SPURS cruise ends

Research vessel Sarmiento de Gamboa

The R/V Sarmiento de Gamboa arrived to Ponta Delgada, Azores, on April 12, and R/V Endeavor is expected to be at Narragansett a few days later. The SPURS spring 2013 cruise is finished and both vessels have achieved the collection of an impressive amount of high resolution oceanographic data, as well as the deployment of several autonomous sampling devices. The SPURS blog (Cruises, SPURS-March 2013) has reported several aspects of the work done. It has been one month of intensive sampling of the high salinity region in the central convergence of the North Atlantic subtropical gyre. The data we have recorded will contribute understanding how this maximum is formed and sustained.

Vesse track with the salinity values at 4 m (by O.Hernándex, LOCEAN)

During the 17 days the Sarmiento was in the SPURS central area, around 24N 38W, the surface salinity recorded by the underway sampling system evidenced that this salty pool is not so homogeneous and stable in time as some times has been understood. In fact the inhomogeneity had been anticipated, even with lower spatial resolution, by SMOS salinity maps and some numerical models. The figure (by O. Hernández, LOCEAN) shows the vessel track during these days with the salinity values at 4 m below the surface along it. One can see the salinity changes, even within a relatively small range of less than 0.3 salinity units, which occur on a single spot that we visited three times.

Location of all moving objects in the area

The information collected by our research vessel was complemented by the Endeavor measurements and data from surface drifters (almost 50 of them released from the Sarmiento during the cruise) and other devices deployed in the area (gliders, profiling floats, moored temperature/salinity recorders). This information, together with high resolution numerical model outputs, was transmitted every day to both vessels from land by other SPURS scientists at the NASA Jet Propulsion Laboratory and LOCEAN, Paris. Dedicated detailed weather forecasts for the SPURS area were also transmitted daily from ECMWF. We can see in the figure the location of all moving objects (including the ships) in the area as displayed by the on-board Geographical Information System on a certain day. This was also used for warnings to avoid collisions during the operations.

Prototype (designed by J.Salvador, ICM) that carries three temperature-conductivity recorders.

Besides the along track data showed above (complemented by underway continuous current profiling), the Sarmiento has recorded around 2000 temperature, salinity, fluorescence, dissolved oxygen profiles in the top 250 m with the towed undulating SeaSoar probe, more than 700 upper layer profiles with autonomous floats deployed for different periods in specific points inside the SPURS central box, and more than 170 hours of high temporal resolution (1 sec) near surface temperature and salinity (plus surface inclination in some units) measured by prototypes of drifters built by ICM and LOCEAN to obtain salinity values at 3, 9, 23 and 49 cm below the surface that will be used to derive the salinity vertical gradient in the very top layer for SMOS products validation. The figure below shows one of these prototypes (designed by J. Salvador, ICM) that carries three high resolution and accuracy temperature-conductivity recorders during a recovery operation at the end of a deployment period.

Temperature and salinity recorded by the SeaSoar during the regular survey in the first week of Sarmiento in the SPURS area (by J. Busecke, LDEO, U. Columbia)

A three-dimensional representation of the temperature and salinity recorded by the SeaSoar during the regular survey in the first week of Sarmiento in the SPURS area (by J. Busecke, LDEO, U. Columbia) synthesizes the main characteristics of the observed phenomena that can provide information on the mechanisms that supply fresher water to the central salty pool to compensate for the continued evaporation and maintain the overall salinity values. Fresh and warm 100 m deep water can be seen in the southern part of the sampled area, while relatively fresh and cool water with weak surface signature but large vertical extent is detected in the northern side. These water masses due to their different density either intrude (north) or slip on (south) the high salinity water in the center of the area. Further analysis of all the information collected during the cruise will for sure help understanding better the dynamics of this peculiar ocean region.