Changes of the salinity in the upper ocean

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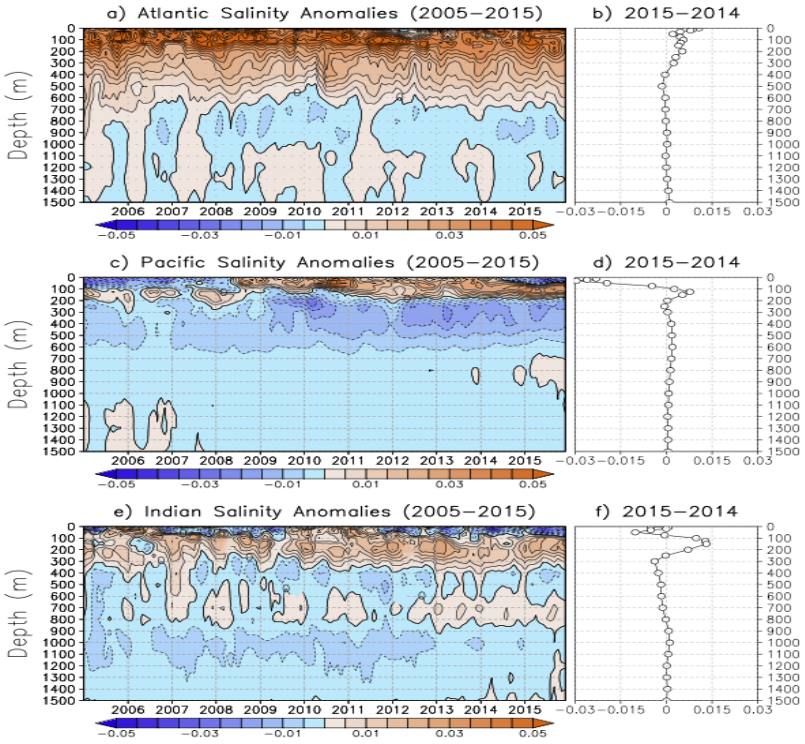
This project is a collaborative effort between AOML and colleagues from NCEI and PMEL (G. C. Johnson, J. Reagan, J. M. Lyman, T. Boyer and R. Locarnini).

Salinity patterns, both long-term means and their variations, reflect ocean storage and transport of freshwater, a key aspect of global climate (e.g., Rhein et al. 2013). Ocean salinity distributions are largely determined by patterns of evaporation, precipitation and river run off (e.g., Schanze et al. 2010). In some high latitude regions, sea ice formation, advection and melting are important (e.g., Petty et al. 2014). The result is relatively high surface salinity in the subtropics where evaporation dominates and fresher SSS values under the Intertropical Convergence Zones and in the subpolar regions where precipitation is stronger. These fields are further modified by ocean advection (e.g., Yu 2011). In the subsurface, fresher subpolar waters slide to intermediate depths, underneath saltier subtropical waters, which are in turn capped at low latitudes by fresher tropical waters (e.g., Skliris et al. 2014). Salinity changes in these layers quantify the increase of the hydrological cycle with global warming over the recent decades, likely more accurately and directly than analysis of E–P estimates (Skliris et al. 2014).

The project aims to detect and analyze changes of the salinity in the world oceans. For example, in 2005-2015 the near surface salinity in the Pacific gradually increased resulting in a transition from a negative anomaly to a positive anomaly in 2008. A reversal of this trend is detected in 2014 to 2015. This and other features are discussed in the salinity section of the BAMS issue on the state of the ocean.



Average monthly salinity anomalies from 0-1500m depths for the Atlantic a) from 2005-2015 and b) the change from 2014 to 2015, Pacific c) from 2005-2015 and d) the change from 2014 to 2015, and Indian e) from 2005-2015 and f) the change from 2014 to 2015. The data was smoothed using a 3 month running mean. The anomalies are relative to the World Ocean Atlas 2009 monthly salinity climatology (Antonov et al. 2010).