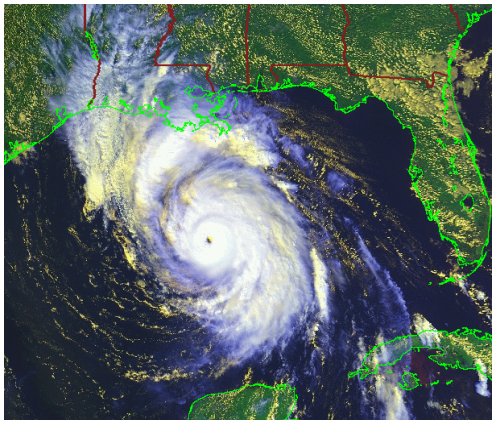
Ocean Observing In The IntraAmerican Seas



Lynn K. (Nick) Shay

Momentum (ocean current and current shear) is central to short term weather events and seasonal variability in the dynamics of the wind-forced mixed layer.

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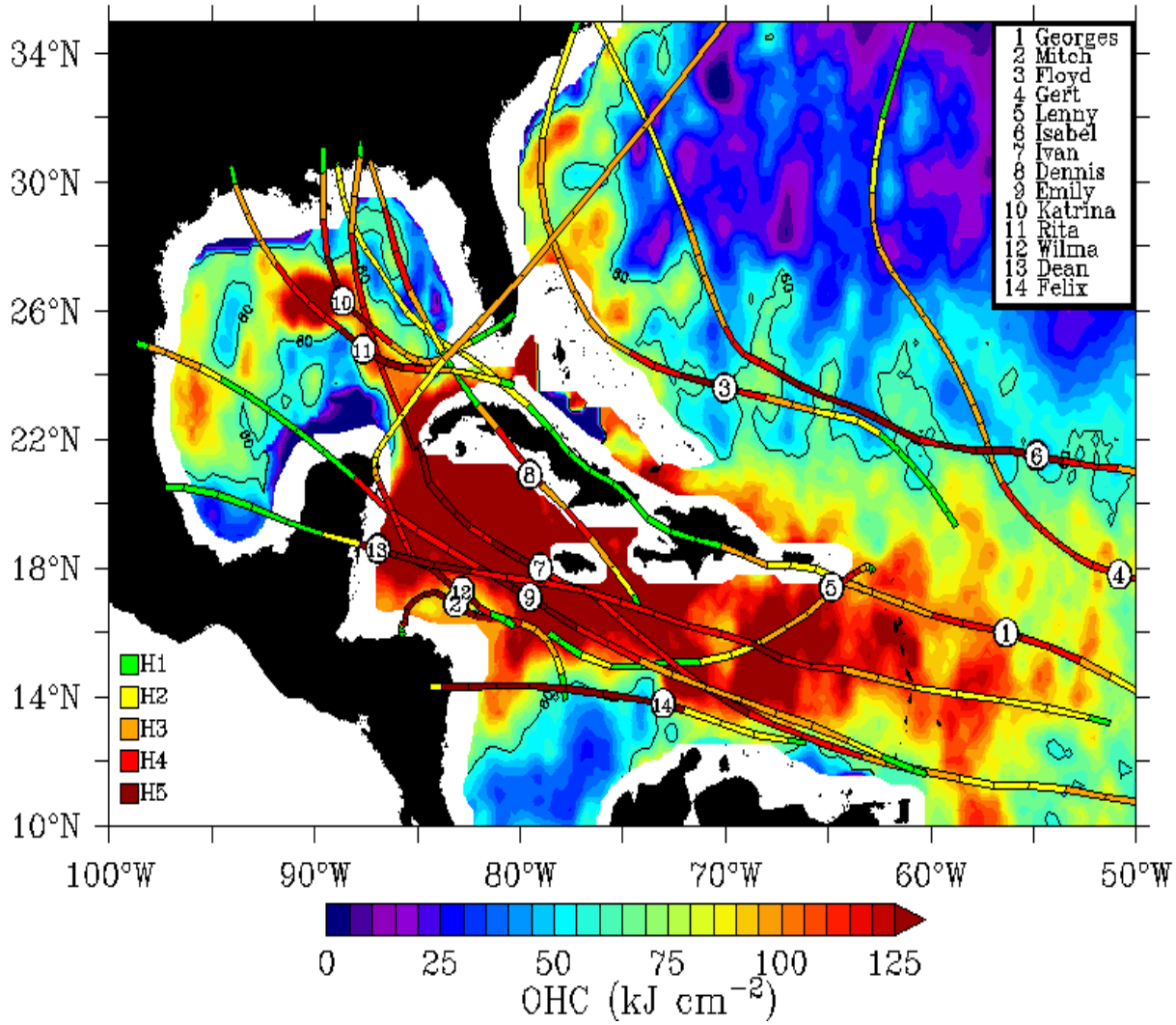
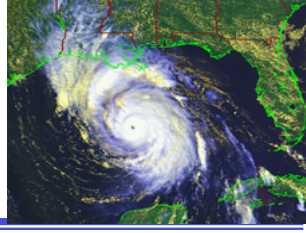
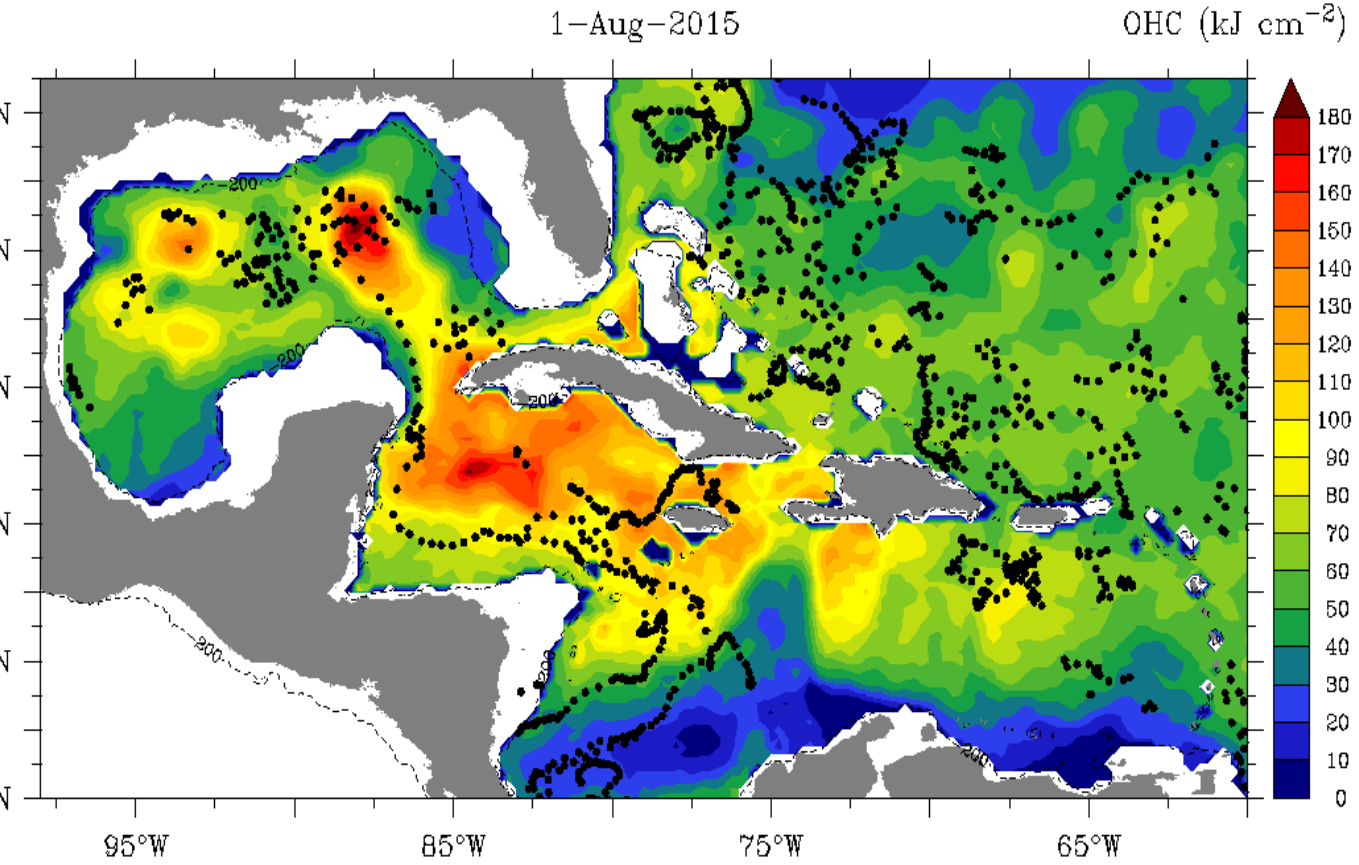


Motivation:

Tracks and positions of maximum intensity for fourteen of the strongest hurricanes recorded in HURDAT from 1998-2011, plotted over OHC for Sept 2005 from the Systematically Merged Atlantic Ocean Temperature and Salinity (SMARTS) climatology (Meyers et al., JAOT, 2014).

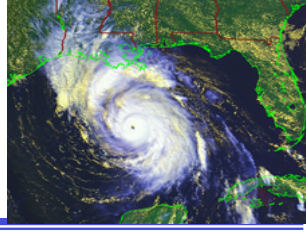
Argo Float Profiles (from 1 Jan to 1 Aug) Superposed on OHC In IAS Region

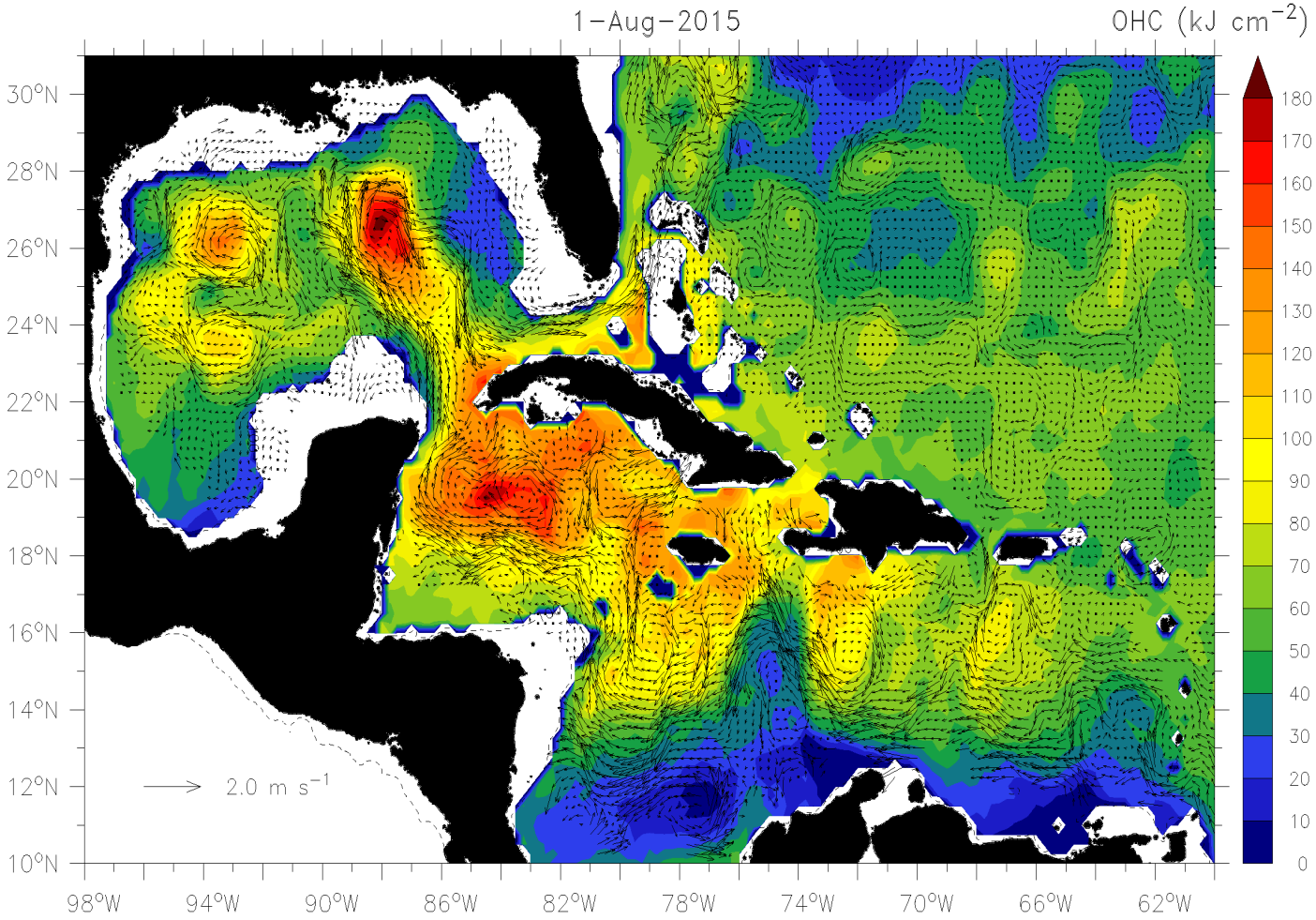




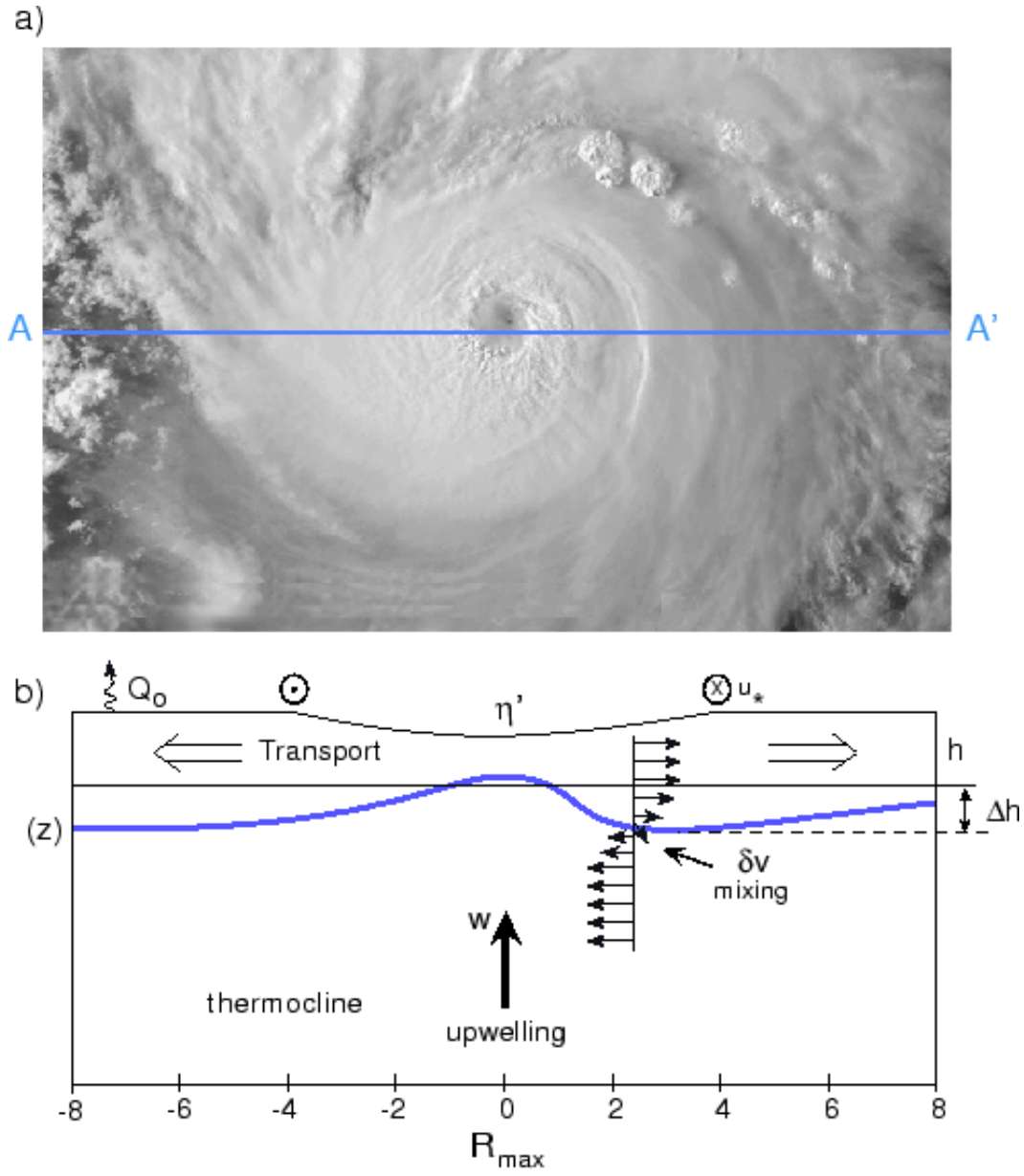
Spatial variability in temperature and salinity and formation and maintenance of barrier layers? Role of momentum on the mixed layer budgets on event and seasonal time scales?

Altimeter-Derived Currents Superposed on OHCIn IAS Region





What is the role of mid to deep currents in the IAS? What are the rates momentum transfers from the upper to lower layers during wind events? Are models getting that correct?



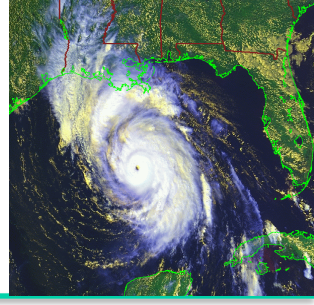
Upper Ocean Responses:

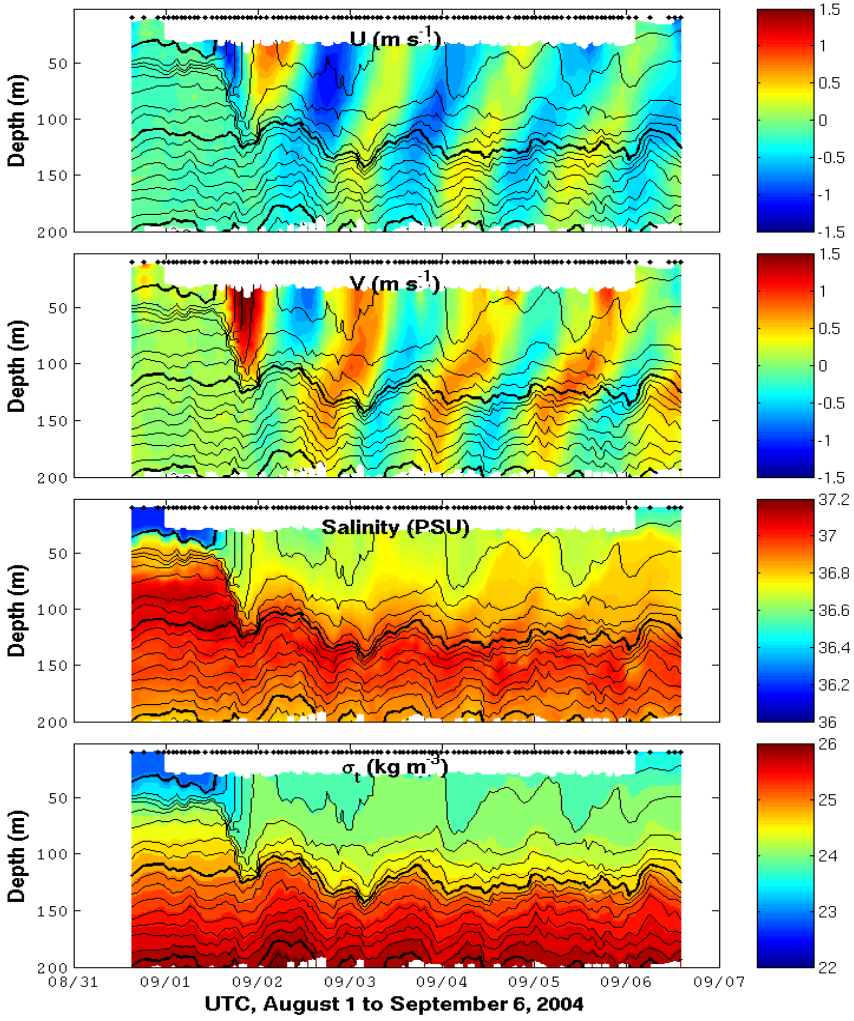
Momentum is central to the mixed layer problem through horizontal advection, upwelling (current transport), and vertical mixing.

Current and shear instability central to mixing across depth (h)…… cooling and, feedback to the storm by lowering Richardson numbers.

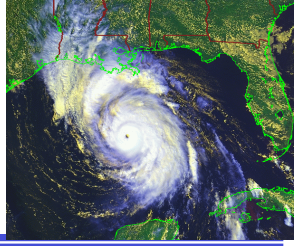
Not many studies using observed currents in the Caribbean/IAS.

Hurricane Frances (04) EM-APEX Float Deployed at 1-2 Rmax (Sanford et al., GRL, 2007)





Summary



Near-surface circulation patterns are complex in IAS. How is this reflected at mid-depths (e.g., thermocline). How accurate are the 3-D models with the deeper circulation patterns?

Both T and S are critical in examining the mixed layer processes and relationship with the deeper structures. Satellite remote sensing provides the larger scale context, but not the fine scale to mesoscale variability needed for improved predictability over seasonal to annual time scales.

This issue is amplified during the passage of events in that current shears (and instability) are responsible for a large fraction of the **vertical mixing** which is parameterized in the ocean models. ***In situ data are critical!***

What is the optimal mix of ocean observing in the IAS including currents and biogeochemical sensors given the complex circulation patterns and shear-instability events (e.g., hurricanes)?