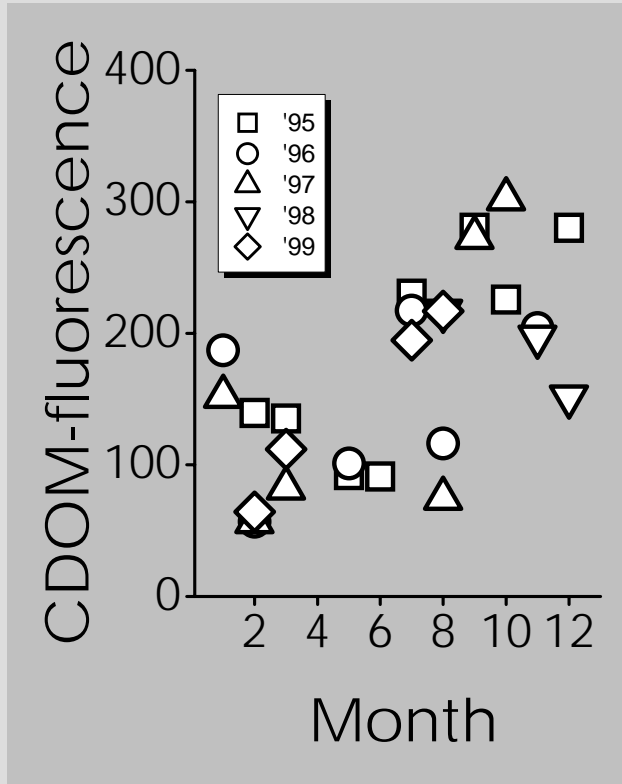


Caribbean Surface Water Seasonality Salinity and Silicate



0.6 to 5.5 % of CSW at CaTS is of river origin.
River waters are present throughout the year
in the North Eastern Caribbean

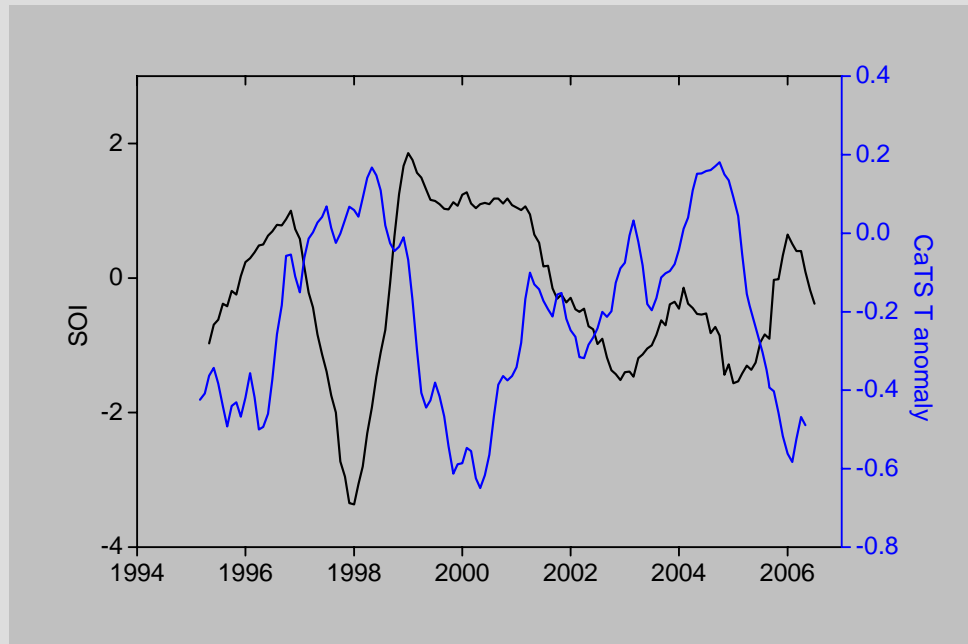
Caribbean Surface Water Seasonality Colored Dissolved Organic Matter - CDOM



CDOM affects

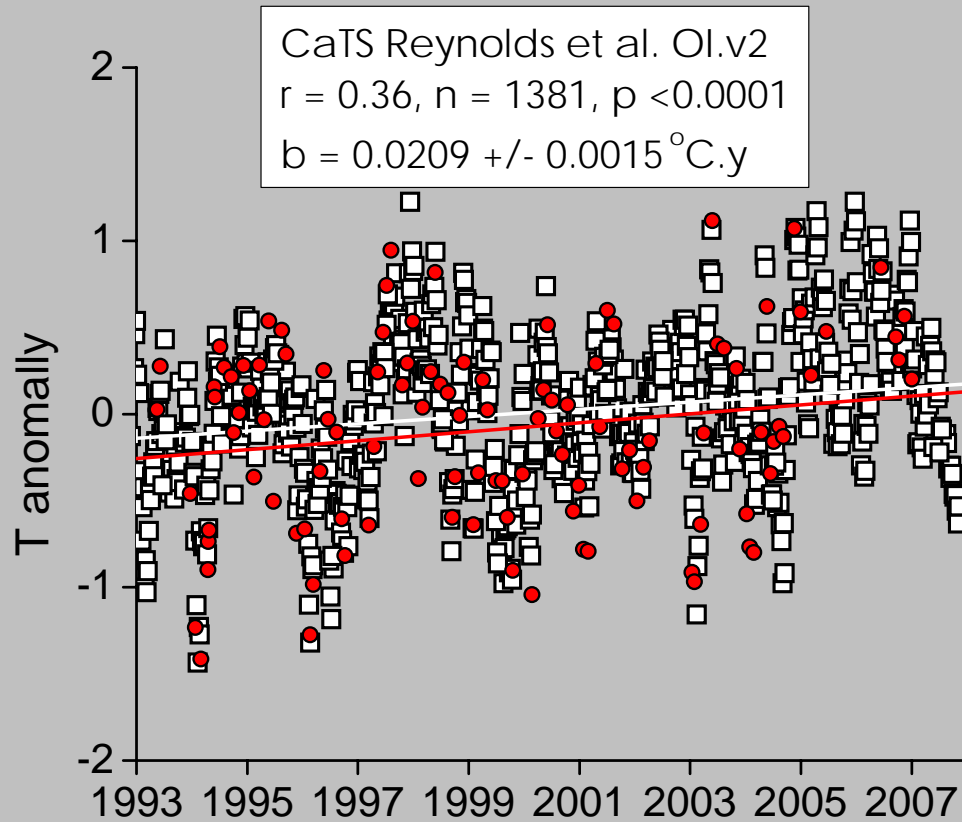
- optics,
- phytoplankton community composition primary production
- pCO₂

Caribbean Surface Water climate forcing: Temperature effects

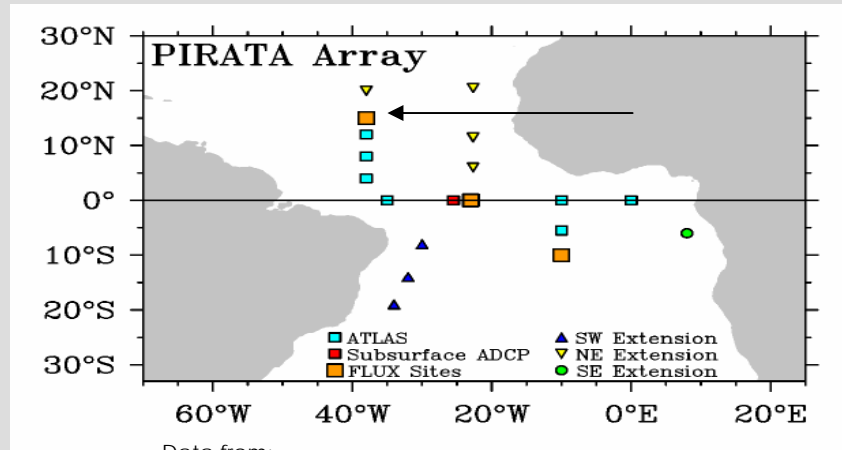


Positive anomalies in near-surface T ($r = -.59$) at a 2 month offset are consistent with reports linking negative SOI (El Nino) to positive temperature anomalies in the Caribbean.

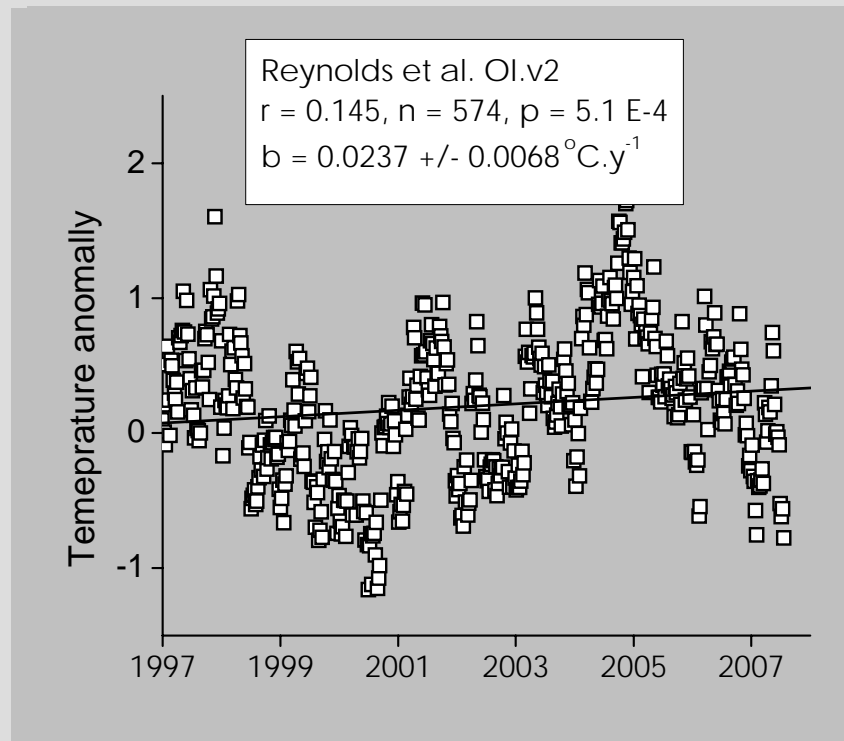
CaTS SST Analysis



SST at PIRATA Array 15 N

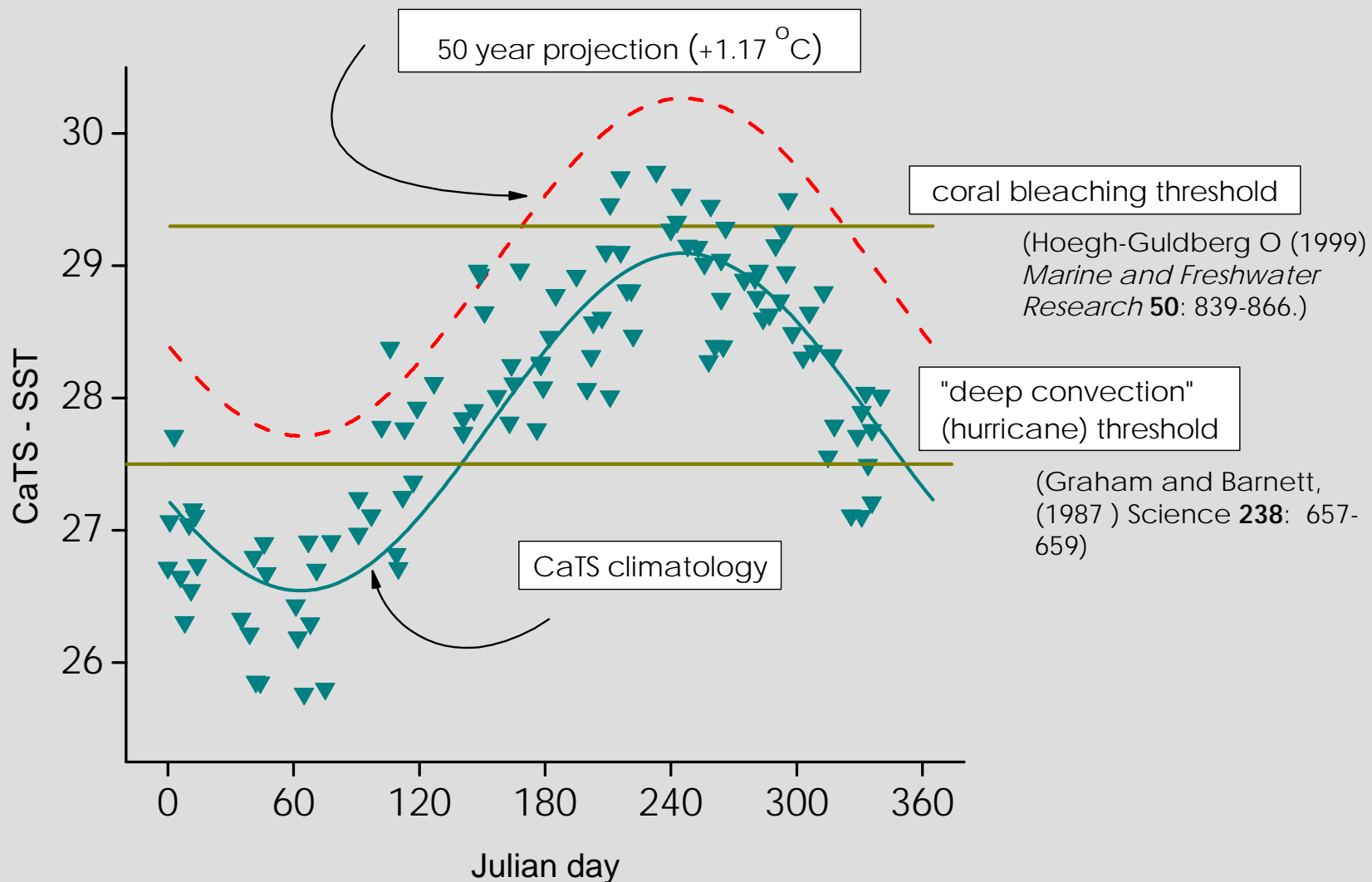


Data from:
TAO Project Office of NOAA/PMEL



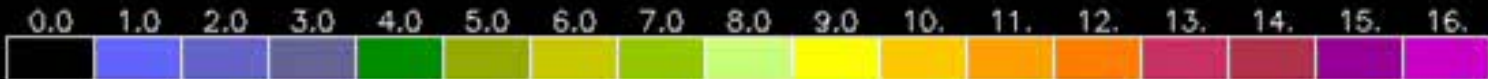
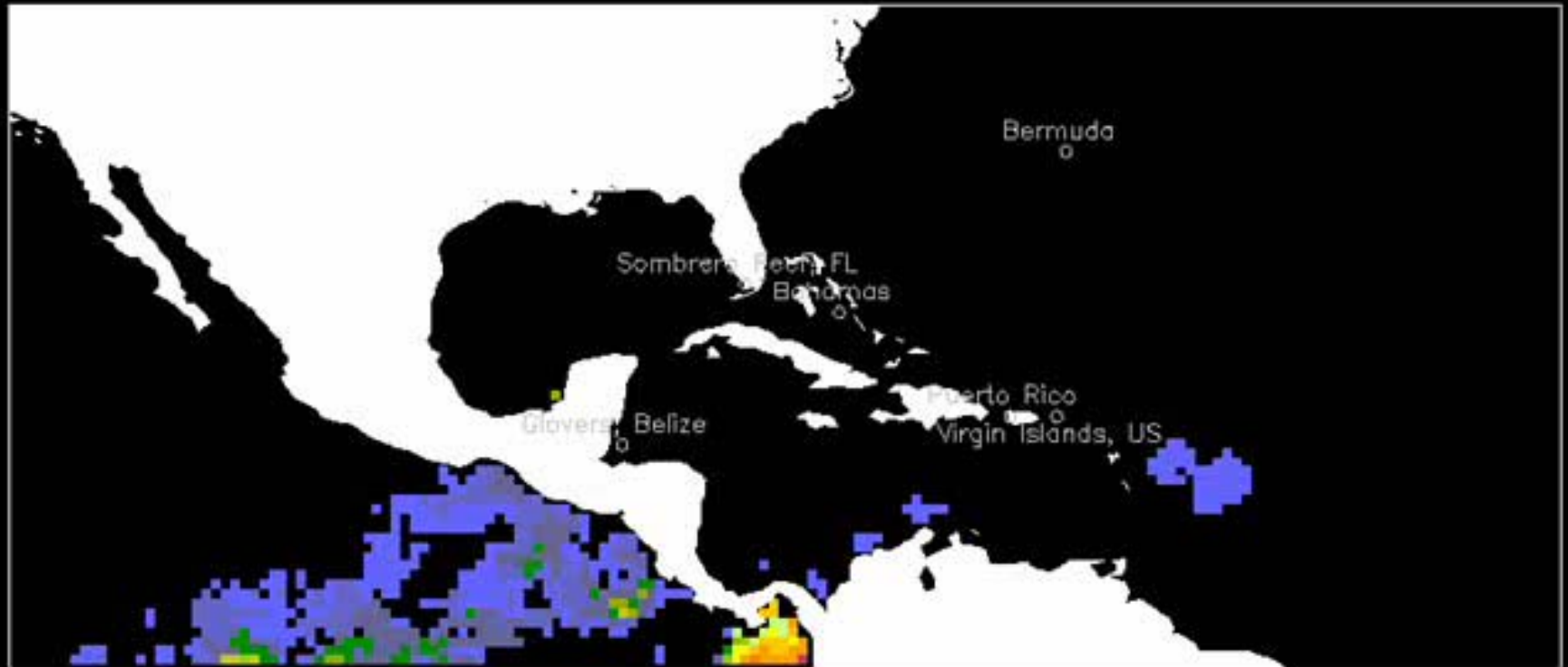
50 year projection for CaTS SST

$$\text{SST}_{\text{projected}} = \text{climatological T} + 0.0233 * 50$$

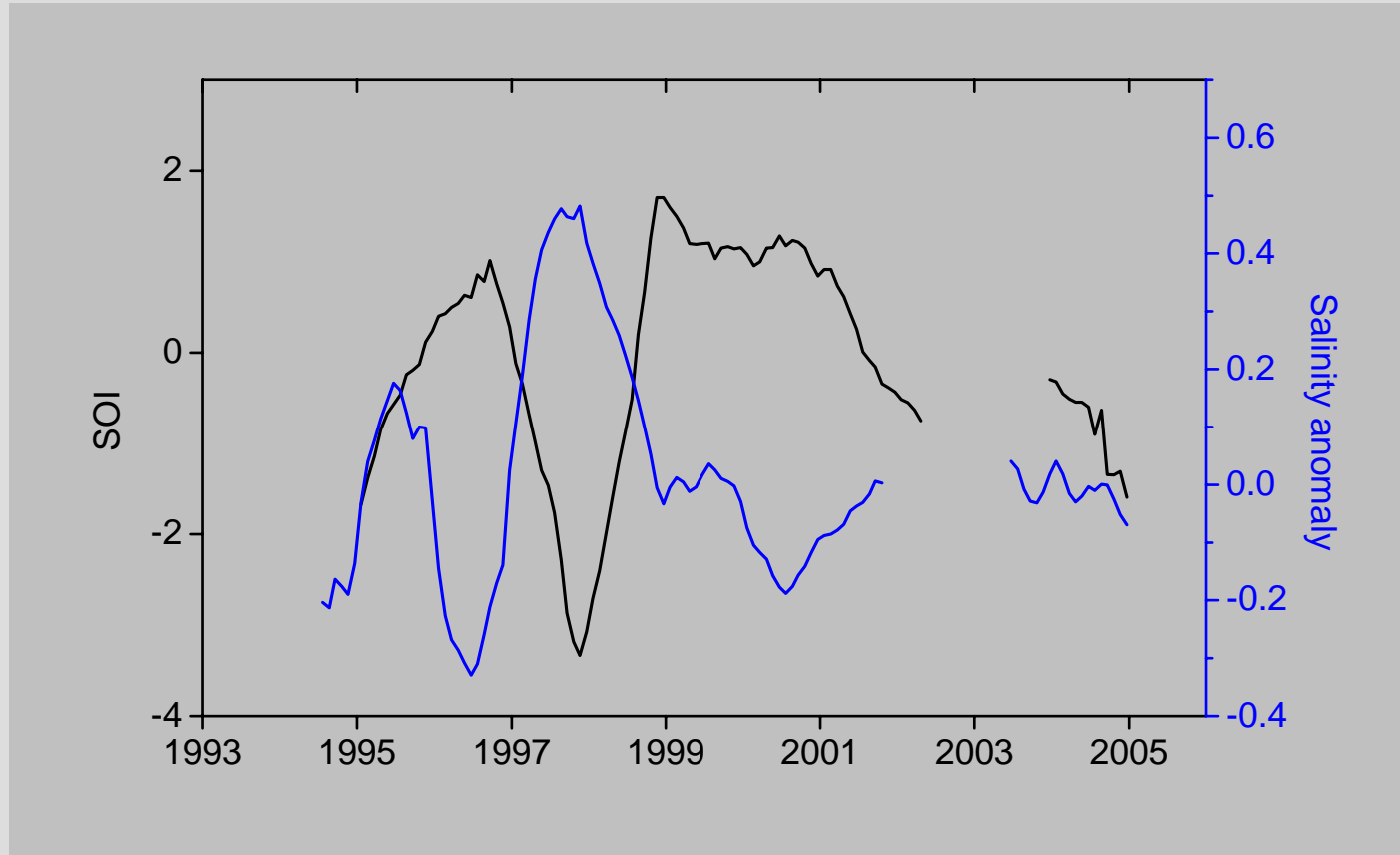


Caribbean 2005 heating episode

NOAA/NESDIS Degree Heating Weeks for last 12 Weeks - 5/21/2005

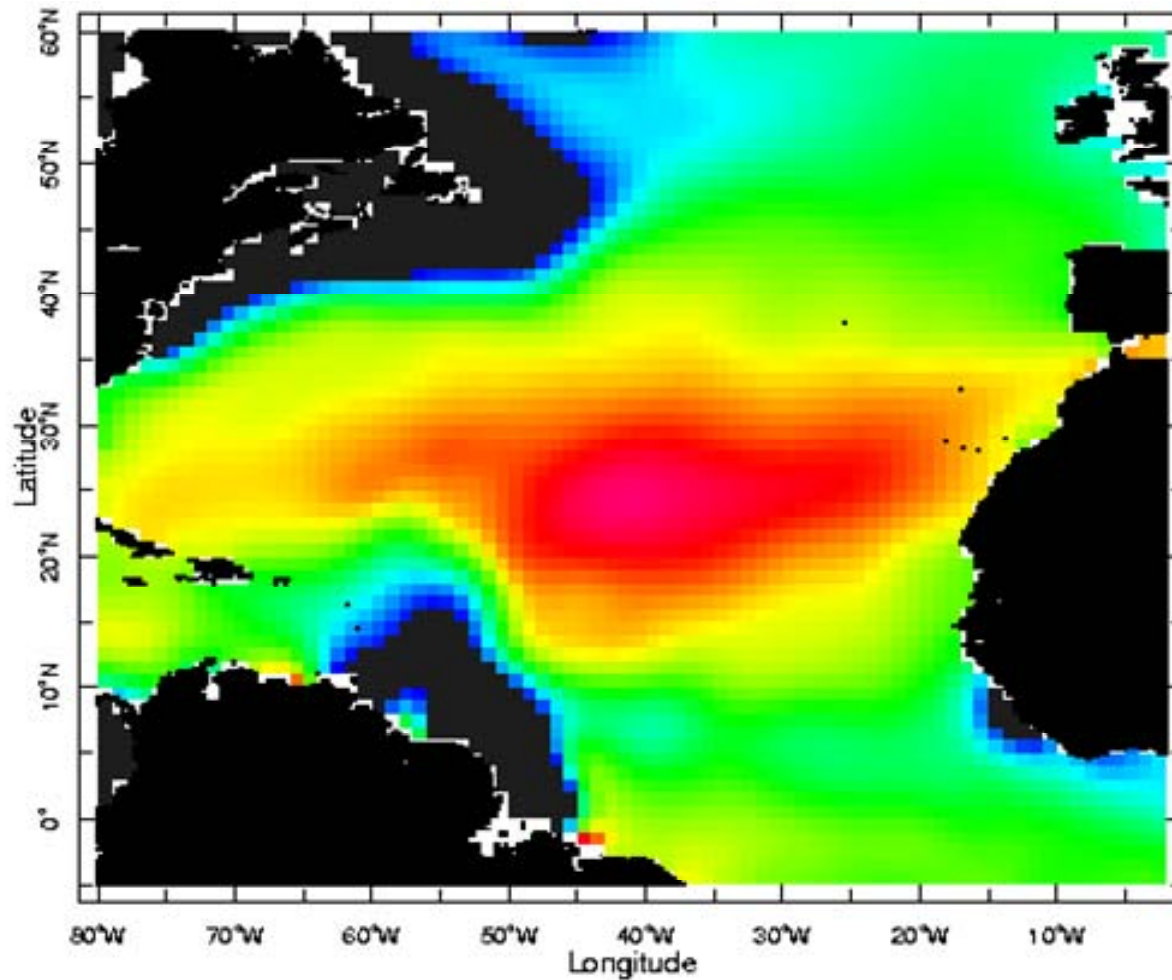


Salinity anomaly and SOI at CaTS



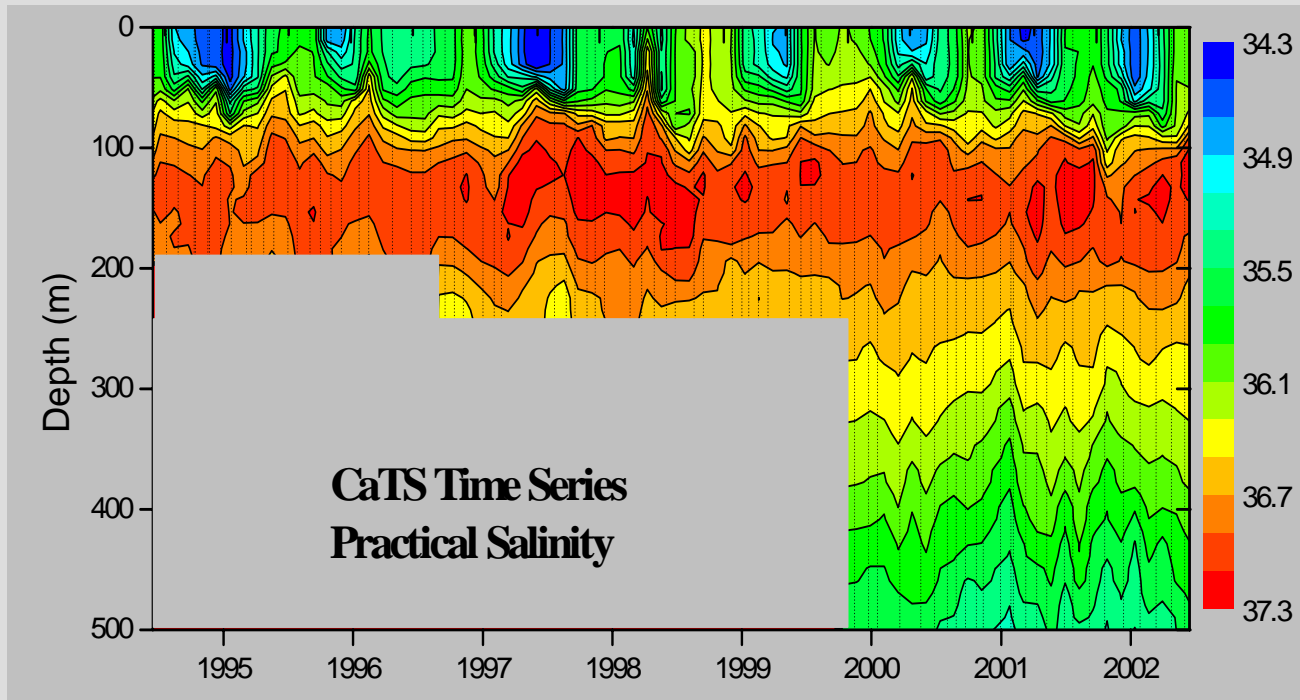
Positive anomalies in near-surface salinity ($r = -.75$) at a 6 month offset are consistent with reports linking negative SOI (El Niño) to decreased rainfall over South America.

Subsurface expression at CaTS: The Subtropical Underwater - SUW

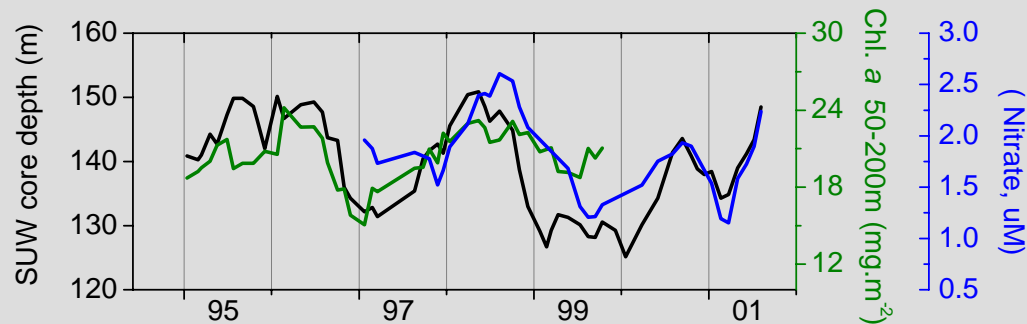
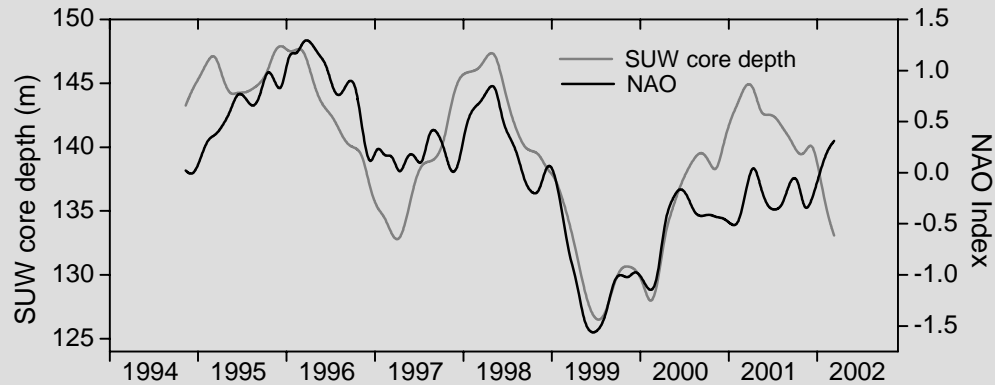


0.0 m Jul

Subsurface expression at CaTS: The Subtropical Underwater - SUW



Subsurface expression at CaTS: The Subtropical Underwater - SUW



- North Atlantic Oscillation modulates SUW properties at CaTS with a 45 month lag and appears to influence phytoplankton biomass below the upper 50m

Conclusions

- Seasonality of Caribbean surface water is modulated by remote (ENSO) climate forcing
- Long term warming trend is becoming apparent in SST record
- SUW responds to remote (NAO) climate forcing