RVIB N. B. Palmer, NBP17-06/P06 Leg 1: Weekly Scientific Report 04

32.50°S, 169.75°W
11:45pm, Monday, 31 July 2017 (local time and day)
air: 14.9°C, water: 17.9°C, winds: 11 kn from SE
on station 112

The last week was marked by the International Date Line crossing and an unusual 8-day work-week for us. The crossing occurred Tuesday night around 11:30pm, just before the change of watch, followed by a set-back of the clock and repeat of that day, giving us the opportunity to enjoy a "full 48 hours of Tuesday, July 25" (the Captain's words). The date line also indicated the end of our Lau Basin stations and the beginning of probably the most important deep water segment of P06, leg 1 in a global, climatic sense: the crossing of the deep western boundary current (DWBC) along the eastern flank of the Tonga Kermadec Ridge, which separates the Lau Basin from the Southwest Pacific Basin. The DWBC carries Antarctic Bottom Water (AABW) and Circumpolar Deep Water (CDW) northward toward Samoa Passage (10°S), the choke point for the flow of bottom/deep waters formed around Antarctica all the way to the North Pacific.

We find that the preliminary salinity and oxygen data collected and processed by ODF this week show the typical signatures of AABW (low salinity, high oxygen) and CDW (higher salinity, lower oxygen) that have been observed in the DWBC and the adjacent basin on prior P06 occupations. Changes in bottom/deep water properties, in particular in temperature and carbon, have been observed in this area in prior studies and will be subject of the future data analysis of the 2017 P06 section.

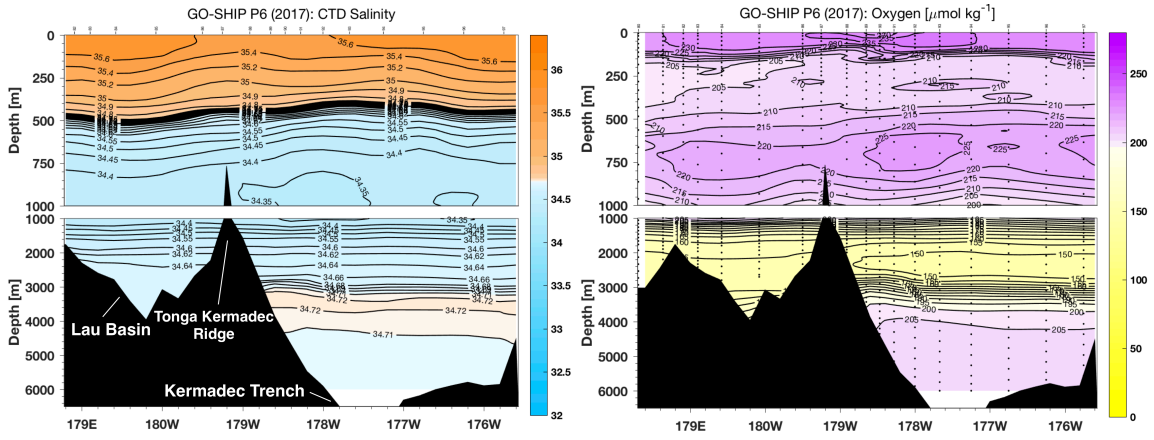
Since leaving the New Zealand EEZ on Friday, July 28, we have deployed one float and three drifters. The deployment of the float was particular exciting because it involved the first SOCCOM float of leg 1, equipped with pH, fluorescence, backscatter, oxygen, and nitrate sensors in addition to the standard Seabird CTD sensors. These measurements will help to increase the coverage of South Pacific and Southern Ocean biogeochemical observations, which are badly needed to better understand the ocean's uptake of anthropogenic carbon and other processes in this region.

While sampling the DWBC on the flank of the Tonga Kermadec Ridge and over the Kermadec Trench, we followed the oceanographic tradition of shrinking stryrofoam cups that people had been decorating for the past week. With a maximum depth of 10,047m, the Kermadec Trench is known as second deepest ocean trench in the world, but some of the sensors' pressure ratings did not allow us to lower the CTD rosette past 6000m depth. We are now past the Louisville Seamount Chain to the east of the Kermadec Trench, entering the still very deep (5000-6000m), but flatter stretch of the Southwest Pacific Basin. Soon, we will increase our tight station spacing to 33-34nm to make up some of the time lost due to the medevac and bad weather. We scooted along the northern edge of another weather system over the weekend, which required somewhat lower wire speeds to avoid zero tension on the CTD wire. A re-termination of the wire was necessary because of a kink observed after station 106. The weather has calmed down, and we are making decent time on our route along 32.5°S with an eye set on Tahiti.

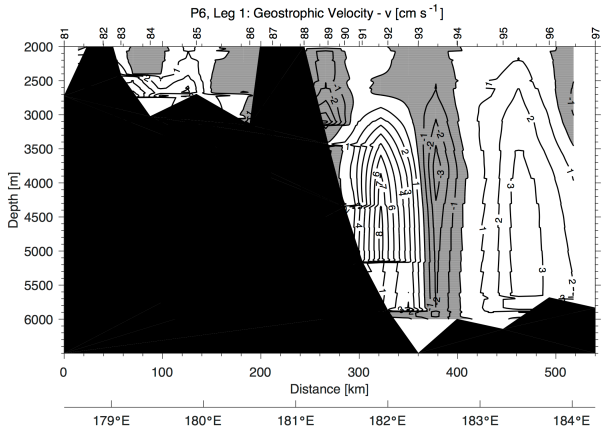
- Sabine Mecking and Isa Rosso

http://usgoship-p062017.blogspot.com

Celebrating station 100 of P06, leg 1 on 7/29 (photo by A. Collins), styrofoam cups ready to be crushed at 6000m depth, and sun over the South Pacific



Preliminary salinity and oxygen sections across the Lau Basin and Kermadec Trench, showing above the trench a thick layer of fresh, oxygenated Antarctic Bottom Water (below 4000m) underneath saltier, less oxygenated Circumpolar Deep Water (3000-4000m), and fresher, oxygen-poor Pacific Deep Water (1500-3000m).



Preliminary section of geostrophic velocity (referenced to 2000db) across the Lau Basin and Kermadec Trench, showing the Deep Western Boundary Current, that flows northward along the Tonga Kermadec Ridge, plus recirculations (white/grey shading is northward/southward velocity).