

English Version

Weekly report 4 (04.01.16 – 10.01.16)

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

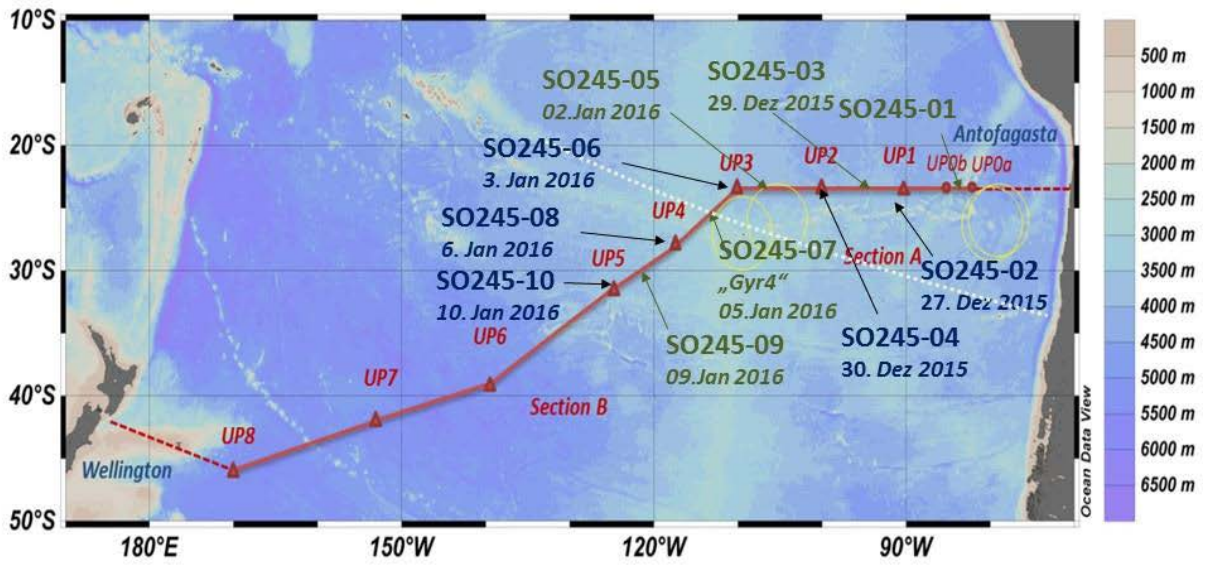
The completion of the first full week of 2016 marked an important waypoint in our journey across the South Pacific Ocean to understand the microbial oceanography of the South Pacific Gyre. We reached half-time in our time at sea, and having completed ca. 3000 nautical miles, not quite half the distance across the ocean. We also crossed the East Pacific Rise, the impressive north-south range that divides the South Pacific Ocean seafloor into eastward and westward moving ocean crust. In doing so we also crossed the *Biosope* Expedition transect (from Tahiti to Valparaiso, Chile, 2004). We are now in the heart of South Pacific Gyre. At the beginning of the week we departed Station SO245-06, which forms the hinge the two sections of our transect, and headed on a southwesterly course through the SPG. On Tuesday, we reoccupied the “GYR4” station of the *Biosope* expedition at our intermediate Station SO245-07 before moving further SW with our main station SO245-08. Due to various time-saving measures and the excellent 13 knot sailing speeds of the *Sonne*, we decided to spend some extra time at Station SO245-08 to address diurnal variation in the microbial populations in the gyre. The extra 12 hours of station time included four extra high resolution CTD-bottle casts through the upper 250 meters of water throughout the night of January 6 throughout the following day, where sun-driven peroxide production throughout the upper water column was documented. A small boat foray was also launched to obtain uncontaminated surface seawater trace element samples away from the boat.

We find dissolved inorganic nitrogen nutrient compounds, such as nitrate, at vanishingly trace concentrations in the surface waters of the SPG. The MPI Biogeochemistry Group has been searching for types of phytoplankton that live in symbiosis with N₂-fixing cyanobacteria. N₂ fixing cyanobacteria can make use of the abundant N₂ gas dissolved in seawater using specialized cells for N₂ fixation called heterocysts. Such diatom-diazotroph associations (DDAs) have been sampled and identified during our cruise using the NOC Southampton Micronet followed by light and fluorescence microscopy at various sites including the our most recent station (see Figure above). Experiments to determine the N₂ fixation activity in these symbioses are being carried out onboard, but these measurements will have to wait until the samples are returned to Bremen.

Technically, scientific operations are running well. After some initial problems at the earlier stations, the MPI pump CTD system was running smoothly and returning high resolution profiles throughout the upper 270 meters of the water column. In a coordinated action between microbiologists and the Chief Engineer Achim Schüller and his crew, the ship's underway seawater supply system, both rotary and membrane pump systems, has been cleaned to facilitate higher quality underway microbiological sampling.

The hot and humid weather of the latter part of the week has now yielded to our first wind and waves. Nevertheless, *Sonne* still pleasantly sails on with surprisingly little motion. So, as we move into our third full week at sea, we can report that all is well and we look forward to what the second half of the expedition brings us.

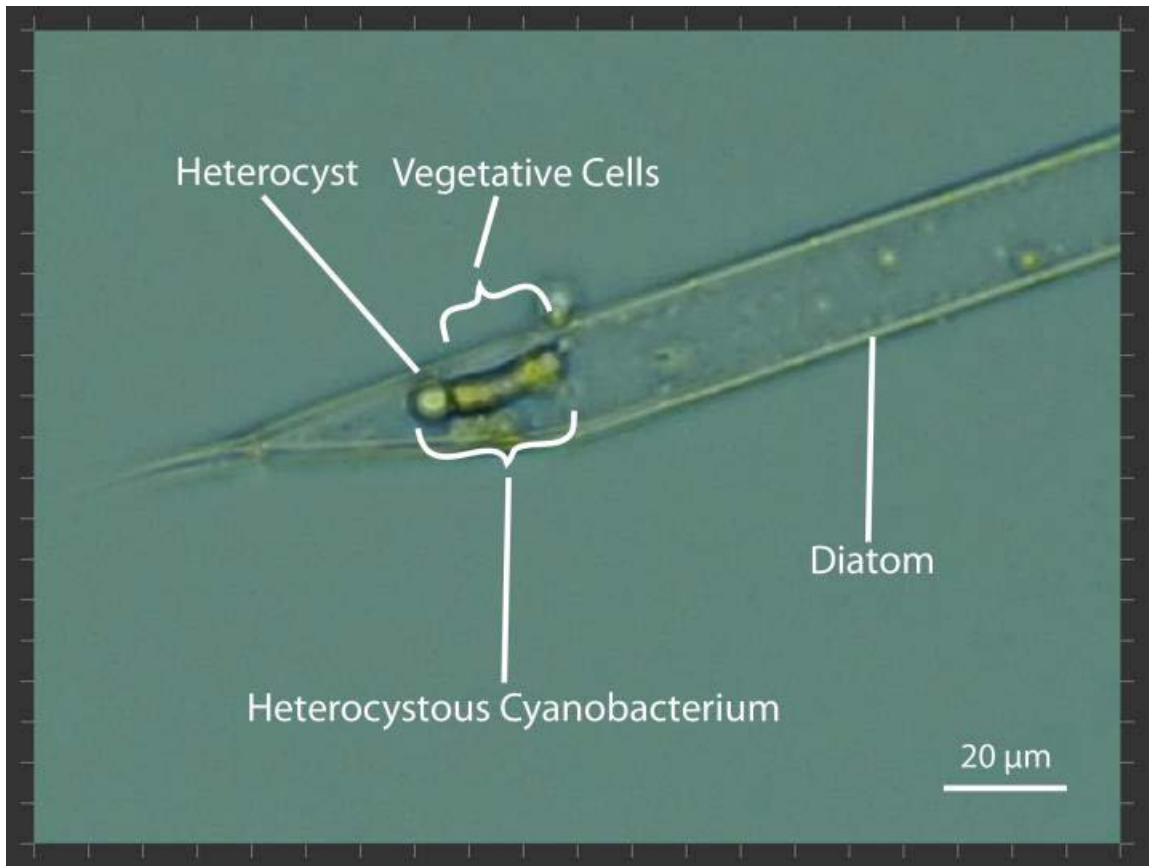
Tim Ferdelman, on behalf of the scientists and crew



Completed and upcoming UltraPac stations. Light stippled line shows approximate transect from the 2004 *Biosope* Expedition.



Micronet deployment/recovery from the deck of *TFS Sonne*



Light microscopy picture of a diatom-diazotroph association