GO-SHIP 2018 S04P, NBP 18-02

Week 5 Report – back to the 67°S line

Sunday April 15, 2018

Current position: 67°S, 151°W Winds: from W at 40 knots Outside Temp: -11°C, 12°F Wind Chill: -38°C, -36°F Surface Water Temp: -1.4°C, 29.5°F



We started this week off with a 2 day steam back to the 67°S line where we left off before heading down early to the ice edge of the 150°W leg before the shelf became too iced in to realistically reach. The winds and seas picked up during the transit but conveniently died down to less than 20 knots (23 mph) upon arrival at the 67°S line (Station 54). With a total of 1500 m of wire removed the casts are going smoothly but attention is heightened due the difficulties encountered with the wire up to this point.



Many more drifters and profiling floats were deployed within the 170-150°W span of longitude on the 67°S line. With all the CTD operations and sampling taking place indoors on the NB Palmer, it's great to have an excuse to go outside for deck ops to deploy these instruments. Storms have been blowing in from the west from the 50-60°S latitude band, and the threat of their dipping down to 67°S keeps us on our toes. We've also had a storm move in from the south just for good measure. Varying weather forecast have given reports as different as night and day with winds predicted from 10-20 knots to gusting up to 70 knots! There isn't much choice at this point in the cruise track but to ride out any storms that pass and these variable forecasts require careful attention to changing conditions when deciding to deploy the rosette. As the threat of bad weather loomed on the horizon, we encountered a giant iceberg called B30 that we had passed by on the transit back to the 67°S line. This iceberg 'island' spans an area of greater than 20 nautical miles (shown in the radar image at the right) with plenty of smaller icebergs, growlers and loose ice surrounding it. On Friday night, while the good weather was still with us, we positioned station 66 roughly 8 nm shy (west) of our target location to allow breathing room between B30 and



our operations. It had drifted roughly 40 nm to the west since our last encounter and appeared to still have a westward velocity. As station 66 was being wrapped up the winds, seas, and snow picked up making it a great challenge to navigate the iceberg city. The fact that it was dark did not help, and we have spent sometime now doing weather patterns to the north just to stay out of harm's ways until we can resume our work. We will wrap up this week transiting in the high seas and winds around iceberg island B30 to reach our next station on its east side at 151°W on 67°S.

Even though we are no longer surrounded by the calm ethereal icy wonderland described in last week's report, morale is high as we end the week completing the 66th station. We have celebrated two more birthdays, passed the halfway point in days at sea and we are drawing nearer to the halfway point in total possible stations.



CTD watchstanders Chanelle, Taimoor, Lauren, and Ribanna (left to right) and Chief Scientist Alison help celebrate Chanelle's birthday at sea.

Until next week,

Ellen and Alison

Preliminary data from shipboard analysis is now available for 3 of the N/S excursions from the 67°S line. Here is a small sampling from 170°E:



Section plots for the entire water column (10 m from the bottom) for temperature (CTDTMP), salinity (CTDSAL), oxygen, total dissolved inorganic carbon (TCARBN), Chlorofluorocarbon (CFC-12), and nitrate are shown for ~170°E spanning from 73-67°S. These are just a handful of the parameters being measured shipboard and many more will be measured on land from collected seawater. There is evidence of deep water formation (Antarctic Bottom Water) off the coast of Antarctica which is clearly visible in the inert water mass tracer CFC-12 and supported by the cold temperatures and high oxygen values at depth south of 69°S.



Here are the same section plots as shown above for $\sim 170^{\circ}$ E spanning from 73-67°S but zoomed in on the upper 500 m.



The ~170°E line spanning from 73-67°S was also occupied in 2011 and 1992 providing a useful comparison to 2018. Here is the difference in total dissolved inorganic carbon (C_T) between 2018 and 1992 (left panels) and between 2018 and 2011 (right panels) for the entire water column (top) and upper 500 m (bottom). There is a net increase of C_T in both the upper ocean and entire water column in this region that has continued to increase between 2011 and 1992 to present day reflecting uptake of carbon from the atmosphere.