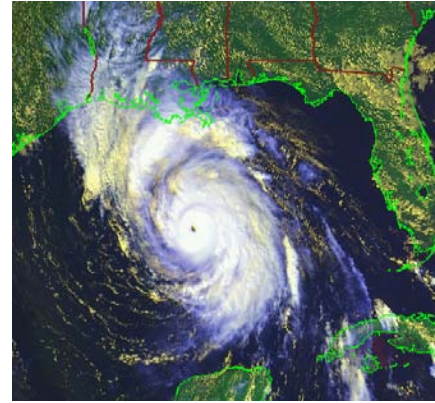


Ocean Data Acquisition System on NOAA WP-3Ds In Support of HFIP



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P. Meyers, (RSMAS/UM), S. Paul and T. Richards (NOAA/AOC)**

**Goal: To design, install, test and debug an ocean
data acquisition system on NOAA WP-3Ds
as per HFIP Team 7 milestones.**





HFIP Team 7 Milestones: Obs



Conduct NOAA Hurricane Field Program with 200 G-IV and 190 P-3 flight h, dropwindsondes, 500 AX(BT, CP, CTDs), and additional ocean observations in cooperation with the U. S. Air Force, BOEM, DOTSTAR and any other groups taking tropical cyclone observations. Activities during the Field Program will be:

- Test and evaluate software for new broadband receivers on NOAA P3s. Obtain deep (800 m) AXBT, **AXCP, and AXCTD** data.
(AOC, UM)

Software for receivers and probe modifications were made as a result of 2010 Deep Water Horizon (DwH) flights (Shay et al., JGR, 2011). Still more work to do for “real-time” system for **AXCP and AXCTDs**.

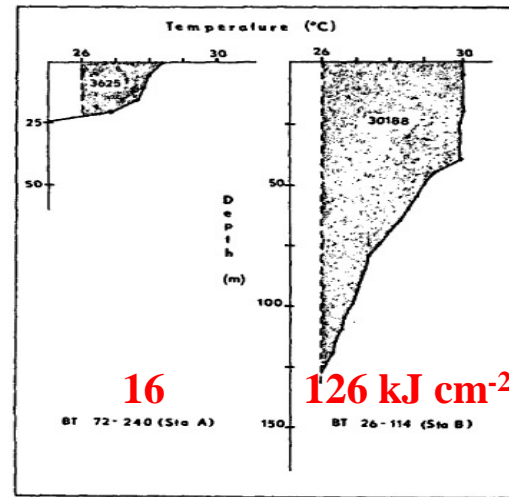
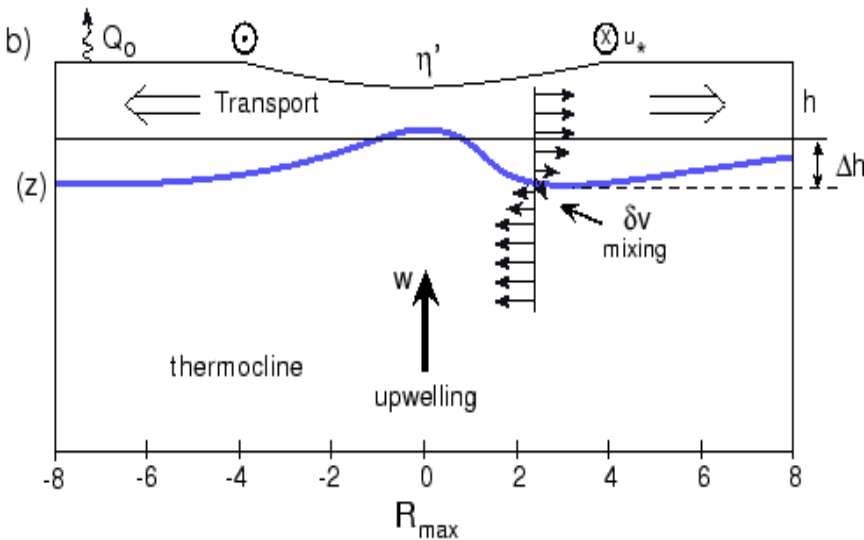
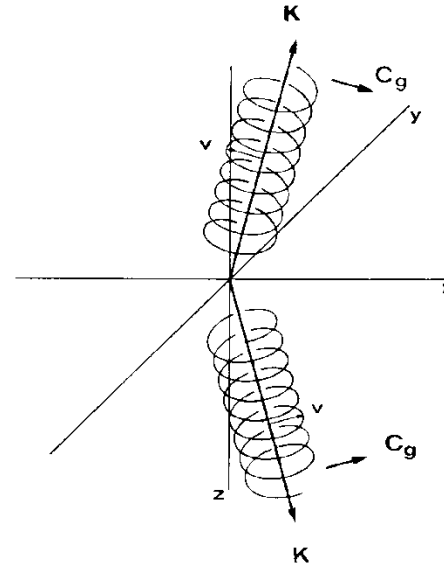
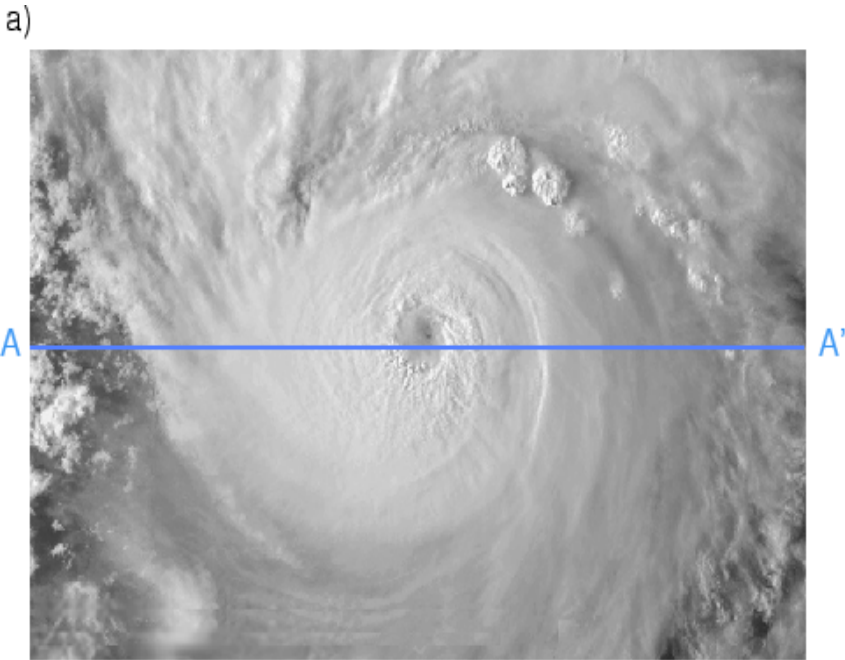
Leaman (1976)

Integrated thermal structure (OHC) and vertical current shear.

Current and shear central for mixing, cooling and, feedback to the storm.

Due to the depth of warm layers and strong background flows, minimal cooling positive feedback to TC.

Is SST Enough?



$$OHC = c_p \int_0^{D_{26}} \rho [T(z) - 26] dz,$$



Progress: Aircraft



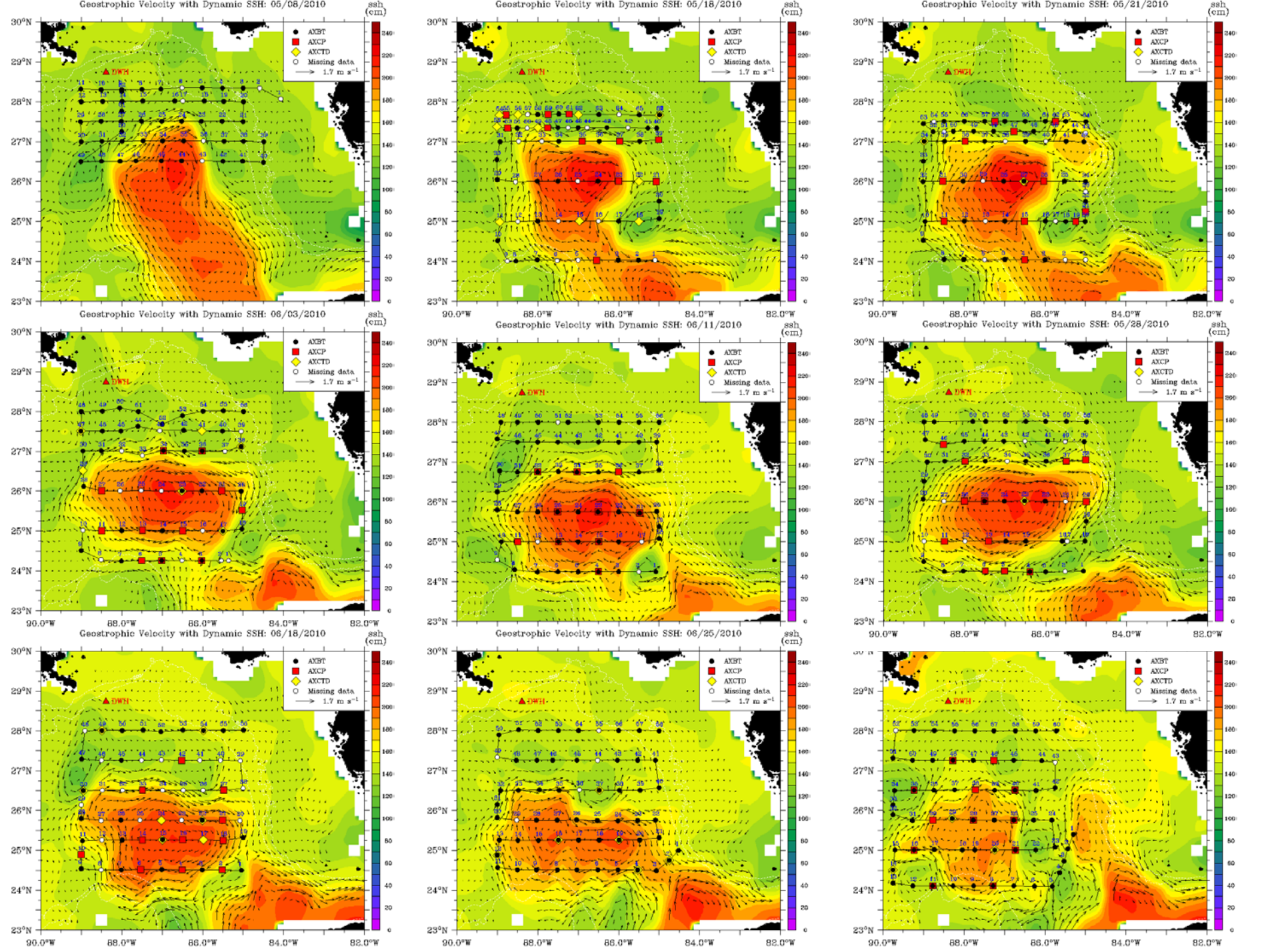
As a result of the DWH flights (May through July 2010), isolated problems with profiler manufacturing and software/firmware problems with Mark 21 (777 profilers deployed), Specifically:

- RF transmissions were weak from AXCPs;
- Software problems with AXCP software;
- Capacitors on RF board;
- Mark 21 software could not handle the digital AXCTDs; and,
- Procurement of Mark 10/Mark 21 delayed till problems resolved.

System procured in December 2010, tested at RSMAS in Feb 2011.

Mark 10, Mark21 and Flash Card installed on P-3s.

Replacement profilers have been received in summer 2011 for the IFEX/HFP program in collaboration with BOEM.



NOAA WP-3D profiling over BOEMRE Moorings (In Collaboration with AOML HRD, AOC, TPC, NCEP)

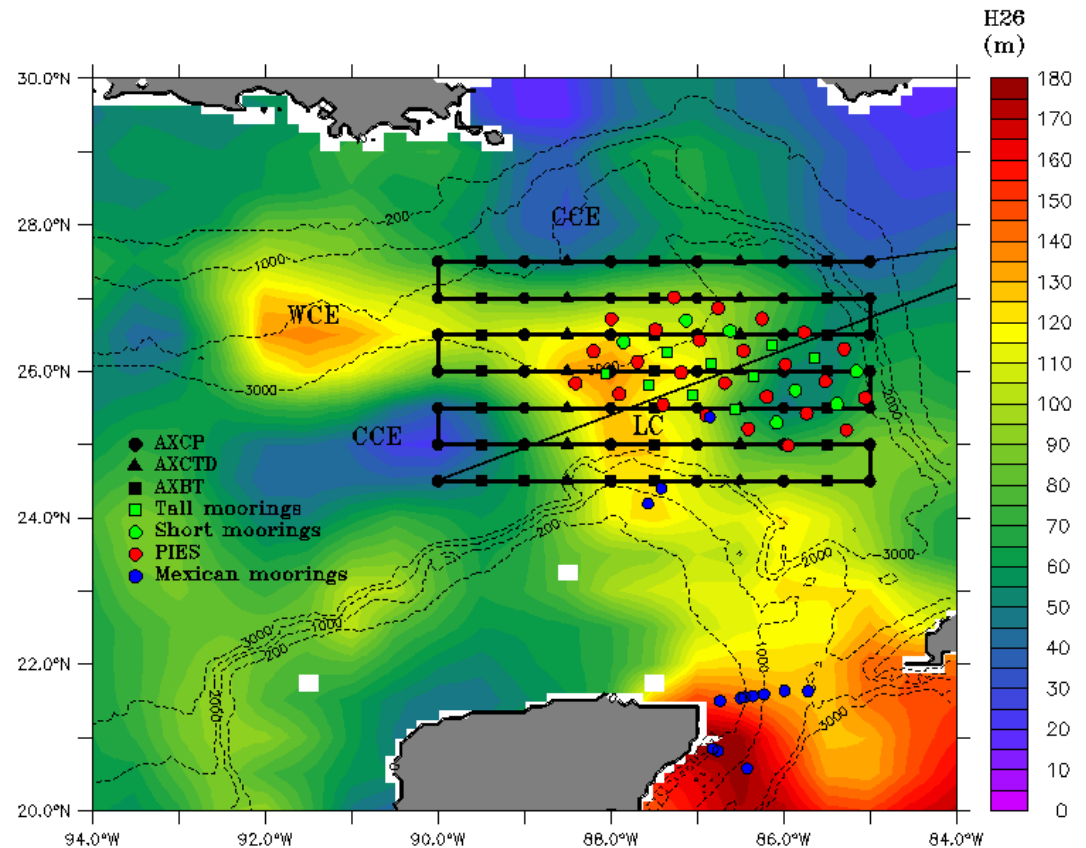


Deliverables include:

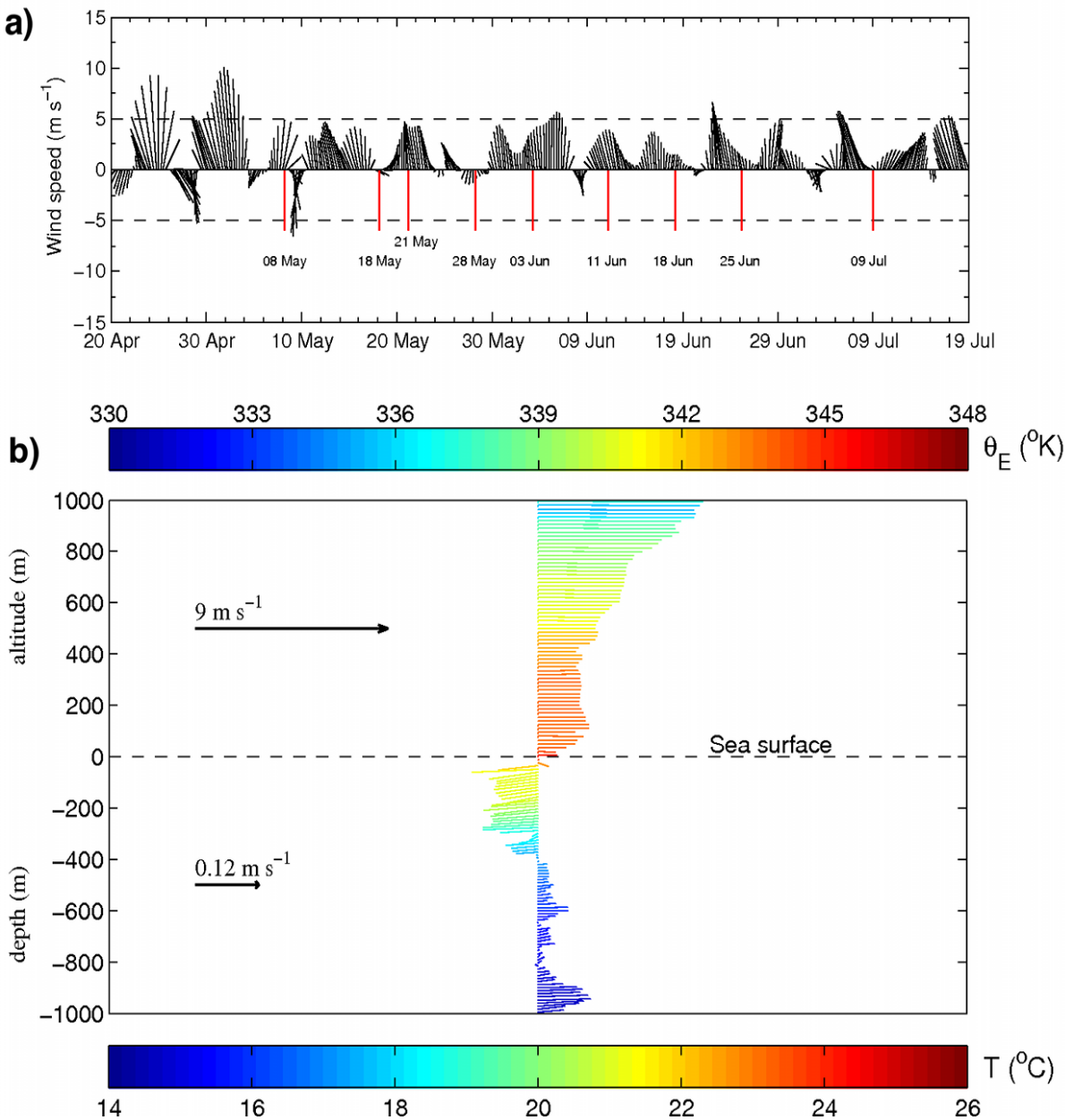
V, T, S profiles to 1000 m @
2-m resolution.

Surface winds (SFMR, GPS)
provided by HRD.

Atmospheric profiles of V, T
and RH @ 5-m resolution.



Expendables deployed from P-3 and proposed moorings relative to the LC, WCE and CCE superposed on late Sept 05 altimetry derived 26°C isotherm Depth (After Rita).



Upper: adjusted surface winds (10-m) at NOAA Data Buoy 42040 located ~55 km NE of DWH-Red lines depict day of the flights.

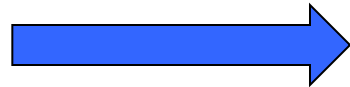
Lower: atmospheric boundary layer winds from GPS sonde and ocean currents from an AXCP (stick plots) colored to depict equivalent potential temperature (K) and ocean temperature (C) (Shay et al., JGR,2011)



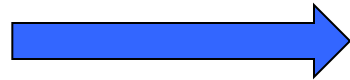
Permanent Installation on RF42



AXBT RX Units



Mark 21 Processors



Marantz 560 Units for Storage



LM Mark 10a RX Unit (200 kHz Bandwidth)





Summary of *OHC* Flights Deployed in 2011 (Successful)



1. Ocean probes (values in parenthesis indicate good probes).

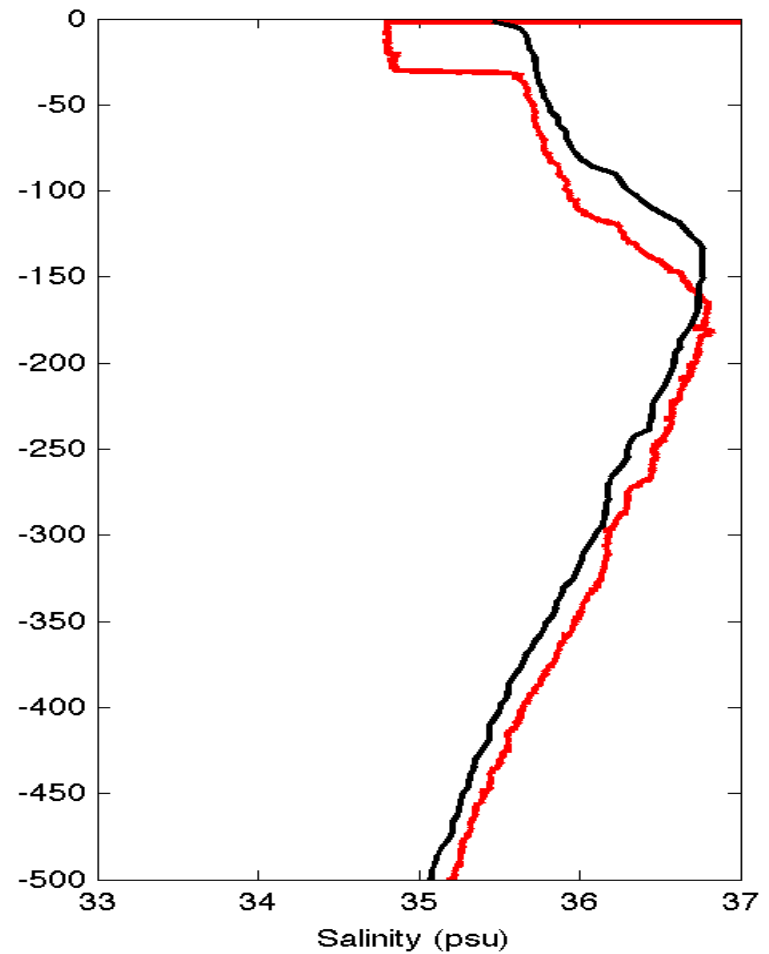
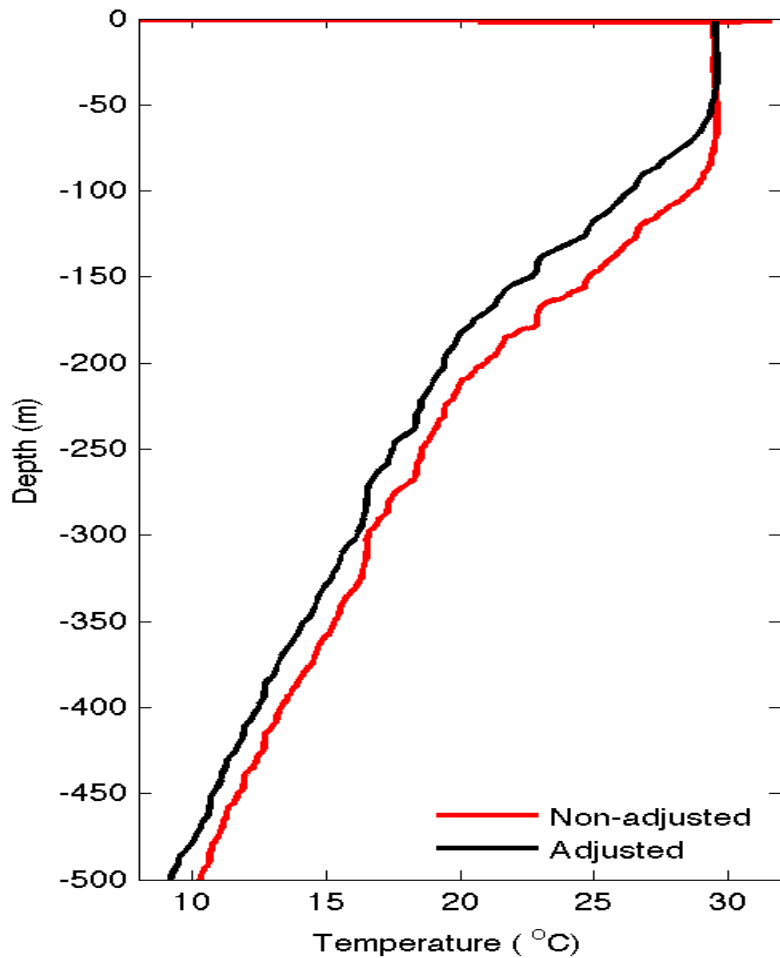
Flight	AXBT	AXCP	AXCTD	TOTAL	Success rate
20110908H1	19 (19)	24 (15)	14 (14)	57 (48)	84.2%
20111018H1	19 (16)	25 (17)	25 (25)	69 (58)	84.1%
Overall	38 (35)	49 (32)	39 (39)	126 (106)	84.1%

2. Atmospheric probes.

Flight	Dropsonde	Success rate
20110908H1	13 (12)	92.3%
20111018H1	20 (20)	100%
TOTAL	33 (32)	97%

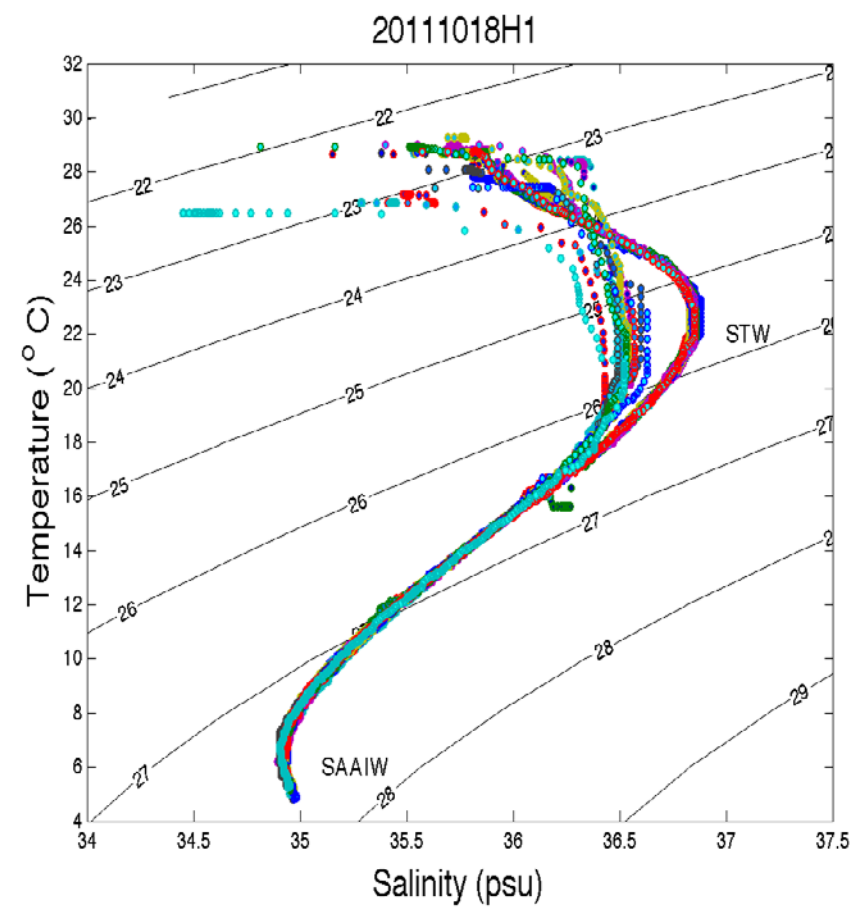
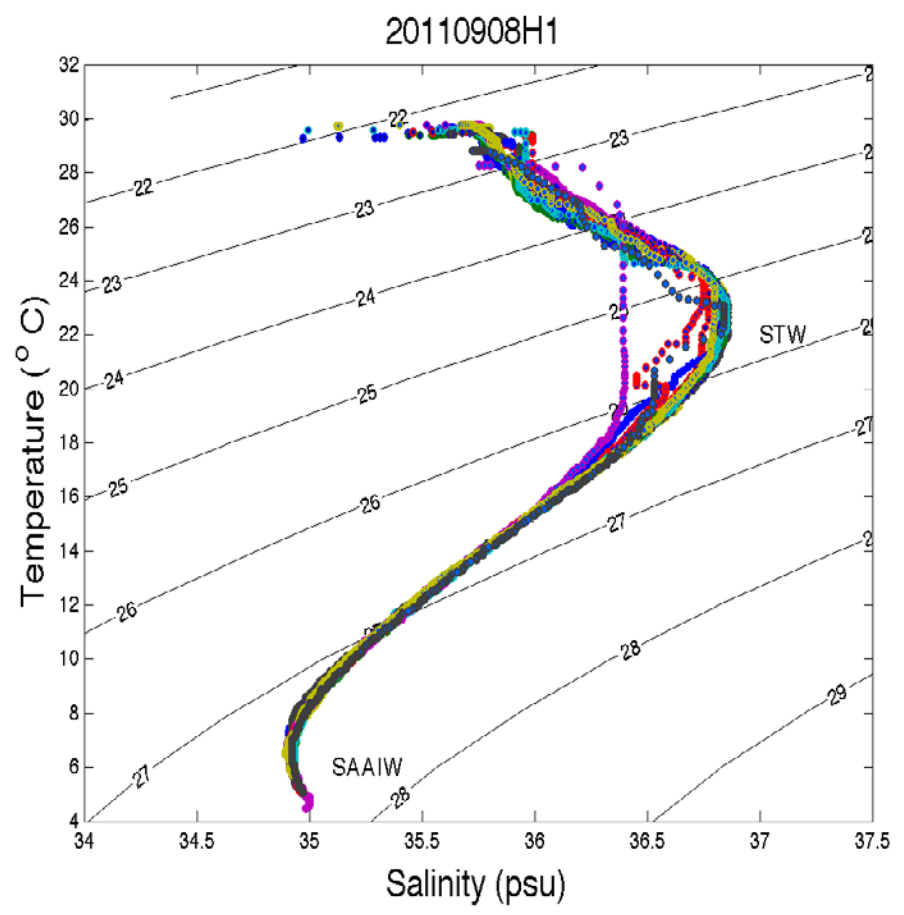


AXCTD From Sept Flight



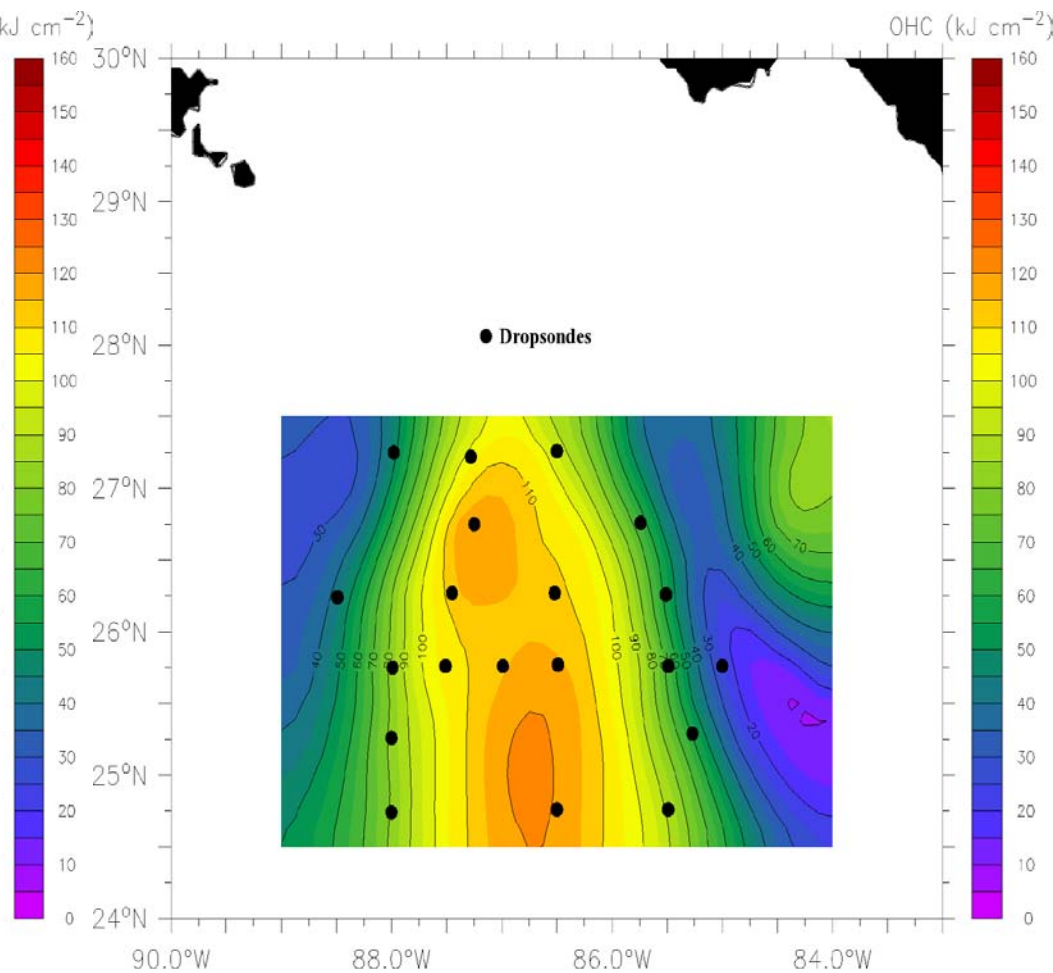
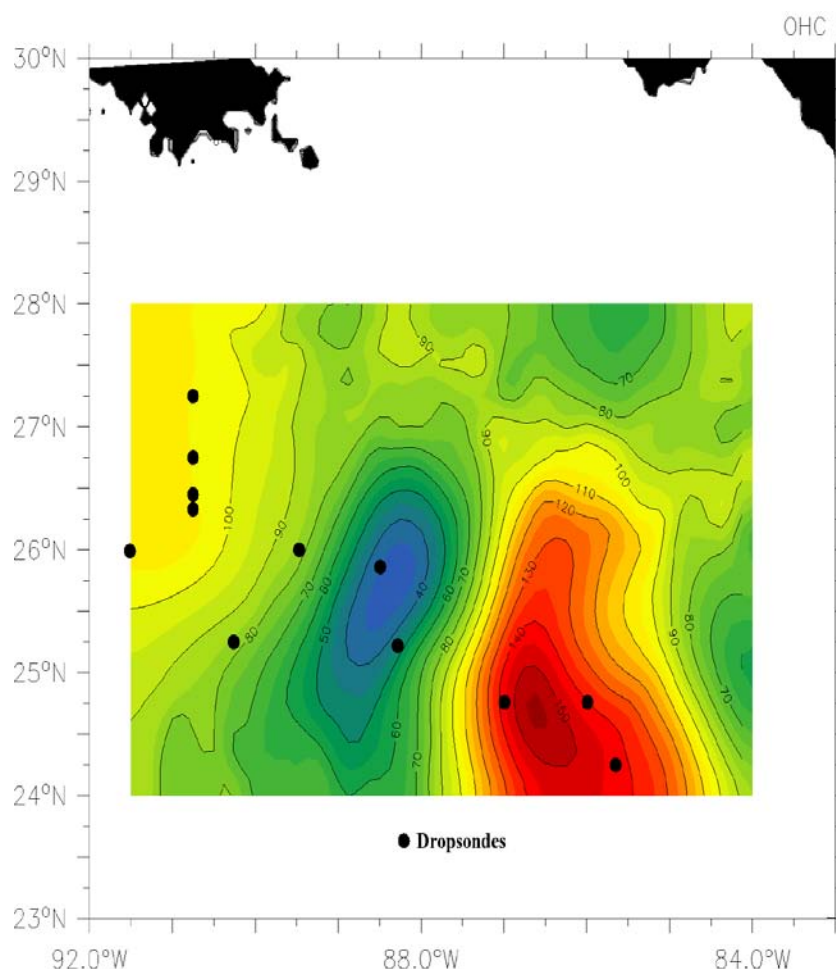
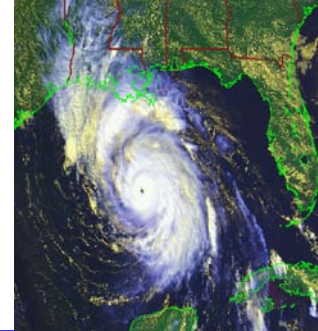


T/S Curves From AXCTDs on Sept (left) and Oct (right)



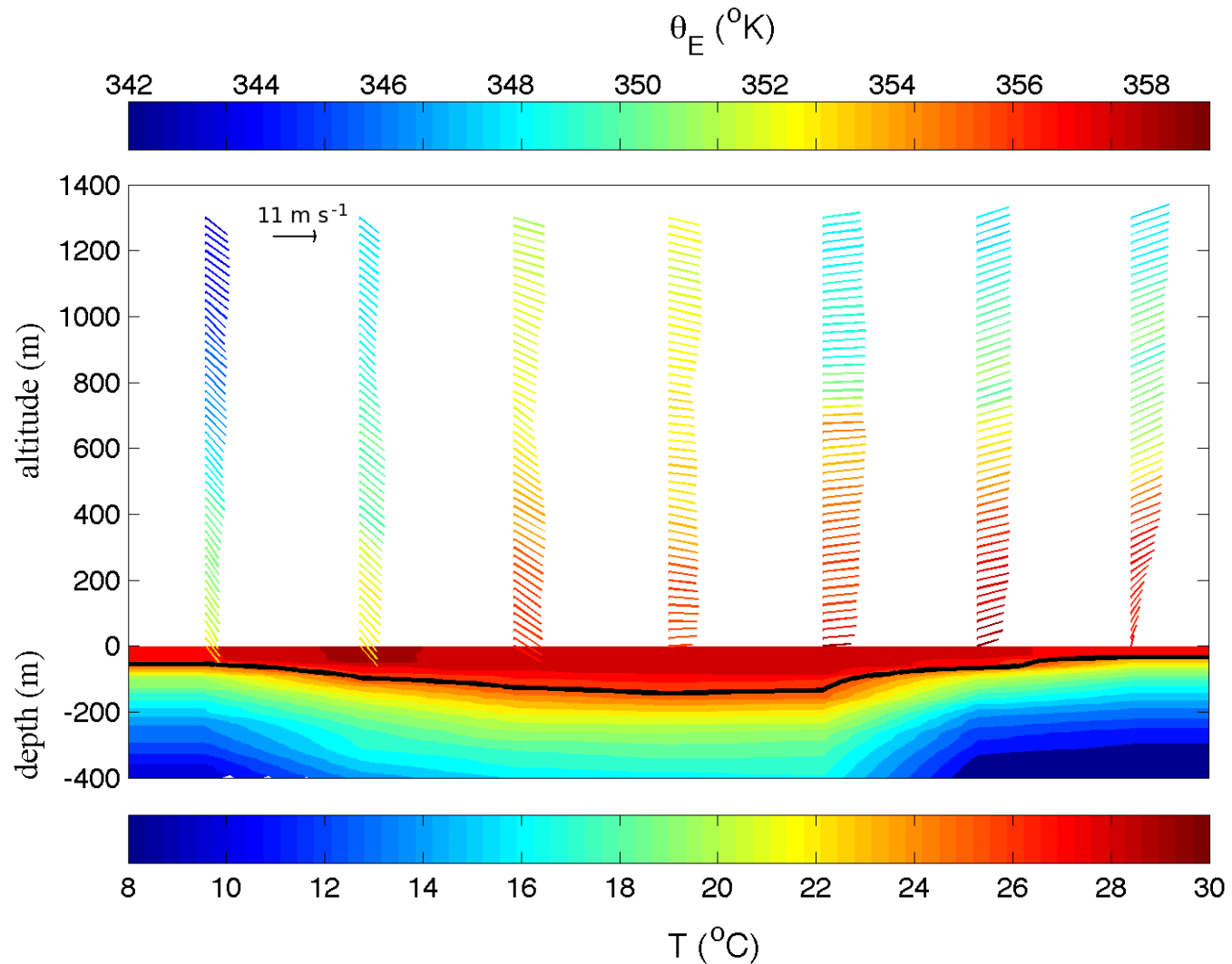


OHC from Sept and Oct Flights 2011



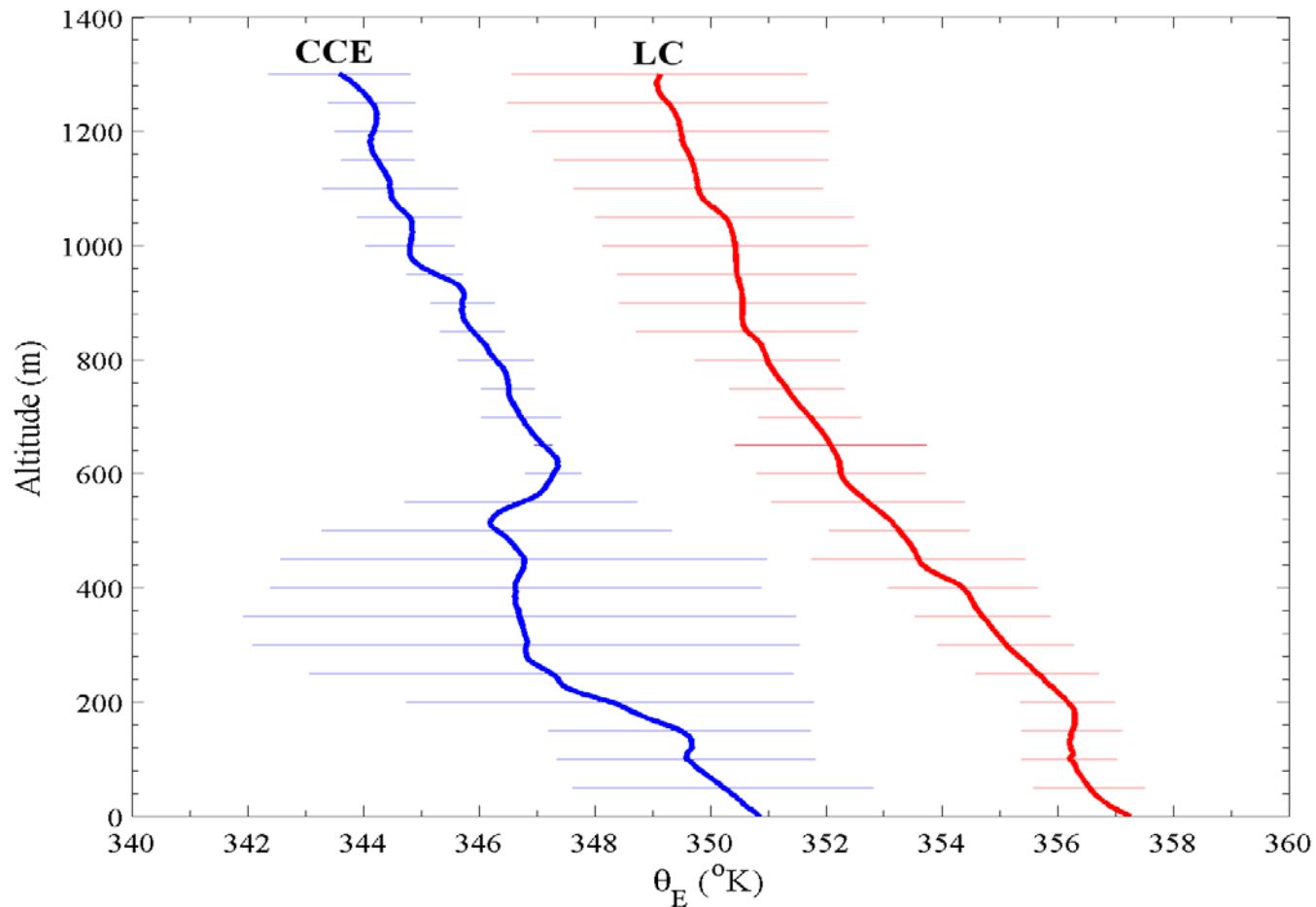


Equivalent Potential Temperature and $T(z)$





Equivalent Potential Temperatures Oct 2011





Closing Remarks:



New broad-band (200 KHz) expendable ocean data system of the NOAA P-3s has been installed at AOC at Station 2 and computer access at 5.

Vendor software still requires work for “real time” AXCTDs and AXCPs and only the system on 42RF was tested.

Ocean measurements needed for initialization of basic state from altimetry, floats, drifters, AX..., **improve shear-induced mixing** schemes and **air-sea parameterizations** (Shay and Halliwell, JHT, 2007-2011; Jaimes and Shay, MWR, 2009; Halliwell *et al.*, MWR, 2011).

Stock of high resolution profilers: 230 AXCPs (about 1/2 need refurbishing by vendor); ~175 AXCTDs. Shelf life is 2 to 3 years.

These higher resolution must be deployed at altitudes less than 10,000 feet at speeds less than 200 knot IAS - **NOT AXBTs.**