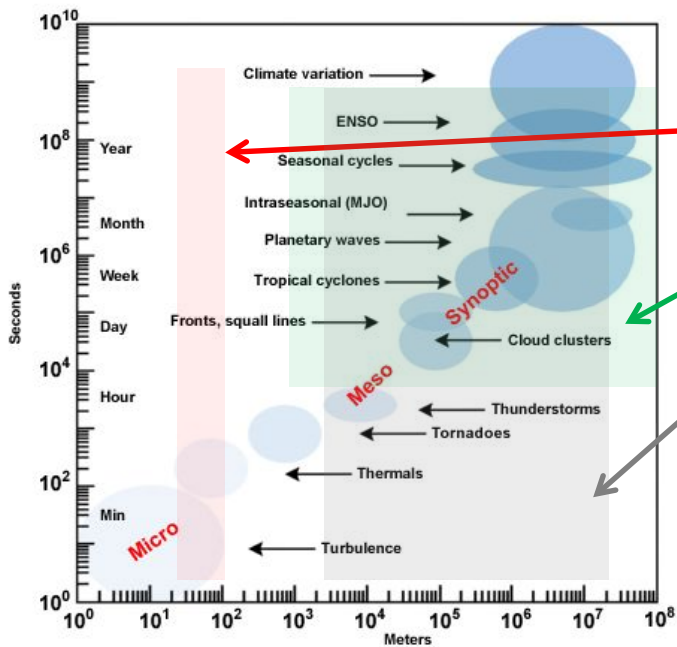




Evolving NDBC Buoy Observations to Add Value to Hurricane Research and Forecasting

**Interdepartmental Hurricane Conference
Tropical Cyclone Research Forum**

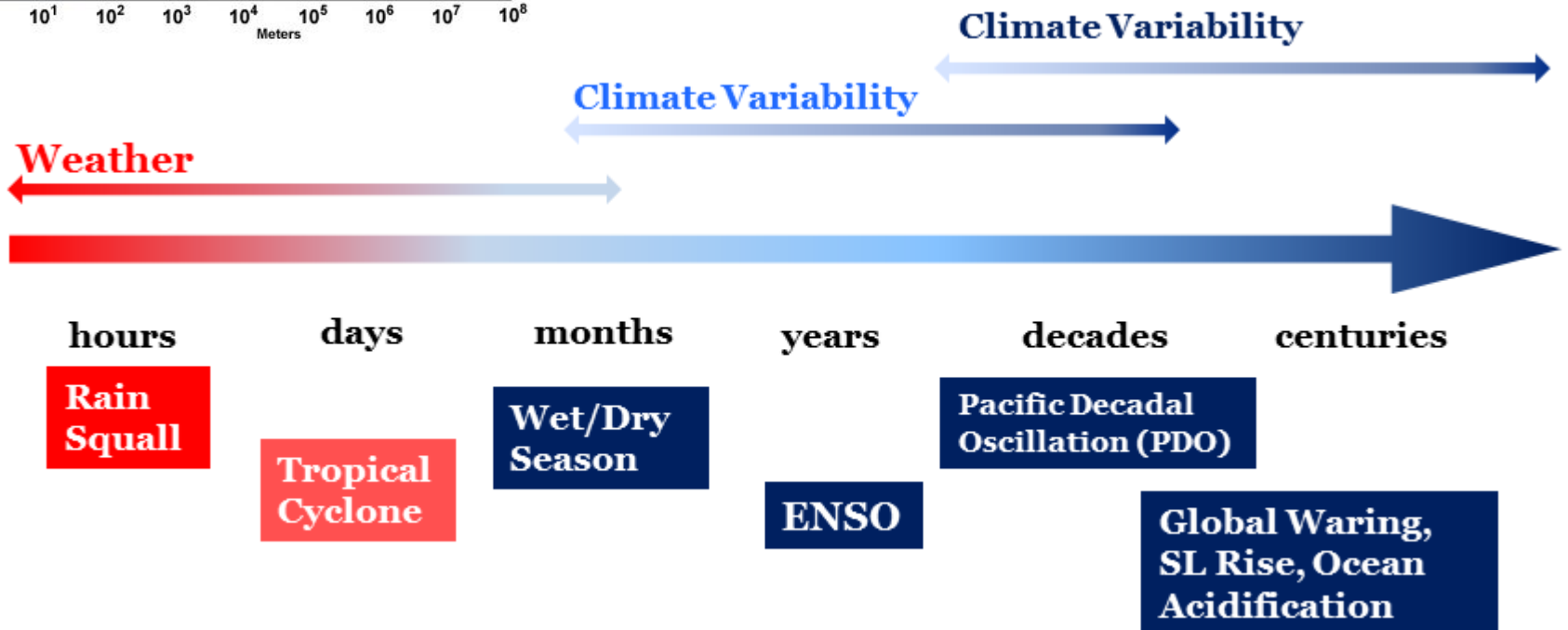
**Karen Grissom
12 March, 2019
National Data Buoy Center**



Individual Moorings

Satellites

Moorings Networks



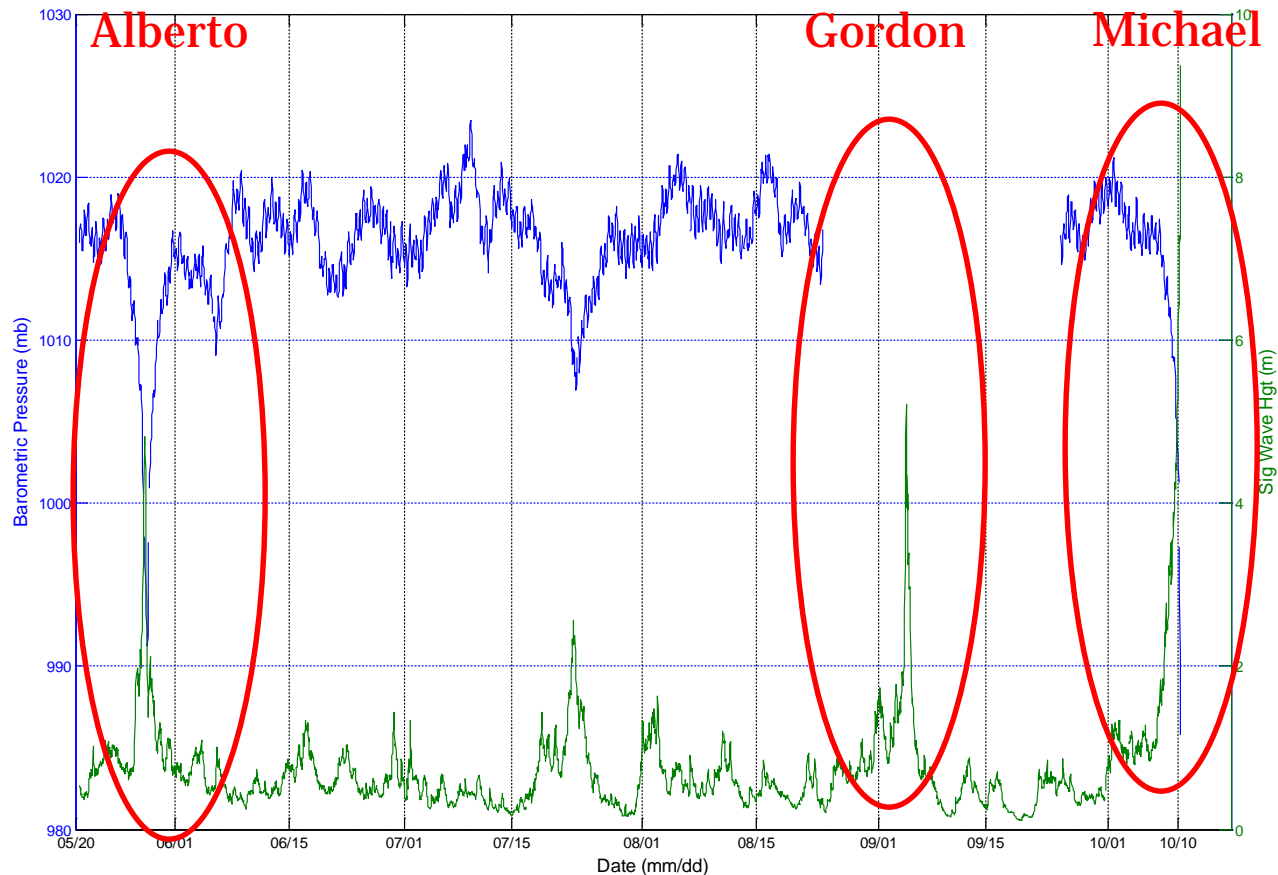
Time and Space Observing Needs

Value of In-Situ Buoy Observations

- **Initialization**
 - Provide background state prior to TC – improve initial conditions
- **Validation/ground truth**
- **Developmental testing & calibration**
 - Contribute to post storm understanding of magnitude & duration of ocean response
- **Captures temporal variability**
- **Impervious to cloud cover**

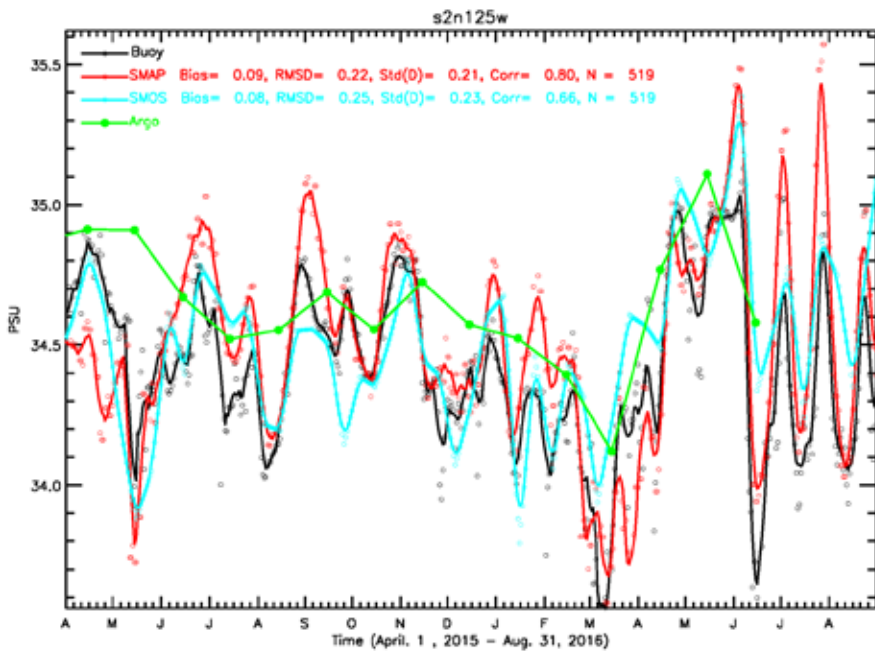
Initialization

- Ocean observations assimilation critical to improving initialization for intensity
- Observation (waves, SST) and derived integral properties (heat content) often used as constraint of mesoscale variability – background state

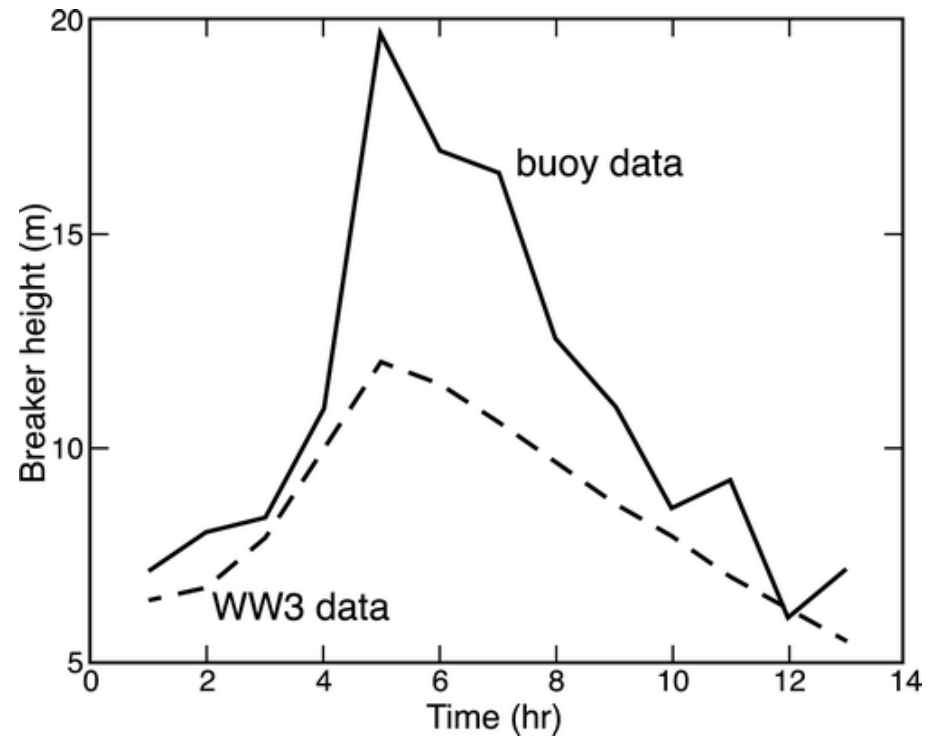


Validation

- Select locations
- Observations for testing/validation of satellites and models



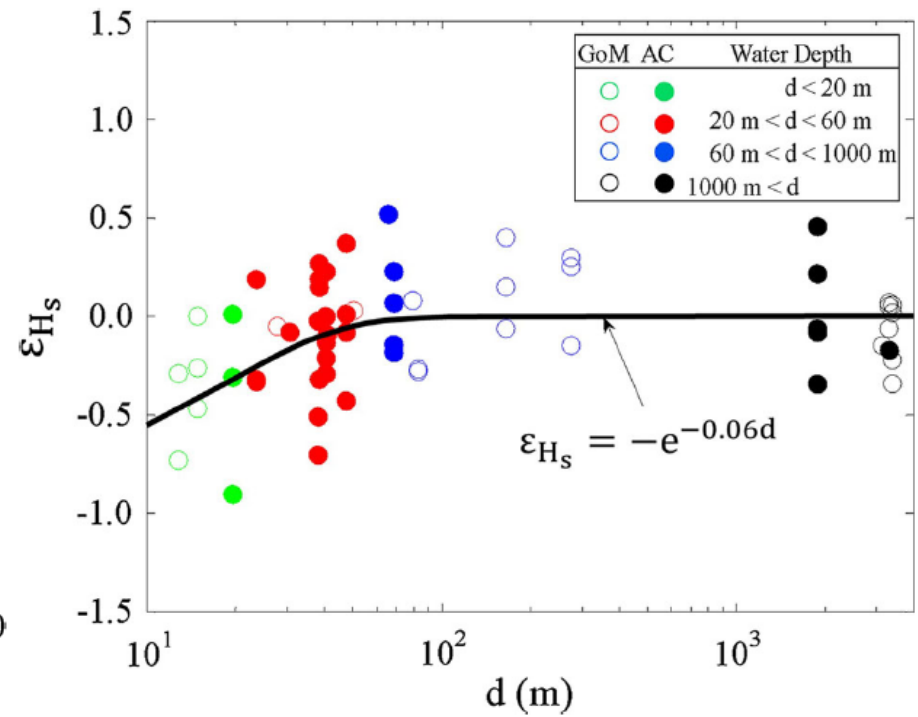
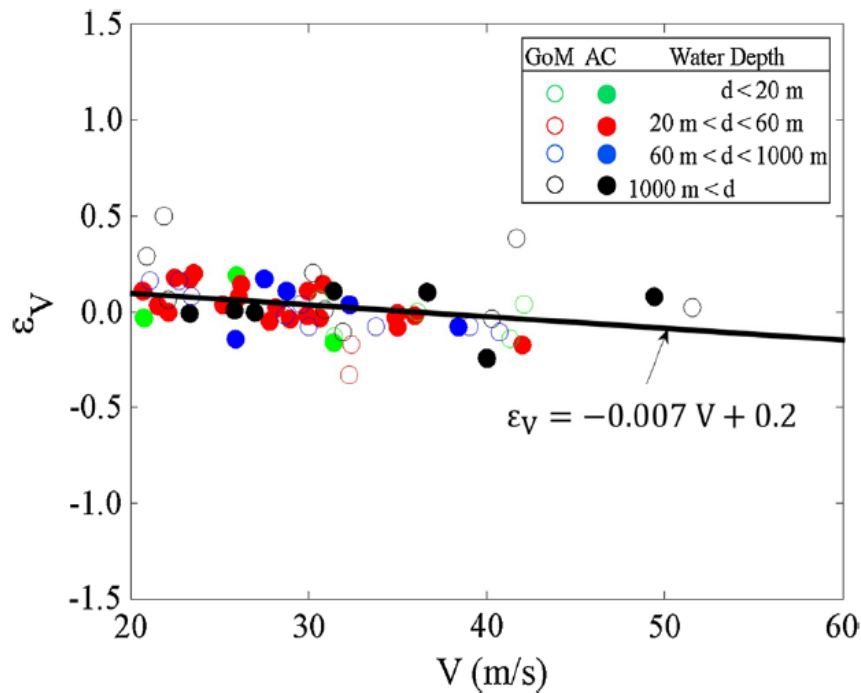
Tang et al, 2016



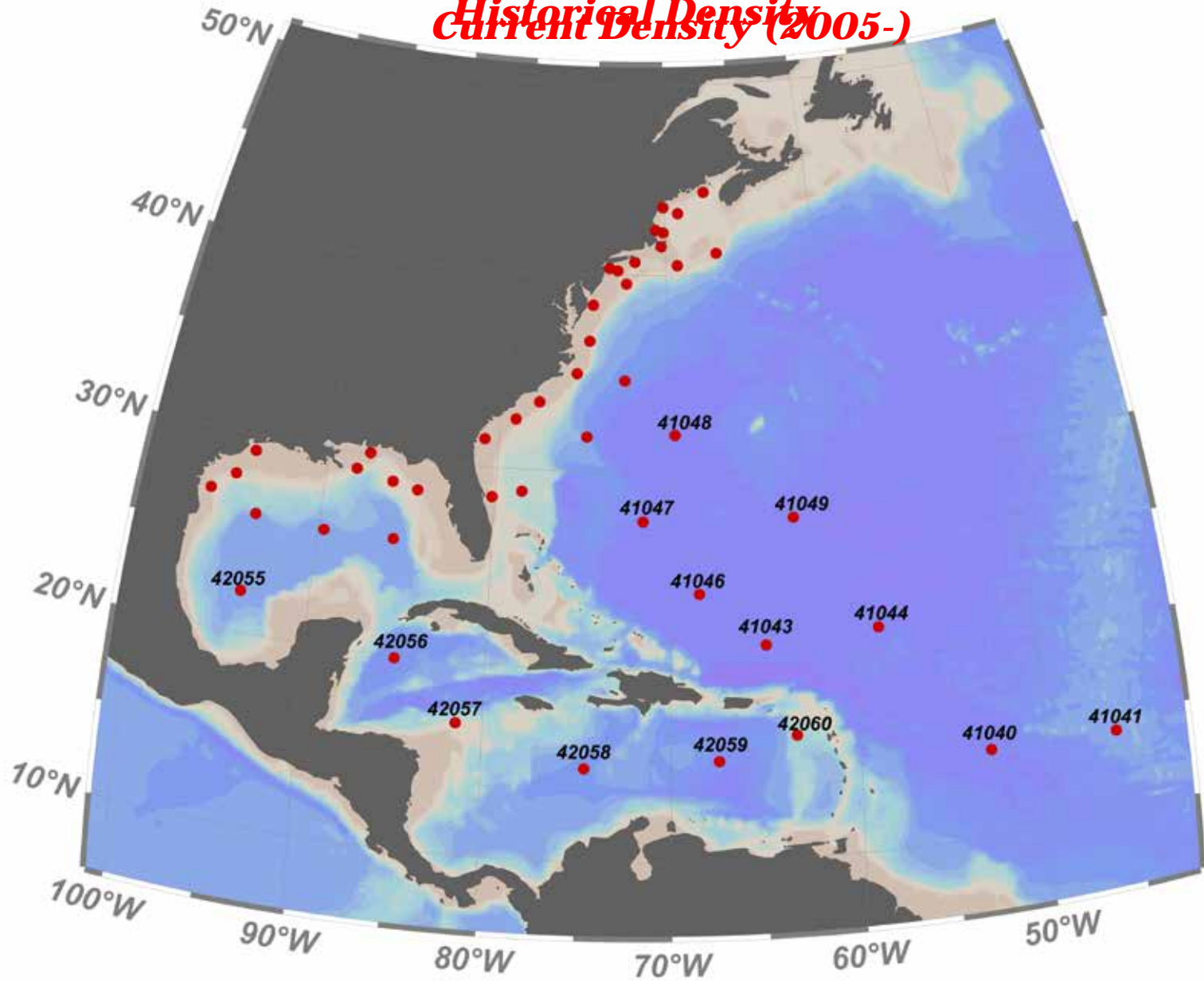
Businger et al, 2015

Calibration

- Moored sensors can be re-calibrated to become in-situ reference stations for satellites and other type of sensors



Historical Density
Current Density (2005-)



Spatial Density



10-meter hull



6-meter hull

NDBC Legacy Buoys

3-meter hull



2.1-meter hull



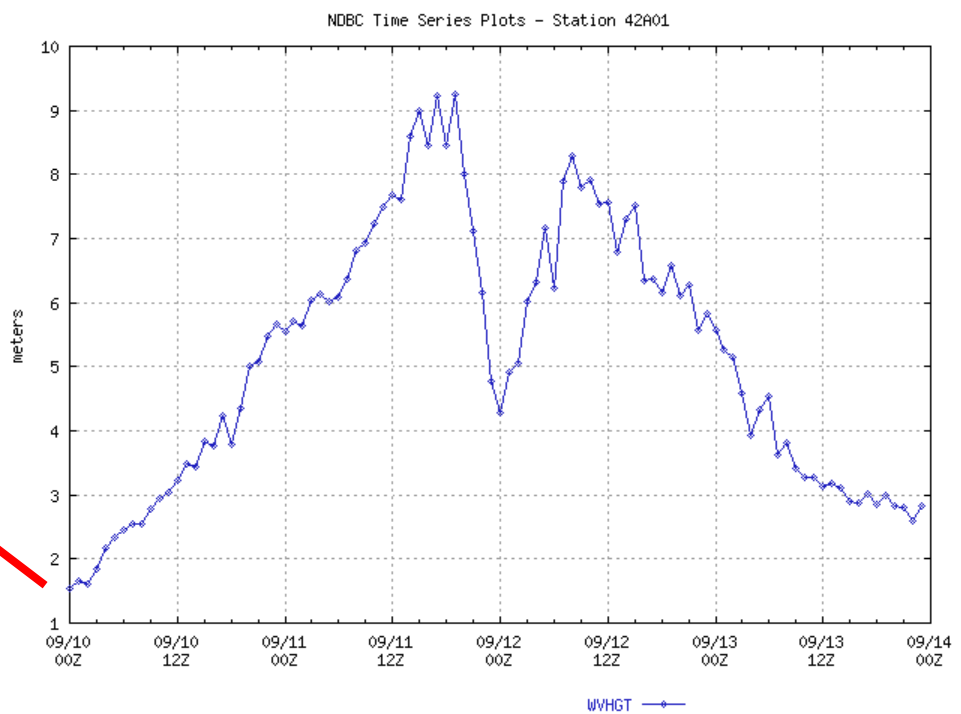
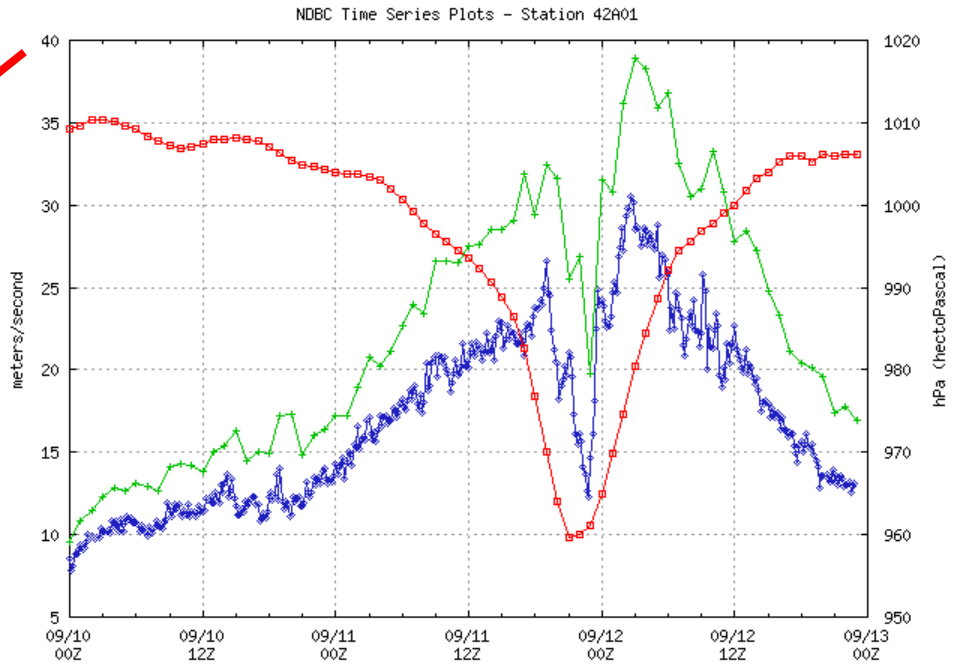
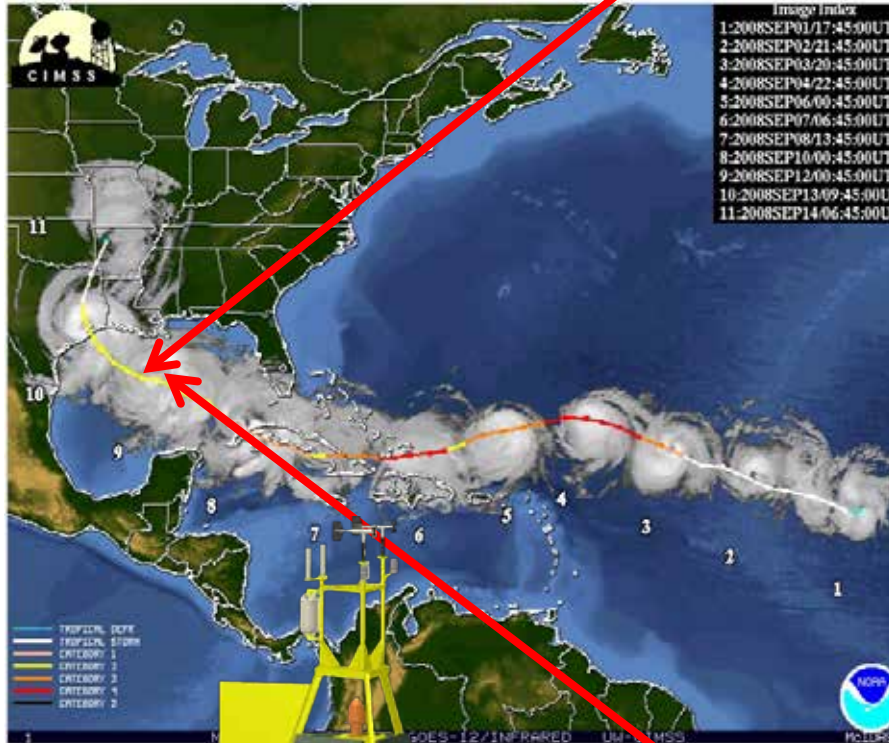


Value Added



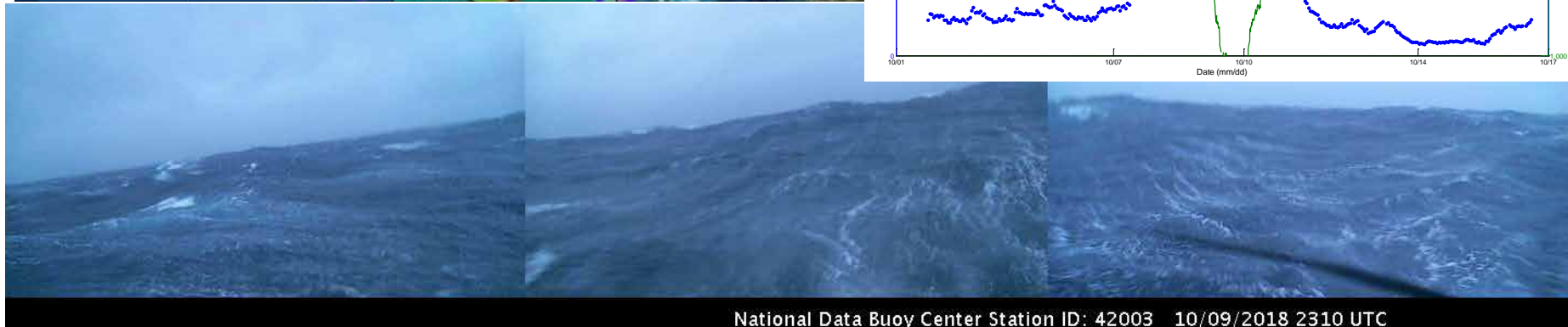
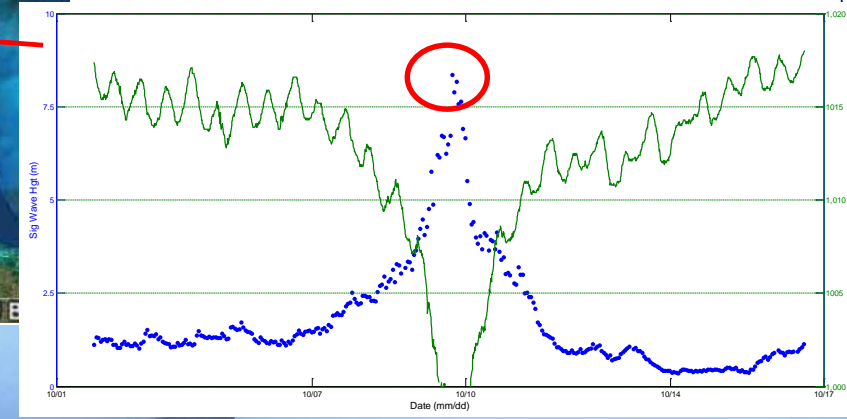
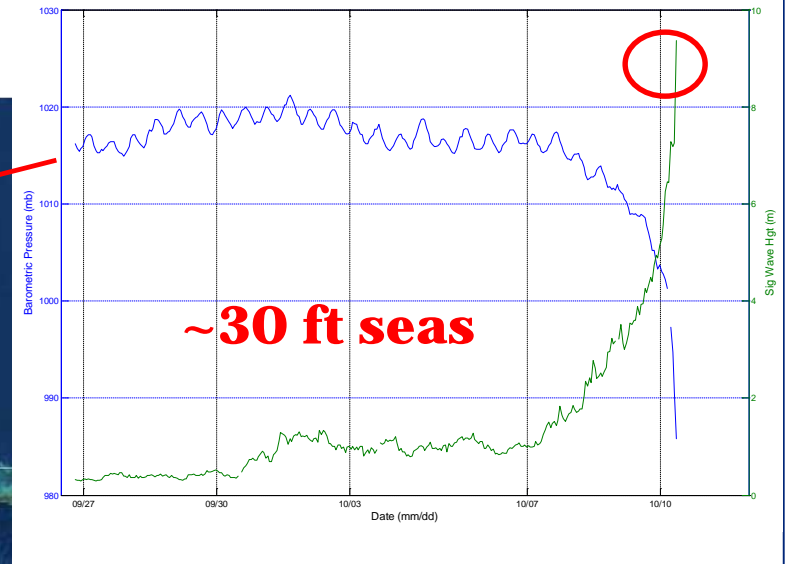
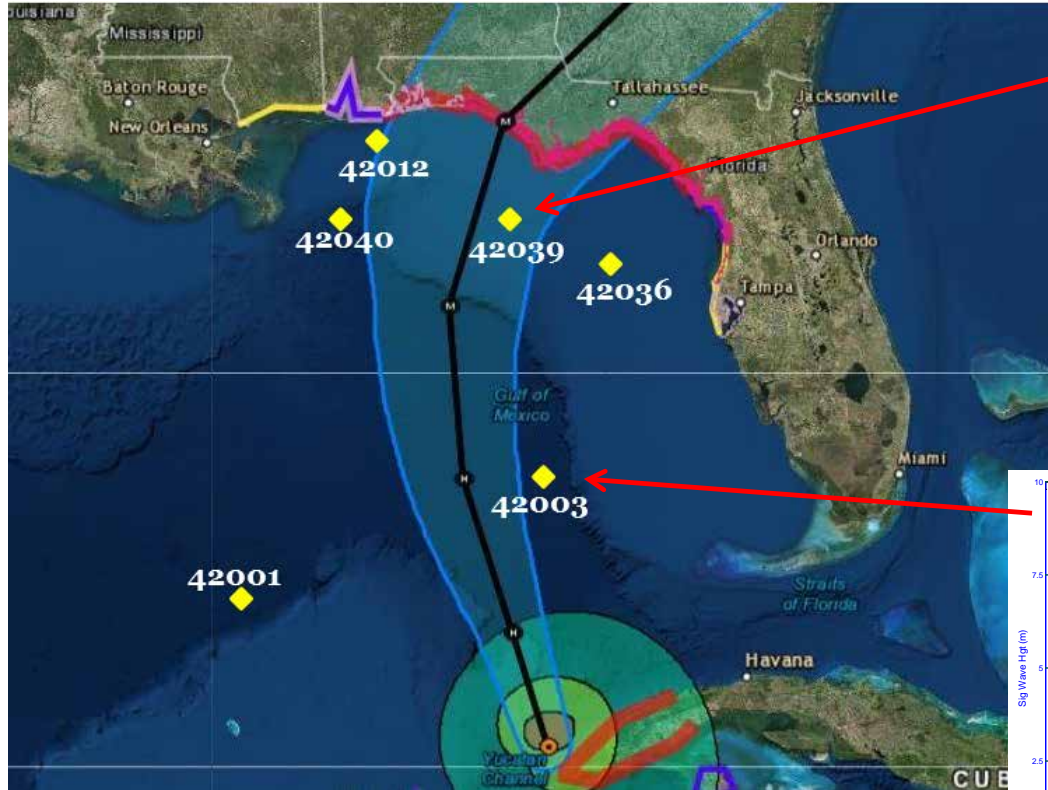
- Moved SST from hull mounted to in-situ bridle mount – faster response time
- Added capability for RT subsurface in-situ T,S,P (& currents)
- Excellent coverage of time domain & less time aliasing
- High-resolution near real-time data to GTS
- Hurricane Supplemental Observations: Barometer, wind speed and direction reports 1 min extreme

Marine Weather: Hurricanes



Legacy Buoys

Michael



National Data Buoy Center Station ID: 42003 10/09/2018 2310 UTC

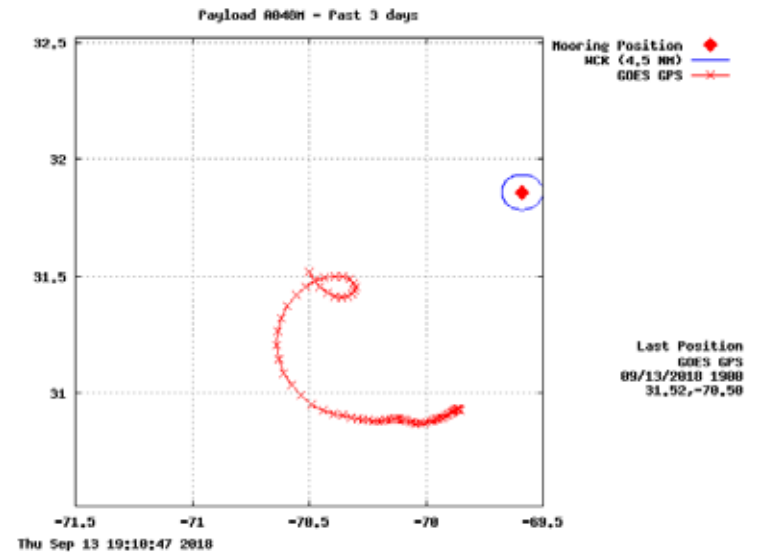
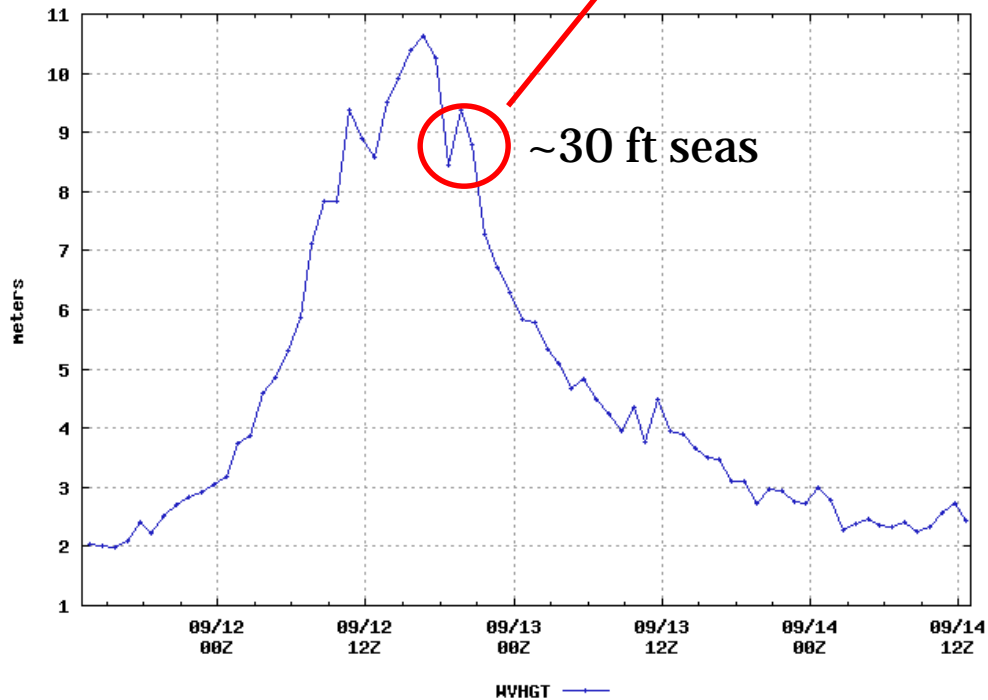
Waves: 42039 & 42003

Florence



National Data Buoy Center Station ID: 41048 09/12/2018 1910 UTC

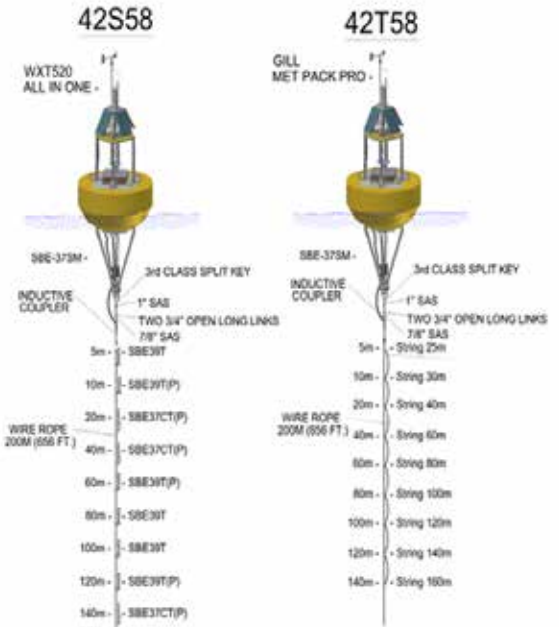
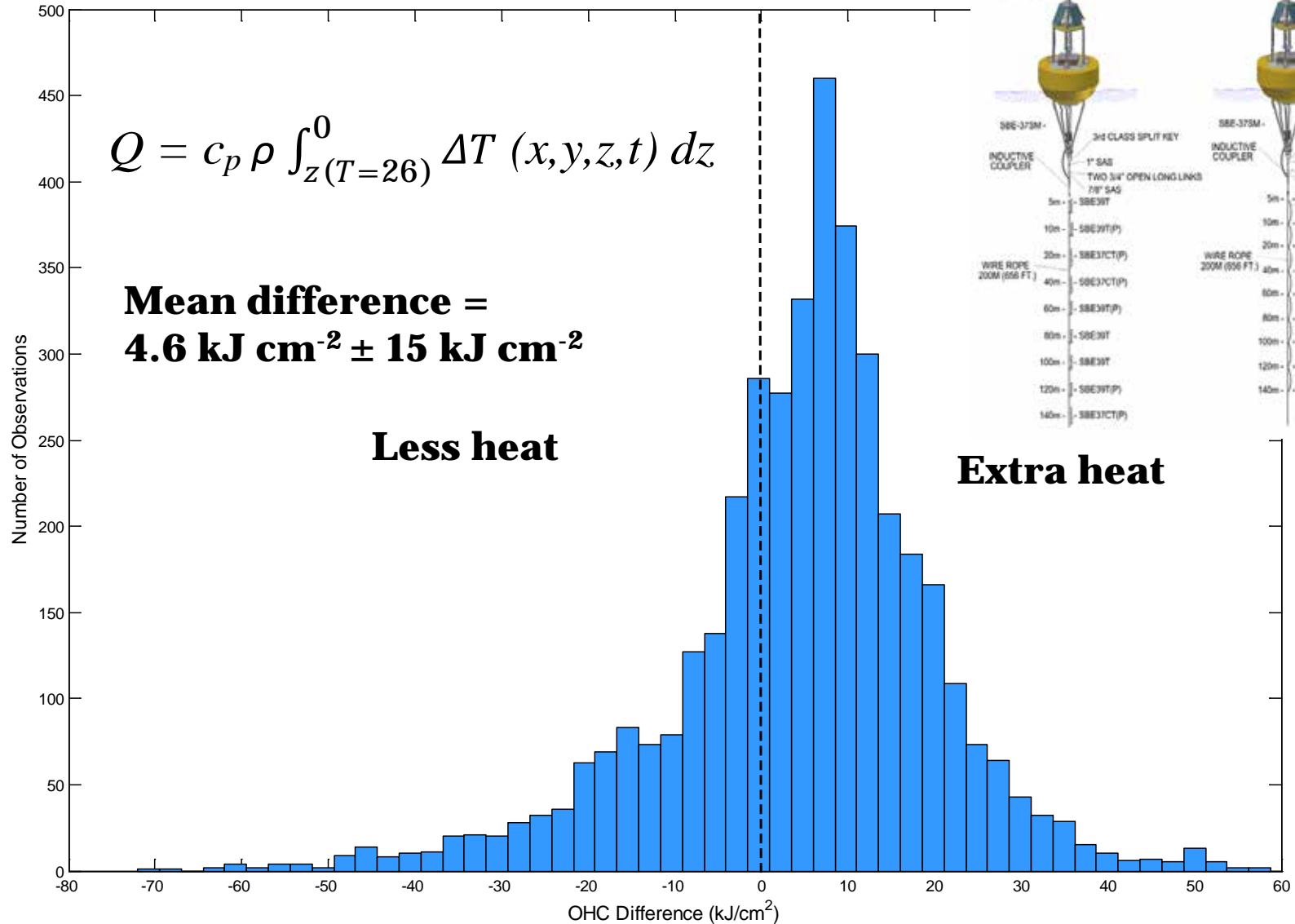
NDBC Time Series Plots - Payload #048M



Waves: 41048

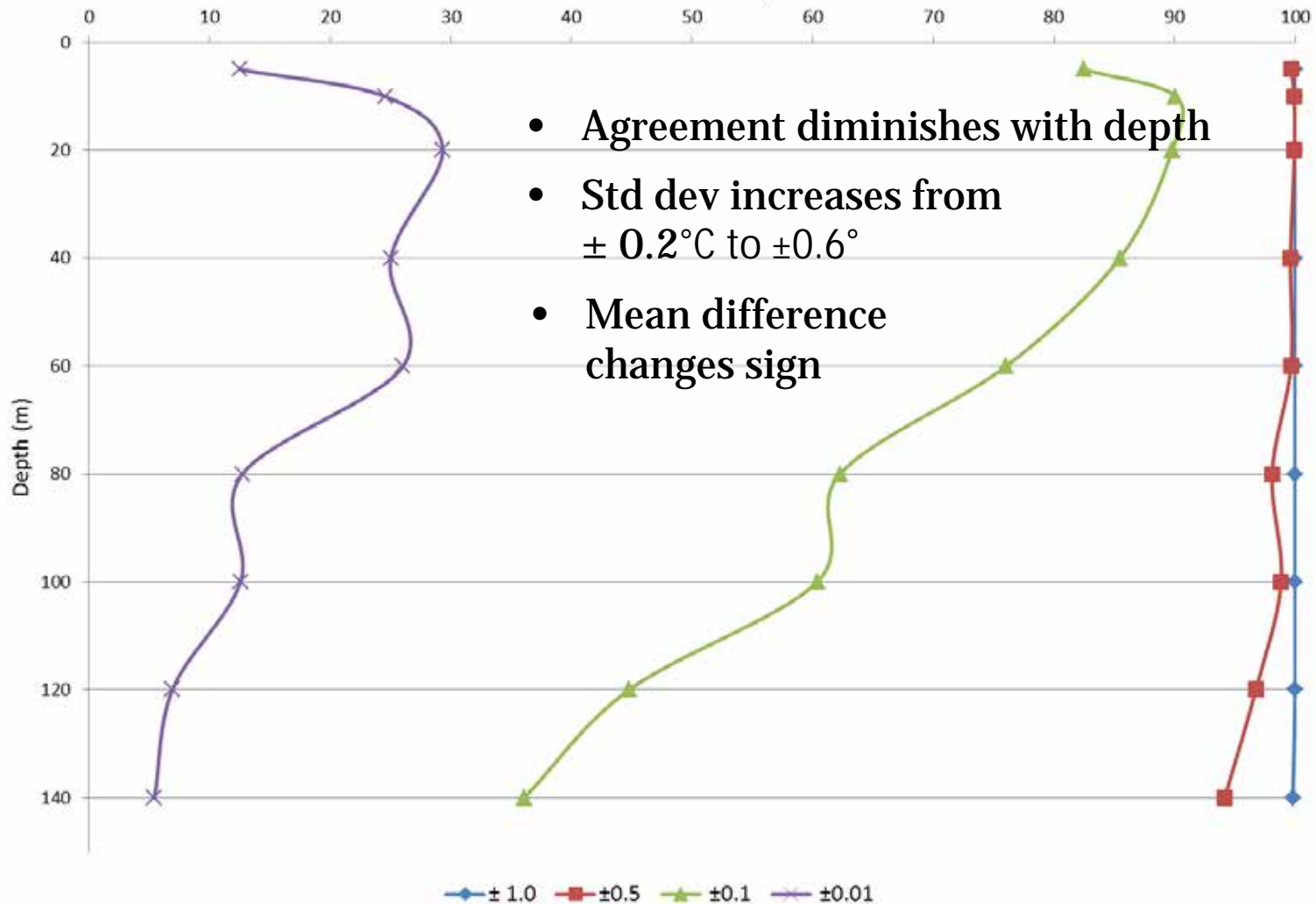


Ocean Heat Content





Accuracy Required?





Summary



- Value of buoy observations: initialization, validation, testing/calibration.
- Different spatial representation, buoys ~ order of magnitude smaller, capture temporal variability.
- Geographical sampling biases due to scarcity of high-quality buoy data
- Technology refresh
 - High-resolution RT data to GTS
 - Cameras
 - Subsurface observations – OHC
 - Accuracy