An ocean observation network to monitor sea level changes and attributions in southeast Florida

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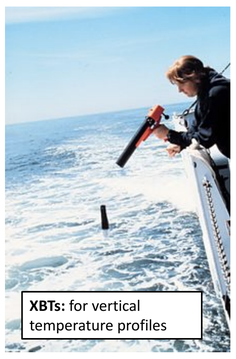
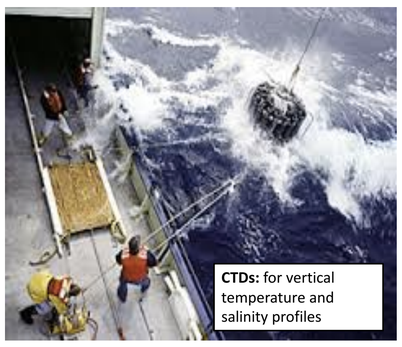
Short term sea level variability may depart from the expected changes in astronomical tides for several reasons that include: water temperature changes, weather events, and ocean dynamics. We describe here how the current ocean observing system is being used to assess how these changes may help improve sea level predictability. Observations from the current ocean observing system use a suite of platforms (tide gauges, underwater gliders, expendable probes, atmospheric sensors, ships of opportunity, cable measurements, surface drifters, satellites, etc.), which together with observations obtained from proposed new or enhanced platforms (moored instruments, underwater gliders) can be used to better understand attributions to sea level changes at time scales ranging from days to larger than one year, off the coast of southeast Florida.

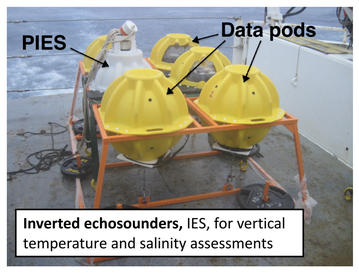
Ocean Observing System



XBTs: for vertical temperature profiles

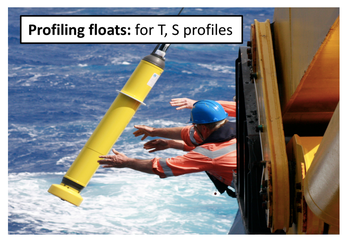


CTDs: for vertical temperature and salinity profiles

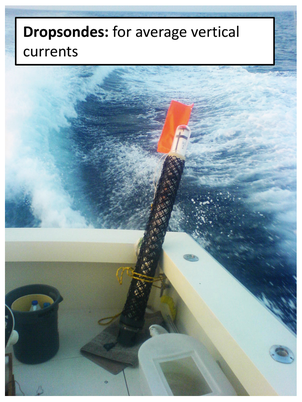


Inverted echosounders, IES, for vertical temperature and salinity assessments

Underwater gliders: autonomous vehicles for T, S profiles and ocean currents

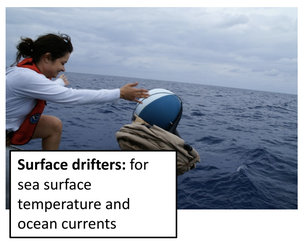


Profiling floats: for T, S profiles

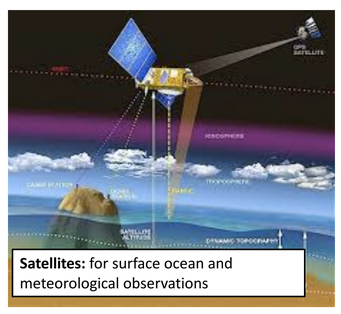


Dropsondes: for average vertical currents

Tide gauges: for time series of sea level



Surface drifters: for sea surface temperature and ocean currents



Satellites: for surface ocean and meteorological observations

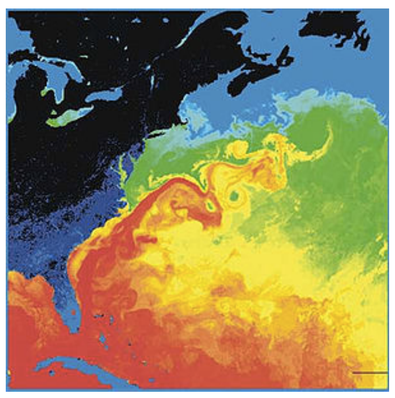
Research cruises

PDF of this poster

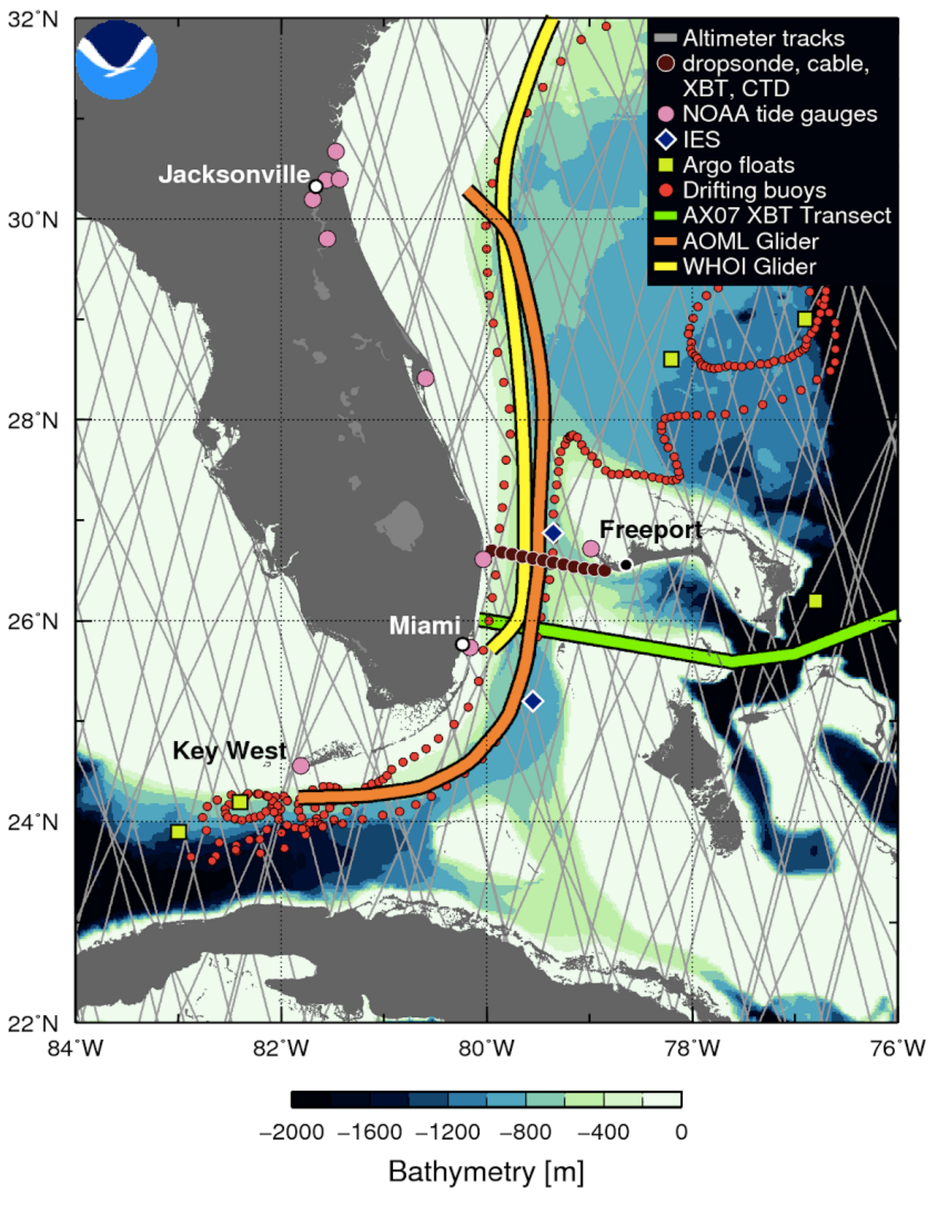
Current and planned ocean observing system to analyze attributions to sea level changes in Southeast Florida.

The Florida Current

The Florida Current is the strong oceanic current that flows northward along the eastern coast of Florida carrying warm tropical waters that eventually feed into the Gulf Stream. The Florida Current represents both the western boundary current for the subtropical wind-driven gyre as well as a return pathway for the Thermohaline Overturning Cell, which consists of a slow circulation redistributing the waters of the world ocean based on sinking at the high latitudes and upwelling elsewhere.

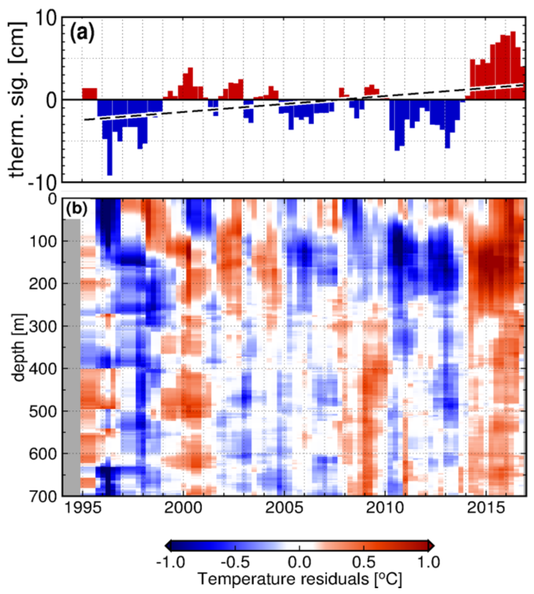


Changes in temperature and intensity of the Florida Current and downstream in the Gulf Stream (see poster *Slowdown of the Gulf Stream*, by M. Baringer et al, ID# 398) and of planetary waves (see poster *Remote sources of Florida Current variability on seasonal timescales: links with coastal sea-level variability along the east coast of United States,* by Domingues et al*,* ID# 211) are being assessed to investigate the impact of water mass properties and ocean dynamics on sea level changes along the coast of the southeastern United States.



Sea Level and Temperature Changes

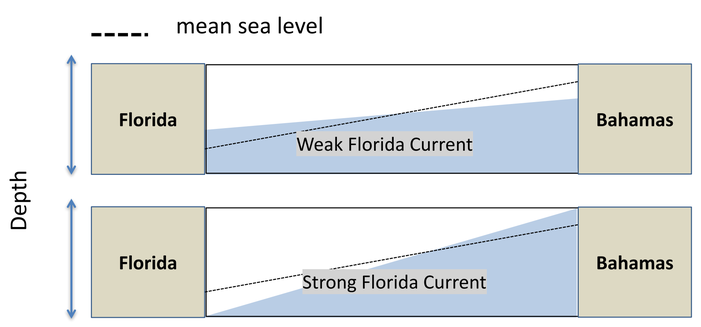
Vertical temperature changes across the Florida Current measured using Conductivity Temperature Depth (CTD) and eXpendable BathyThermograph (XBT) observations show more than 1°C average increase during the last 20 years (b), which have produced an average increase in sea level of approximately 4 cm (a). However, these trends exhibit different values during the periods 1993-2010 (2.6 mm/year) and 2010-2016 (14.9 mm/year). New observations obtained from underwater gliders will help to extend the analysis to a wider range of latitudes and to enhance the temporal resolutions of observations.

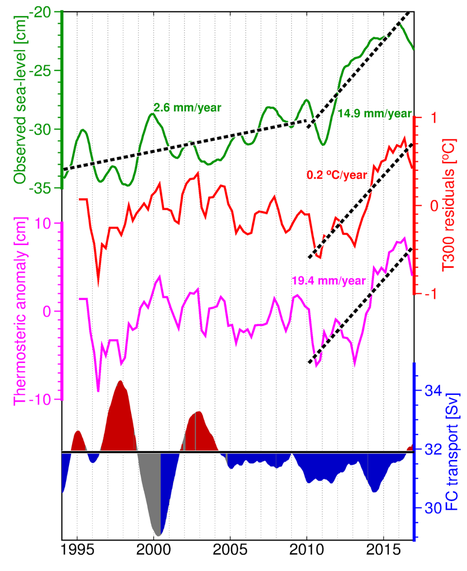


Domingues et al, 2017, in preparation

Coastal Sea Level and the Florida Current Flow

The intensity and location of the Florida Current can be determined using a combination of observational data, including CTD, dropsondes, submarine cable, XBTs, underwater gliders, and satellite data. The intense Florida Current flow sustains a sea level difference between Florida and the Bahamas of approximately 1m. A weaker than average Florida Current transport is linked to a smaller difference in sea level between Florida and the Bahamas causing a higher than average sea level along the coast of Florida. Short time fluctuations of the Florida Current transport may have amplitudes as large as 10 Sv. In this current, 1 SV represents approximately 1cm of sea level difference between Florida and the Bahamas.





Changes in the Florida Current transport and temperature at 27N as obtained by the current ocean observing system provide critical components of the sea level variability along the South Florida coast.

Domingues et al, 2017, in preparation

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