Cruise report 5(11.12.15 – 17.1.15)

SO-245 „UltraPac“ 17.12.2015 (Antofagasta, Chile) – 28.01.2016 (Wellington, NZ).

The end of our third full week at sea finds us just having left Station SO245-12 at 39°S 140°W on the southern edge of the South Pacific Gyre (SPG) and most likely our deepest station at 5270 meter water depth. SO245-12 is at the same site as the earlier *Knox-2RR IODP Site Survey* (*R/V Revelle 2007*) and *IODP Expedition 329* deep sub-seafloor microbiology expeditions. Those expeditions documented an ocean seafloor nearly void of the organic matter required to sustain deep microbial populations, consistent with satellite images of ocean color and chlorophyll distributions. In other words, when viewed from satellite (outer space) or the seafloor (inner space) the SPG appears as an enormous oceanic desert.

The water column chemical and biological data collected thus far on the *TFS Sonne SO245 UltraPac Expedition*, however, tell another story. CTD measurements of fluorescence exhibited a broad 100 m thick distribution with peaks between 190 and 170 meters. Laboratory measurements of chlorophyll *a* on discrete samples are being used to calibrate the CTD fluorescence readings. Interestingly, bacterial cell counts and total organic carbon contents continue to be highest above the chlorophyll peak. Southwestward and towards the outer edge of the gyre beginning with Station SO245-11, chlorophyll contents began shoaling, with detectable fluorescence in the upper mixed 40 meters of water at Stations SO245-11 and SO245-12. Ongoing, bacterial cell counts, identification of cells with high throughput fluorescent in situ hybridization (FISH), and onboard 16S rDNA tag sequencing all being done onboard at a near to real-time pace by the MPI Molecular Ecology group. Presently, their findings will show us whether or not the patterns in microbial populations change or not with the shoaling of the chlorophyll max.

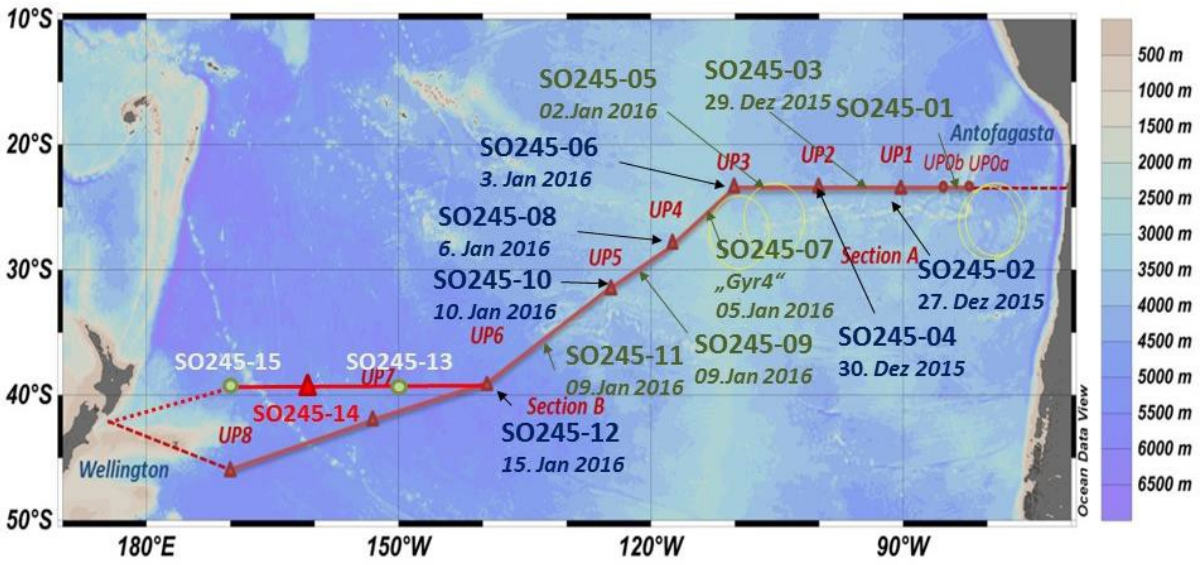
Deployments of all eight in situ pumps continue to be successful. The box core at Site SO245-10 returned with pebble sized manganese nodules scattered randomly across the surface, whereas the box core at SO245-12 was completely paved with 3-7 cm diameter manganese nodules. Gravity cores were also obtained and curated for the MARUM GeoB core repository.

As we came onto Station SO245-11 the weather and sea-state had taken a turn for the worse. Long period swells and wave heights of up to 5 m and winds from the south slowed transit speeds to 11 knots and caused some deployments to be cancelled on the intermediate station. The conducting cable for the CTD also jumped a block during deployment causing an unplanned removal and re-termination of the CTD to the cable. Fortunately, the deck crew and Science Technical Service (WTD) very efficiently repaired the cable and connection, with minimal loss of time.

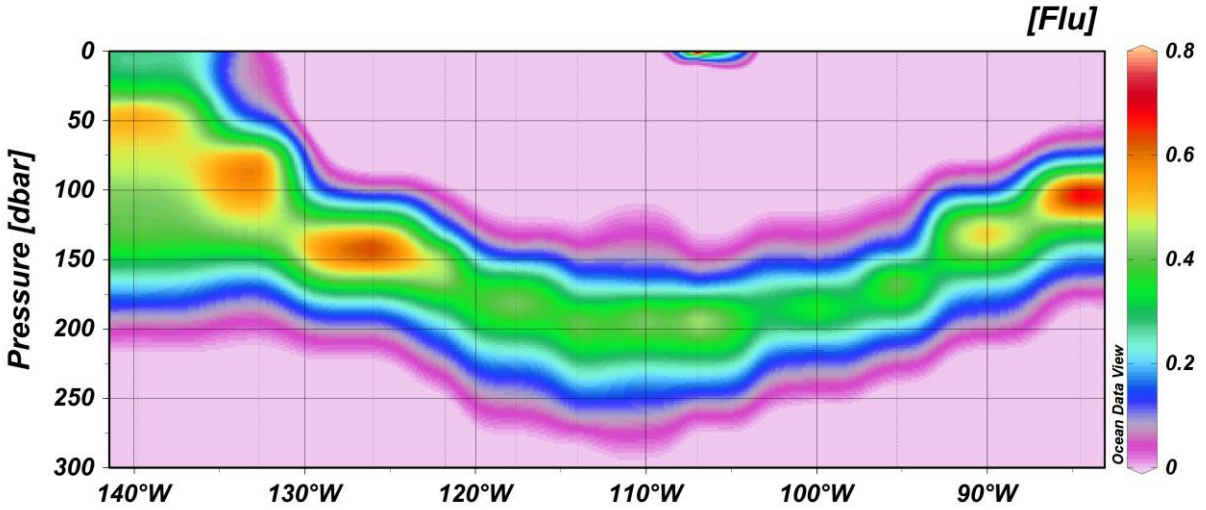
Although we have gained considerable time over the initial science plan with increased ship speeds and shortened station times, the five day loss in Antofagasta haunts us in the form of tight station time constraints. This and the uncertain weather situation in latitudes south of 40°S has led us to move the last main and intermediate stations northwards along 39°S (see figure below). This last section will still serve to complete that transition out of the SPG yet still link with a former north-south GEOTRACES transect at 170°W.

All are well and the first sightings of petrels and albatrosses are sure signs that we have turned our bow towards the lands “down under”. We look forward to our continuing journey across the South Pacific.

Tim Ferdelman, on behalf of the scientists and crew



Completed and upcoming UltraPac stations. Note the new 39°S transect.



Fluroescence from the CTD deployments as indicator of Chlorophyll content in Stations SO245-01 to SO245-12. Depths (meters) are presented as equal to Pressure (dbar).

Retrieval oft he CTD-Bottle Sampling Rosette at Station SO245-11