Geophysical Research Abstracts
Vol. 19, EGU2017-10975, 2017
EGU General Assembly 2017

Near-surface temperature and salinity stratification as observed with dual-sensor Lagrangian drifters deployed during SPURS-2 field campaign

Denis Volkov (1,2), Shenfu Dong (2), Gustavo Goni (2), Rick Lumpkin (2), and Greg Foltz (2)

(1) University of Miami, Cooperative Institute for Marine and Atmospheric Studies, Miami, United States (dlvolkov@gmail.com), (2) NOAA Atlantic Oceanographic and Meteorological Laboratory

Despite the importance of sea surface salinity (SSS) as an indicator of the hydrological cycle, many details of air-sea interaction responsible for freshwater fluxes and processes determining the near-surface salinity stratification and its variability are still poorly understood. This is primarily due to the lack of dedicated observations. The advent of satellites capable of monitoring SSS, such as the Soil Moisture and Ocean Salinity (SMOS), Aquarius, and Soil Moisture Active-Passive (SMAP) missions, has greatly advanced our knowledge of SSS distribution and variability. However, the spatial resolution of satellite retrievals is too coarse to study the upper-ocean salinity changes due to patchy and transient rain events. Furthermore, the satellites measure salinity within the upper 1 cm skin layer, which can significantly differ from in situ SSS measured at 5 m depth by most Argo floats. Differences between the Aquarius and Argo SSS can be as large as $\pm$0.5 psu.

In order to study the near-surface salinity structure in great detail and to link the satellite observations of SSS with all the oceanic and atmospheric processes that control its variability, the National Aeronautics and Space Administration has initiated two field campaigns within the framework of Salinity Processes in the Upper-Ocean Regional Study (SPURS) project (http://spurs.jpl.nasa.gov/). The first campaign, SPURS-1, took place in the evaporation-dominated subtropical North Atlantic Ocean in 2012-2013. The second campaign, SPURS-2, focused on a 3$\times$3° domain in the Inter-Tropical Convergence Zone (ITCZ) in the eastern equatorial Pacific (123.5-126.5°W and 8.5-11.5°N), where the near-surface salinity is strongly dominated by precipitation.

The first SPURS-2 cruise took place in Aug-Sep 2016 on board the R/V Roger Revelle, during which a complex multi-instrument oceanographic survey was conducted. As part of this field campaign, we deployed 6 dual-sensor Lagrangian drifters, specifically designed to measure temperature and salinity near the surface ($\sim$20 cm) and at 5 m depth. The main objectives of this deployment were (i) to validate the satellite SSS retrievals and to investigate the causes for the satellite-Argo SSS bias in the precipitation-dominated SPURS-2 region, and (ii) to explore salinity stratification in the upper 5 m and processes that determine it, in particular in relation to rain events. Throughout the experiment, we have observed systematic differences of 0.01-0.02 psu between the near-surface and 5 m salinity. Rain and low wind events have caused salinity differences of up to 2 psu. Strong evaporation on sunny and low wind days has caused the surface to be saltier than the 5-m depth layer by up to 0.4 psu. The mixing time scale between the surface and 5-m depth has been less than a day. Overall, the drifter observations have shown that the bias between Argo and satellite retrievals in the precipitation-dominated region can be largely due to the surface-subsurface salinity differences.