



JHT Progress Report: Ocean Heat Content Estimates In The Eastern Pacific Ocean For SHIPS Forecasting

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***Goal: To assess the impact of the upper ocean
thermal structure on hurricane intensity in
EPAC.***





Background:

Ocean Heat Content (OHC) has been found to improve intensity forecasting in Atlantic Ocean Basin in SHIPS (DeMaria *et al.* 2005; Mainelli *et al.* 2006).

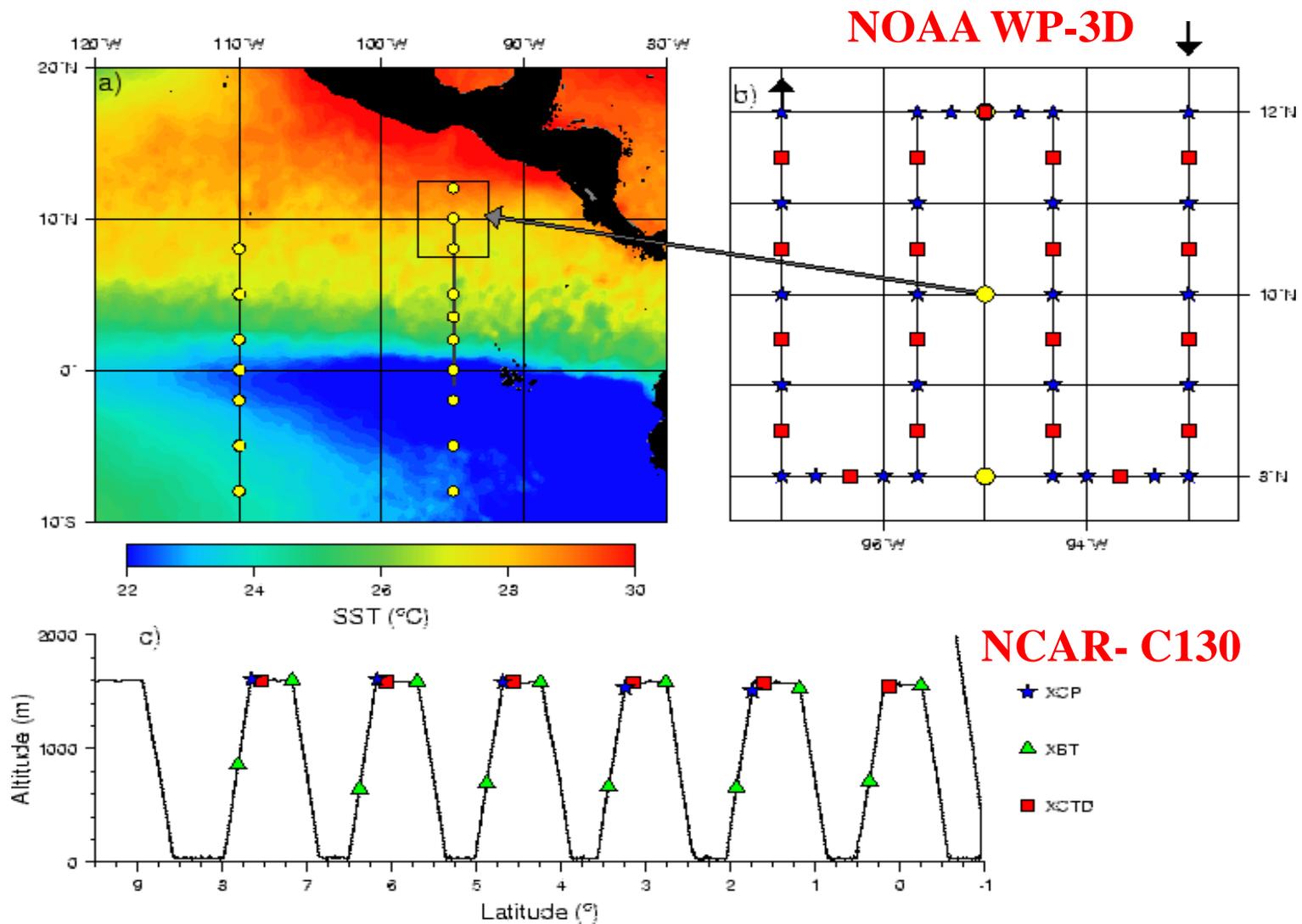
Extending the approach to the EPAC given the significant ocean variability. JHT Grant Progress incorporates:

1. **Data Synthesis from EPIC, TAO Moorings, Satellite Radar Altimetry (Topex, Jason-1, GFO and Envisat), XBT transects) (Yr 1).**
2. **Data Comparisons and Integration with GDEM (Yr 1).**
3. **Monitoring Phase (Yr 2).**
4. **Estimates for SHIPS (Yr 2)**



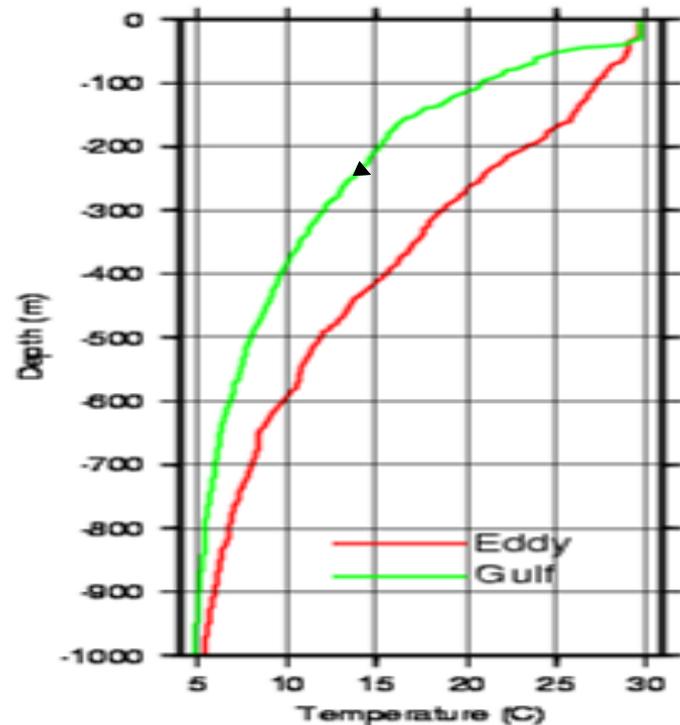


NSF/NOAA Aircraft and TAO Buoys Sample Strategy

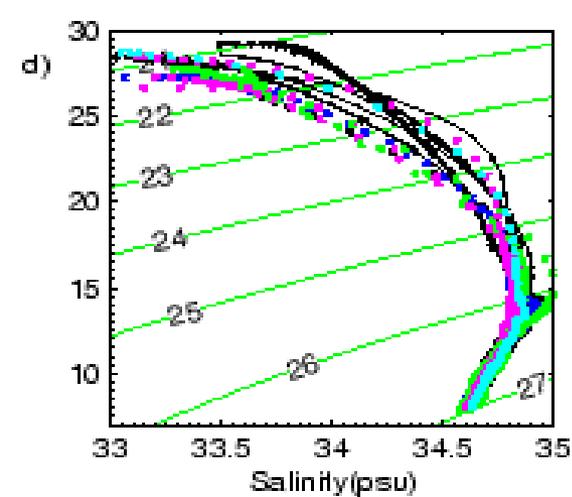
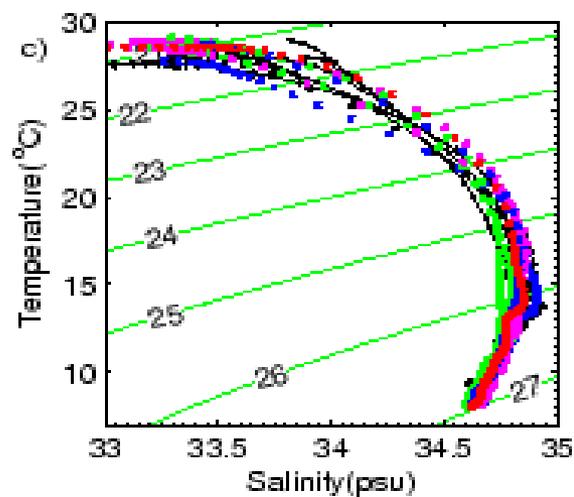
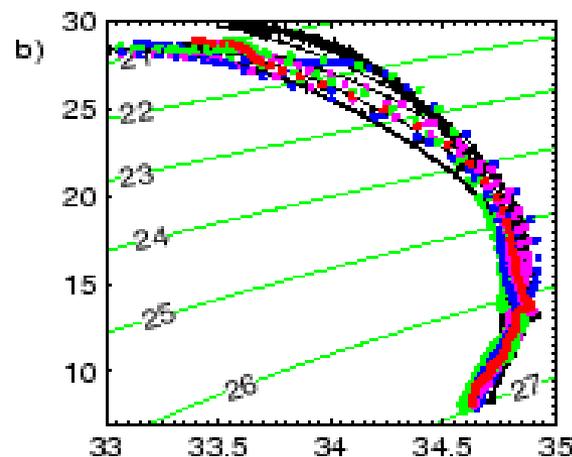
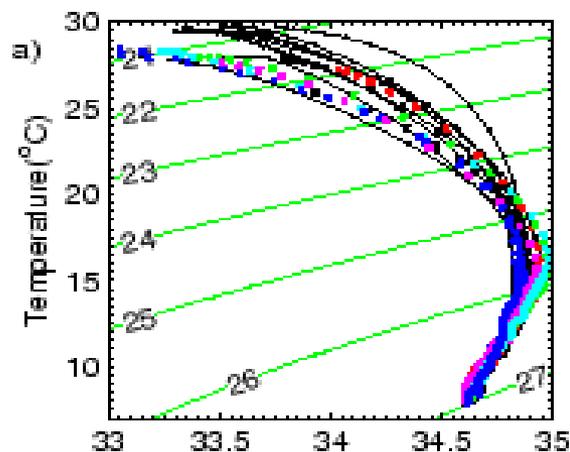


Approach: Two-Layer Model (Kundu 1991).

- Reduced gravity
- Infer depth of 20°C Isotherm using SHA and seasonal climatology.
- Estimate 26°C depth-relative to 20°C.
- Estimate OHC using isotherm depth and SST.
- **Ground Truthing.**

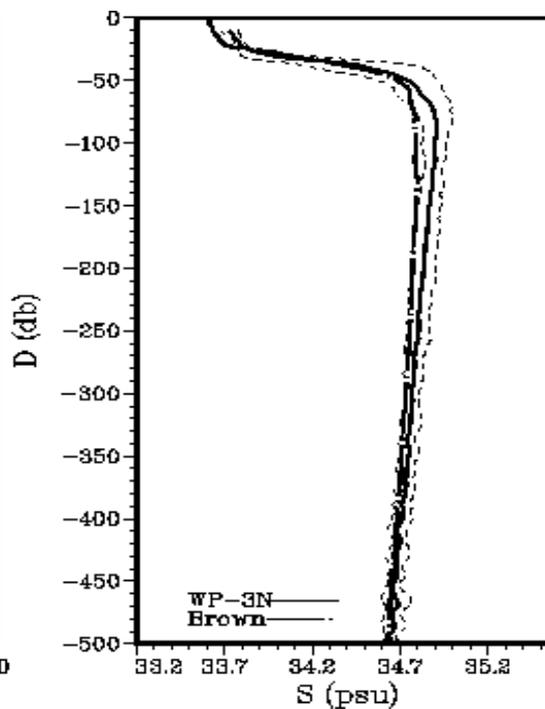
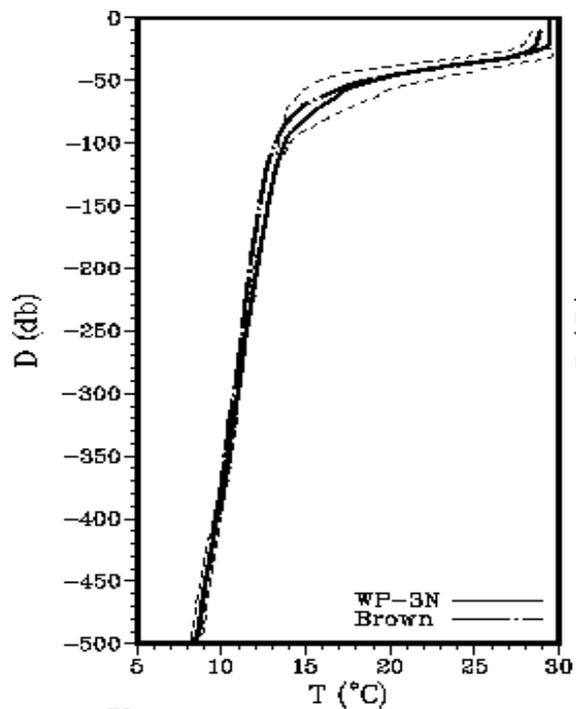


TS Diagrams a) 93W, b) 94.3W, c) 96.6W and d) 97W

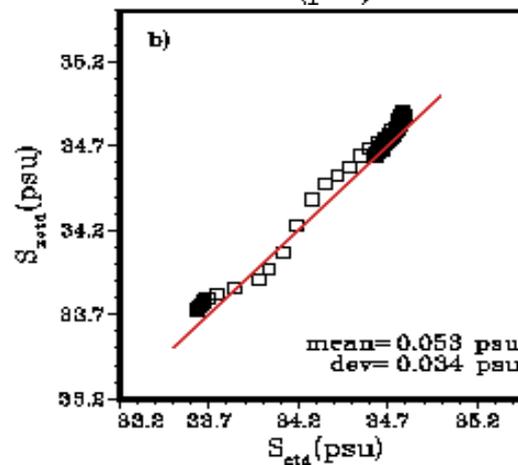
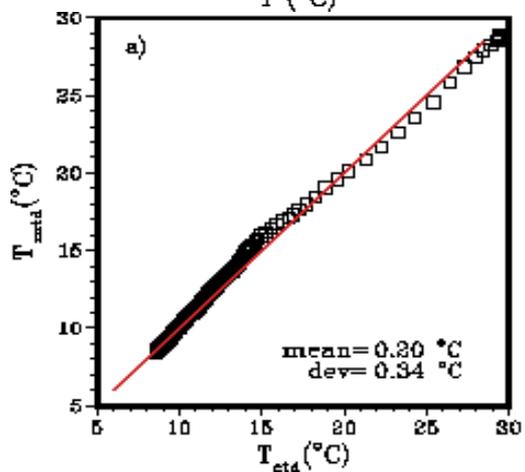




NOAA R/V Brown Versus WP-3D CTDs -10N

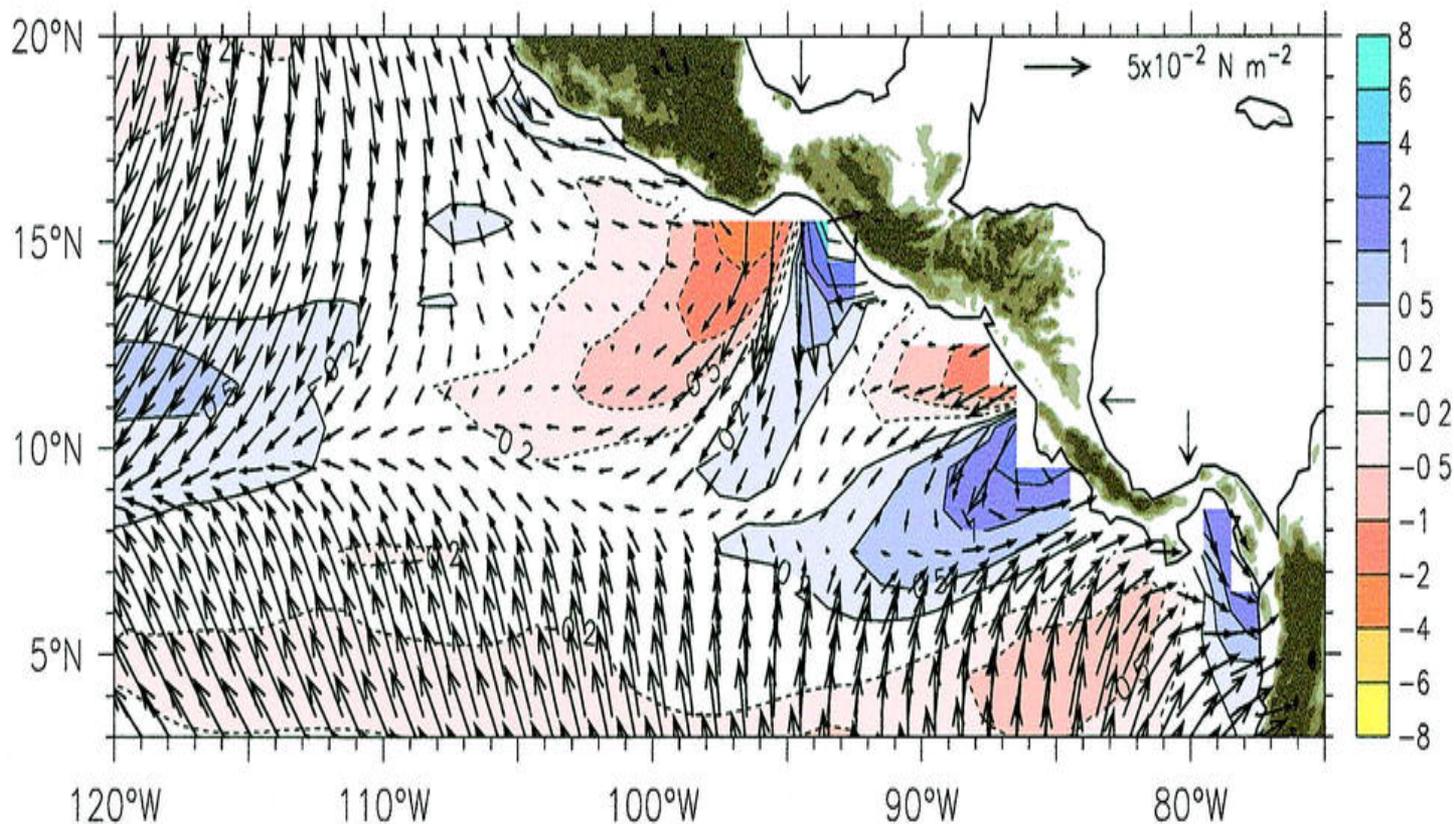


Airborne
Oceanography
Works!

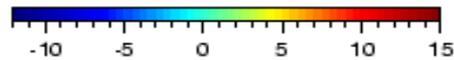
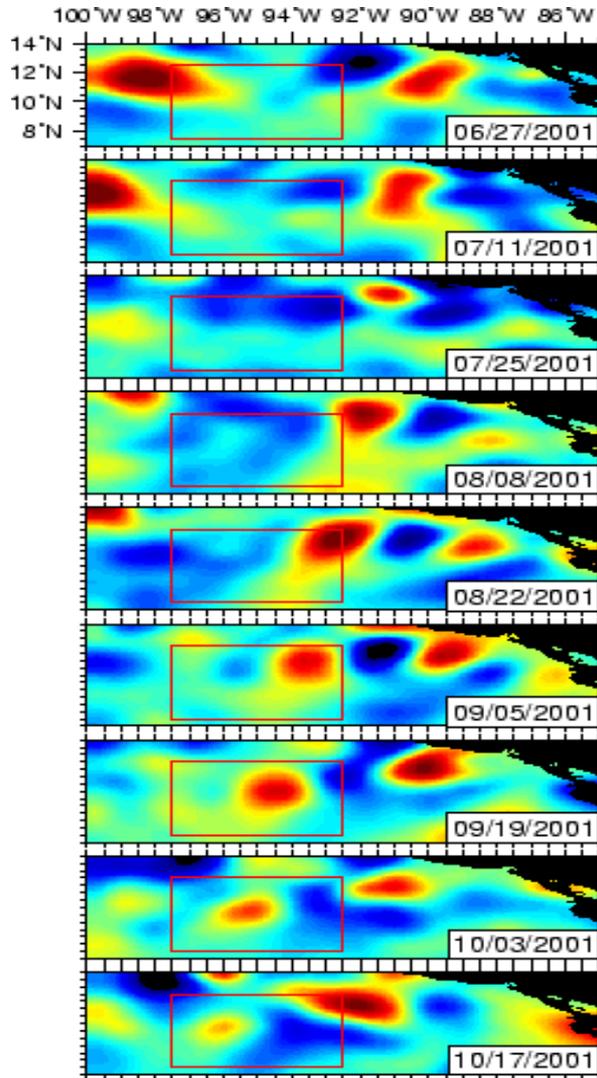




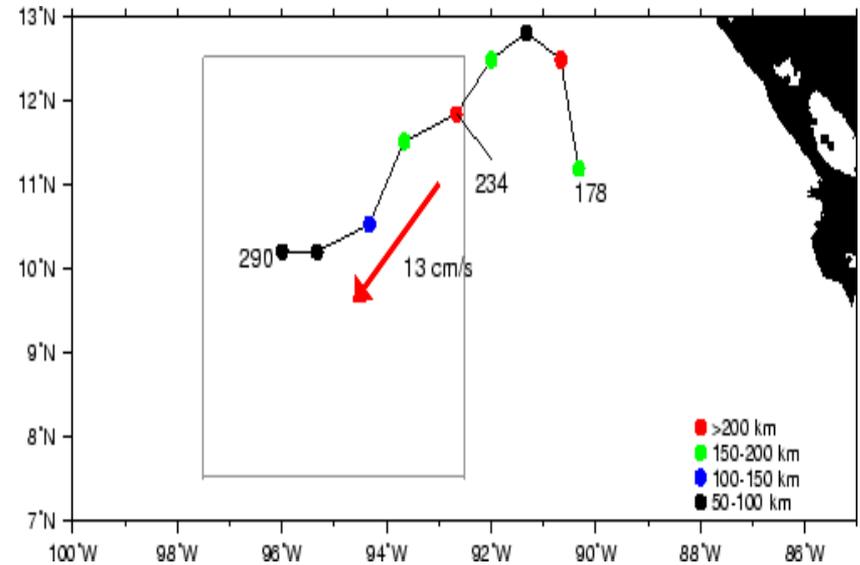
Annual Mean Wind Stress Aug 99-Jul 2000 : Fig. 5 from Kessler (2002)

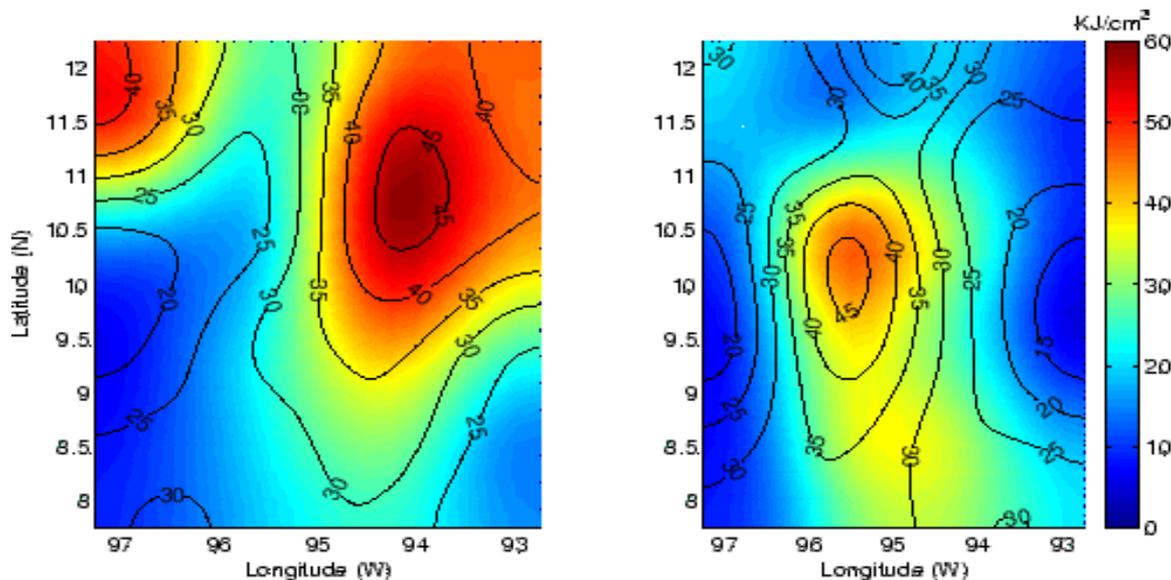
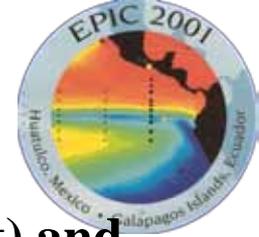


Blended Altimetry Derived Fields and Warm Eddy Pathway.

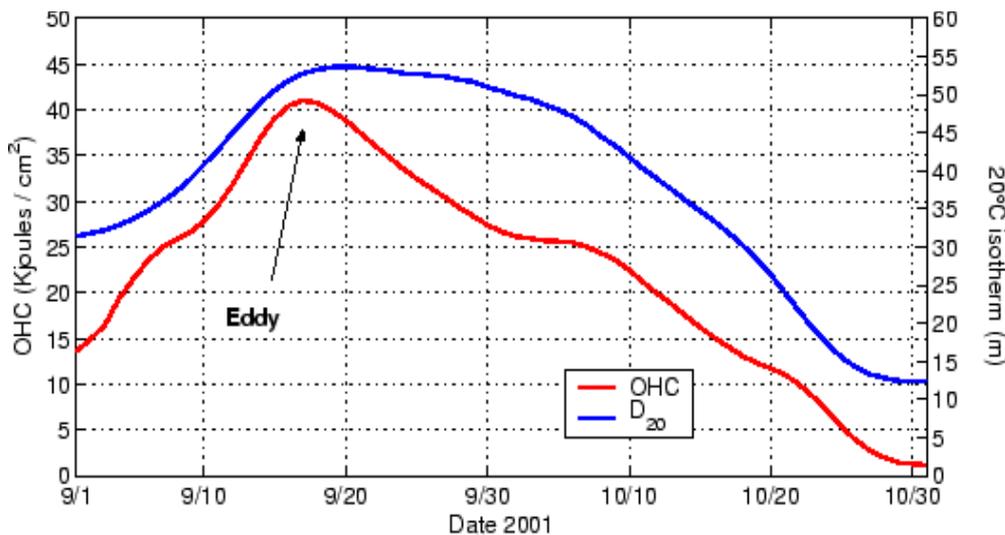


SSH (cm)





Sept (left) and Oct (right) OHC of Warm Core Eddy



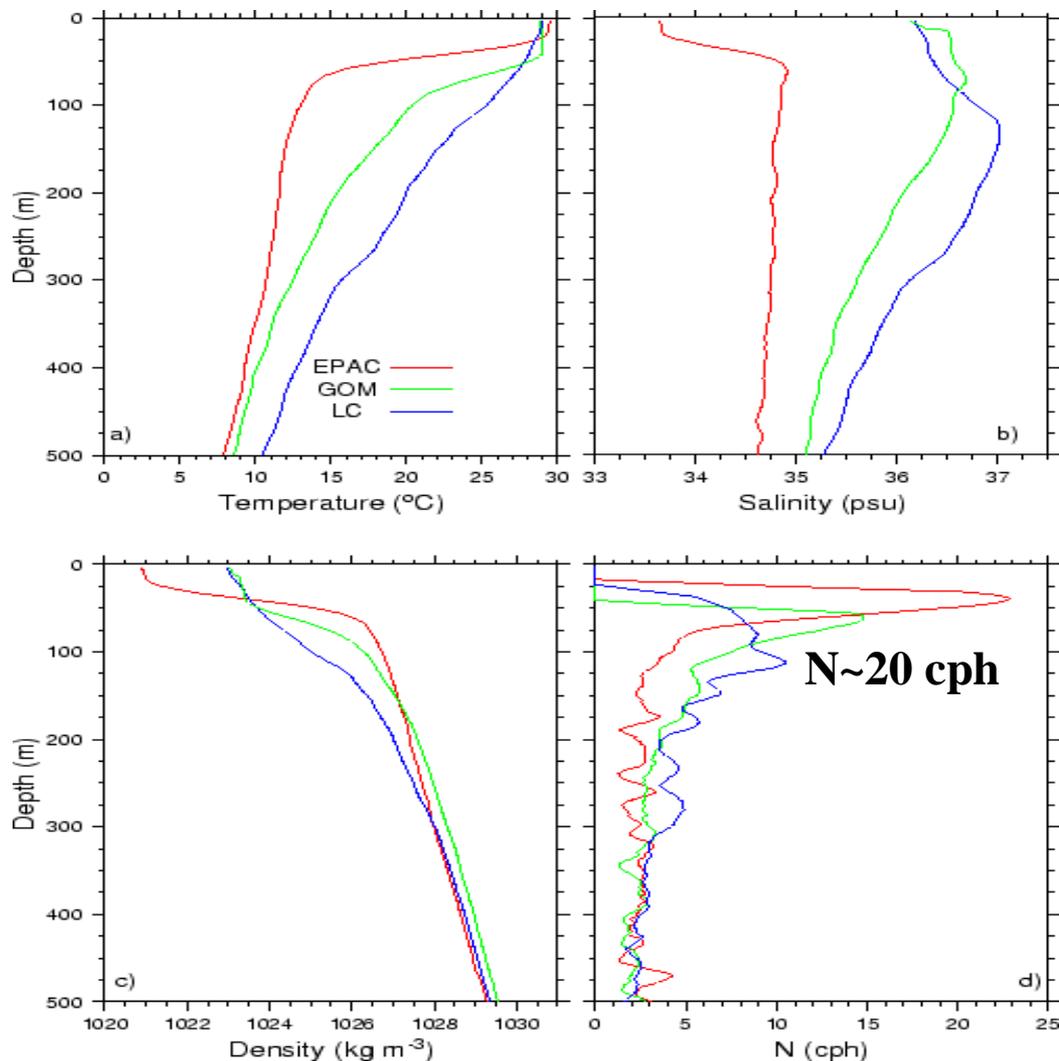
10°N TAO Mooring OHC and D₂₀°C. The shallow isotherm depths may be an indication of the Costa Rica Dome.



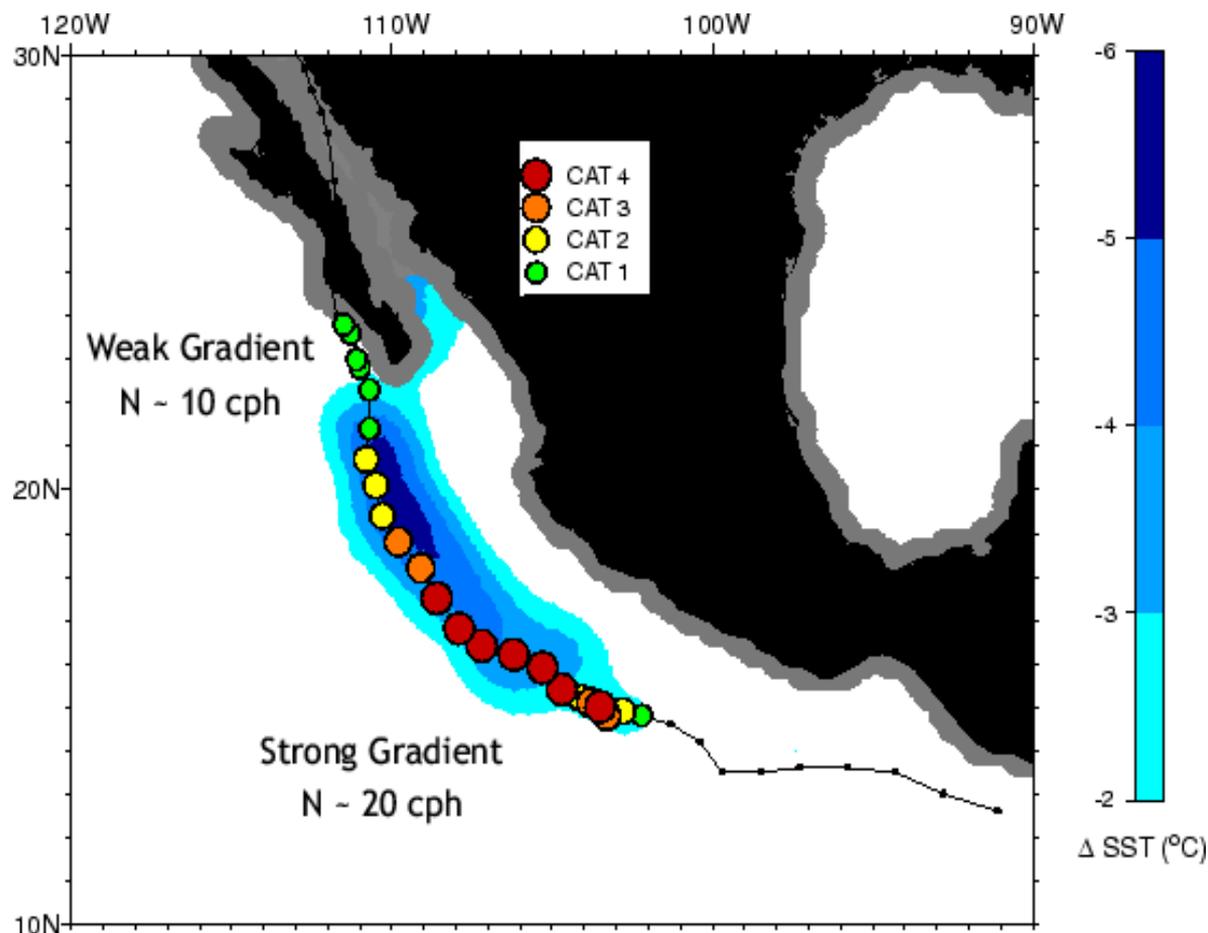
EPAC Paradox

Strong vertical temperature, salinity and density gradients at base of OML in EPAC...

Implications for mixing...and ocean (SST) cooling.

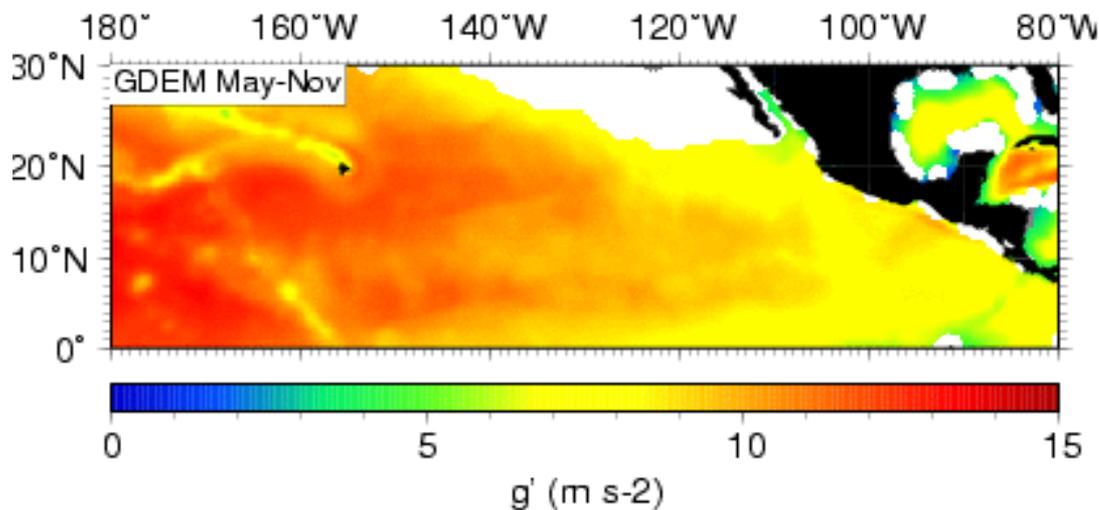
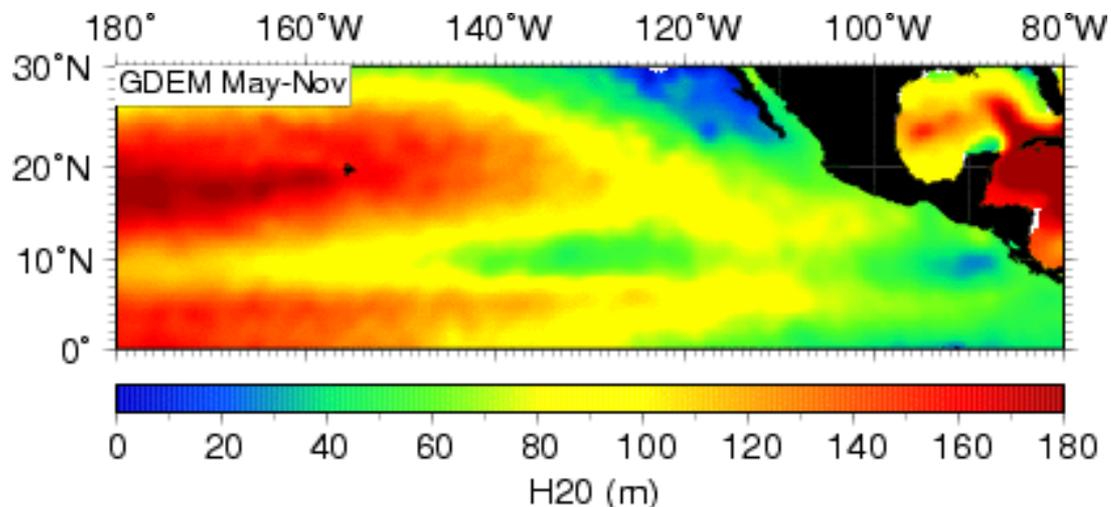


Hurricane Juliette-Induced Cooling

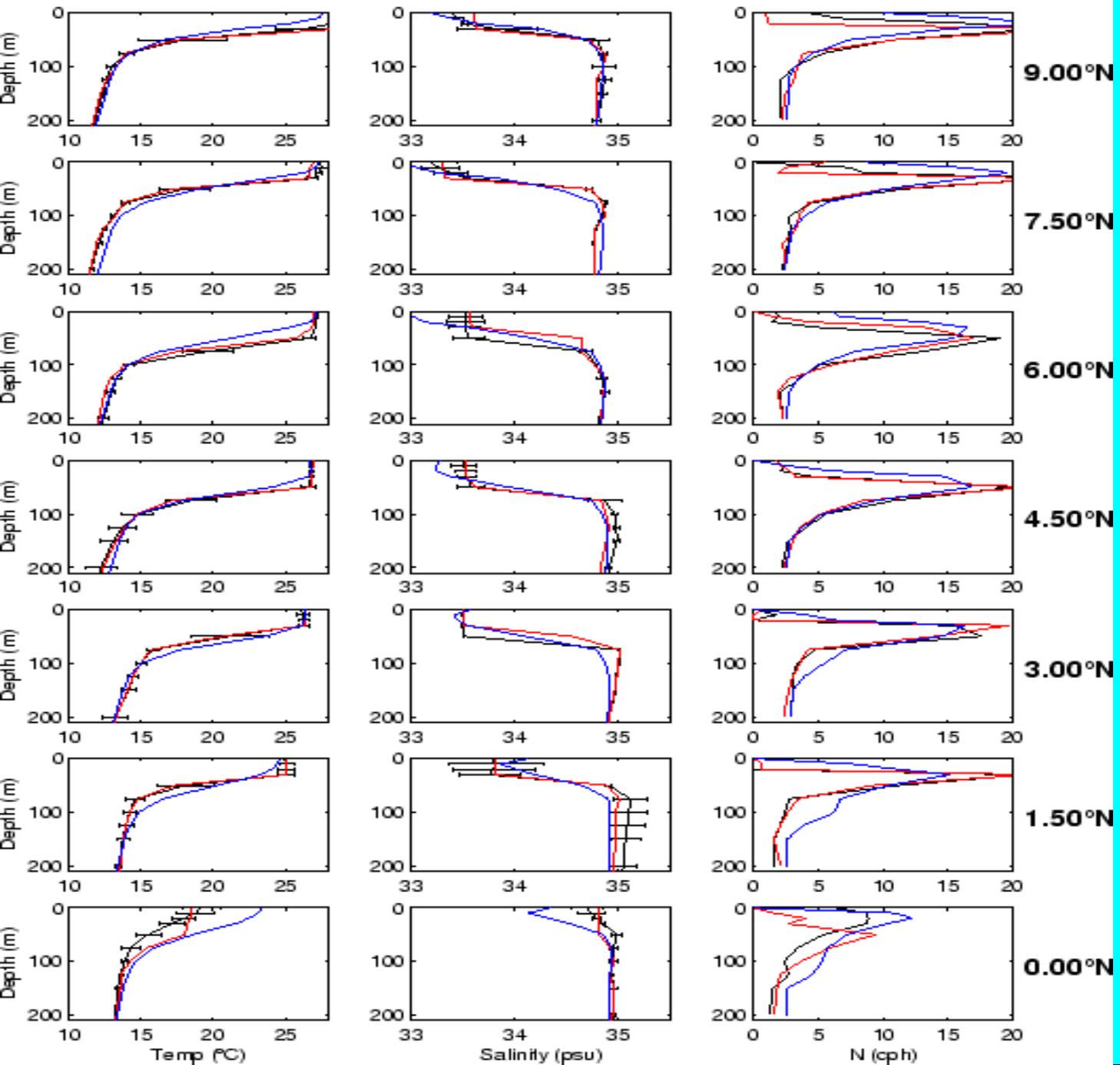




GDEM Depth of 20°C Isotherm and Reduced Gravity ($g' \times 100$):



October: Black-EPIC, Red-Ron Brown, Blue-GDEMv3



**95°W
Ocean
Structure:
EPIC**



Summary:

NOAA/NSF EPIC, XBT transects and NOAA TAO data providing insights into the formation and propagation of warm eddies in the EPAC and the OHC variability-ground truthing....

OHC estimates are significantly less ($<60 \text{ kJ cm}^{-2}$) than warm features in the western Atlantic Ocean Basin ($>100 \text{ kJ cm}^{-2}$)-**L&V- 16 kJ cm^{-2}** .

Strong stratification (N ~ 20 cph) underneath the ocean mixed layer that precludes strong mixing during TC passage over the warm pool.

Over the next few months, finish comparisons between the in situ data sets with GDEM and relate data to SHA from several platforms.

With respect to altimetry, Jason-1, GFO and TOPEX data are superior to Envisat SHA fields based on efforts using pre and post-Rita data.

