

## Weekly Report 4

### June 16 – June 22, 2015

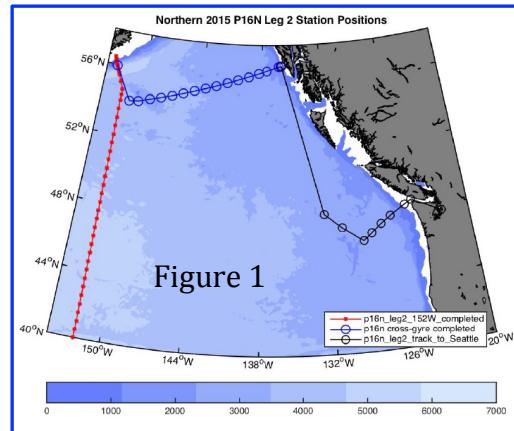
From Alison Macdonald (chief sci.) and Sabine Mecking (co-chief sci.)

P16N – Leg 2 Honolulu to Seattle via 152°W

Current Position: 53 46.8N 134 37.8 W

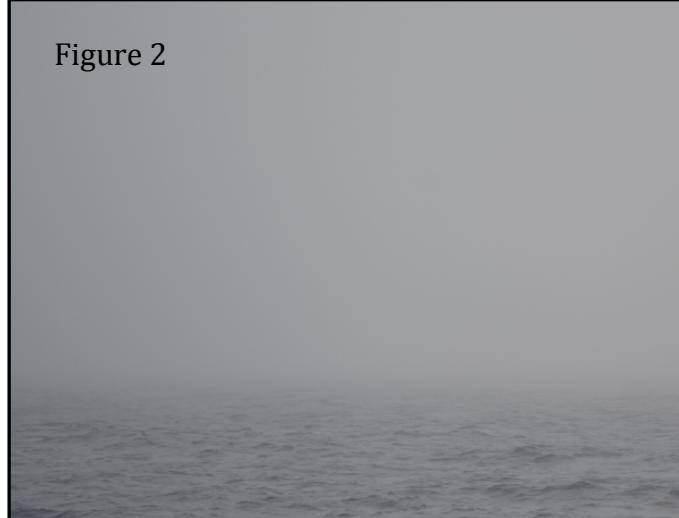
Homeward Bound

<http://clivarp16n2015.blogspot.com/>



When we wrote last week we were about to finish off the 152°W line coming up the slope and onto the shelf south of Kodiak (Figure 1). These last few 152°W stations, though close together and shoaling, and therefore very busy, were relatively uneventful. We were beset with days of placid fog and became used to the long moan of the ship's horn as we steam northward (Figure 2). This passage was made more interesting as we crossed the east-west shipping lanes traversed by container ships running between North America and Asia, recognized cruise liners heading to and from Alaska, and passed through busy fishing grounds with multiple unidentified vessels. Having 4, 5, 6 or more ships around us, visible on our display in the computer room, but outside invisible in a cloak of fog became the norm. The difference between "day" and "night" shift already blurred by the lengthening daylight hours became almost irrelevant in our misty shroud. The rosette went in. The rosette came out. The fog remained. Bongos came in teaming with biology and the C-ops group gifted with calm waters, became a little depressed at the lack of sun.

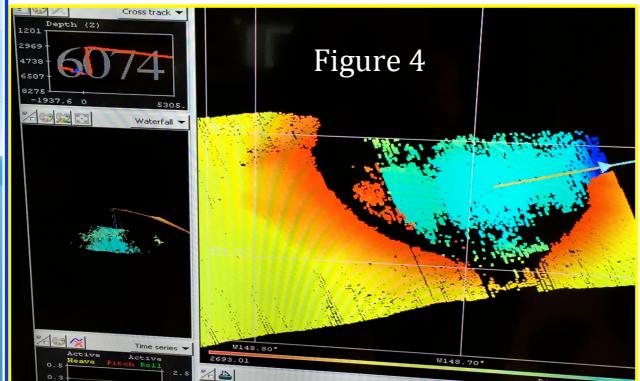
Figure 2



We finished our run north. We were within less than 30 miles of Kodiak Island, but never saw land (too much fog). On our steam south to the cross-gyre (P17N repeat) section of our line, we stopped off at one of our earlier slope stations hoping to see a significant CFC signal in the deep water, hinted at by the 2006 P16N occupation. This signal was not apparent, but we now have a very well sampled profile at 55.95°N, in the Alaska Current (~50 cm/s). Still fogged in we began our steam toward the northeast across the Gulf of Alaska on the June 19<sup>th</sup>. We had a short delay due to some issues with the ship's generators and had to replace the tugger used to bring rosette into and out of the hanger, but with fast steams and efficient deck work we made up the time. The rosette went in and the rosette came out and the fog remained...



And then came June 21<sup>st</sup>, summer solstice. It started in the same pea soup fog, but as the day went on it became brighter and brighter and brighter, and waters became still around us. We'll let the pictures to the left (Figure 3) tell the rest of the story.



The only other significant item to report concerns the multi-beam bathymetric recorder. Perhaps those with greater familiarity with these instruments would say "well, of course", but we report the following experience as a cautionary tale for GO-SHIP cruises which regularly run the multi-beam underway while steaming at full speed. One day last week, making up time and running at more than 11.5 knots in 4000 m of water, the CTD watch glanced up to see a huge circular crater more than 6000 m deep on the multi-beam display (above). The ship steamed straight across the center of this feature. At shift change there was some discussion as to whether or not an extra station and perhaps some radio-carbon measurements might have been warranted. But it was too late for that. Then a couple of days later, during night shift, a similar feature was seen. This time the track skirted the edge of a seemingly circular 6000+ m drop off. The map said it was a seamount. After our station, 4 nm away, we took a little time to go back for a second look with all bathymetric readers running. This time at the recommended survey speed of 8 knots. There was no crater, only the seamount. The suspicion is that this is a multi-beam glitch that occurs when the gates are set for a specific depth range and suddenly a much shallower feature appears. See the black dropouts surrounding the deeper values (blues) in Figure 4.



As we write this on the morning of June 23, we have just completed the last few stations, heading up toward Sitka at the end of our cross-gyre section. After a beautiful sunrise (Figure 5), we can now, *finally*, catch a glimpse of land in the form of beautiful, snow-covered Alaskan mountain ranges. All over-the-side operations are complete with only underway-sampling left on our steam into Seattle. The

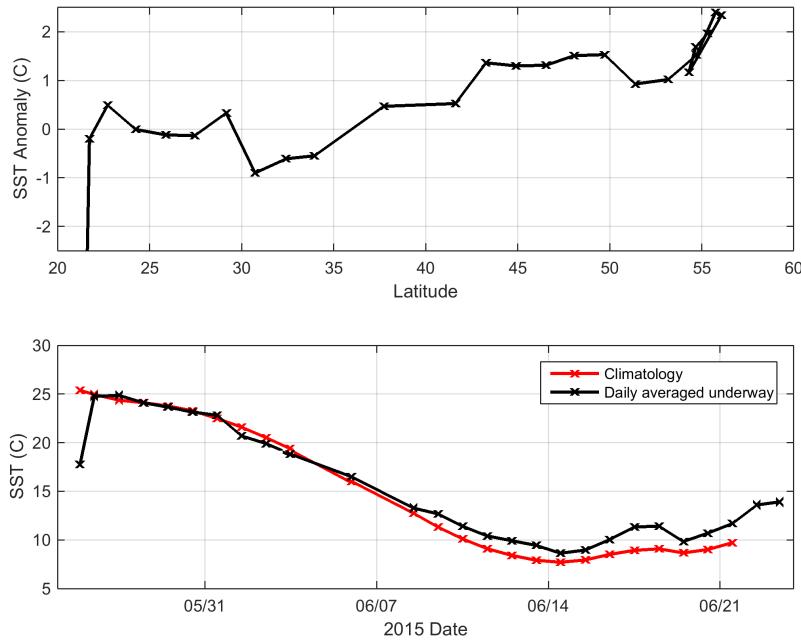
winds have picked up, and we are happy to have finished our work before we pay (just a bit) for the wonderful, and perhaps unbelievable, calm we have experienced during this occupation of P16N.

We would like to thank everyone who has participated in GO-SHIP/CLIVAR P16N, onboard and on land, and who was helped make this cruise a success. The team spirit between scientists, officers, and crew was particularly enjoyable. The collaboration between leg 1 and leg 2 participants was strong on all fronts. On leg 2, we completed all the planned stations (barring the shelf loop removed during our delay in Hawaii) and 2 extra, for a total of 95 stations (not including the test station). At these locations we lowered the rosette with CTD & oxygen sensors, transmissometer, LADCP, UVP, and chi-pods in and out of the water 115 times. We performed bongo operations every night, except for the 2 nights when the lubrication was soaking into the wire (29 in total), C-Ops occurred every day there was any chance of getting results (32 times), and we deployed 5 Argo floats. Along the way we started to analyze the observations and have given you a flavor of that in the previous reports. See the figures below describing a few other avenues of preliminary research.

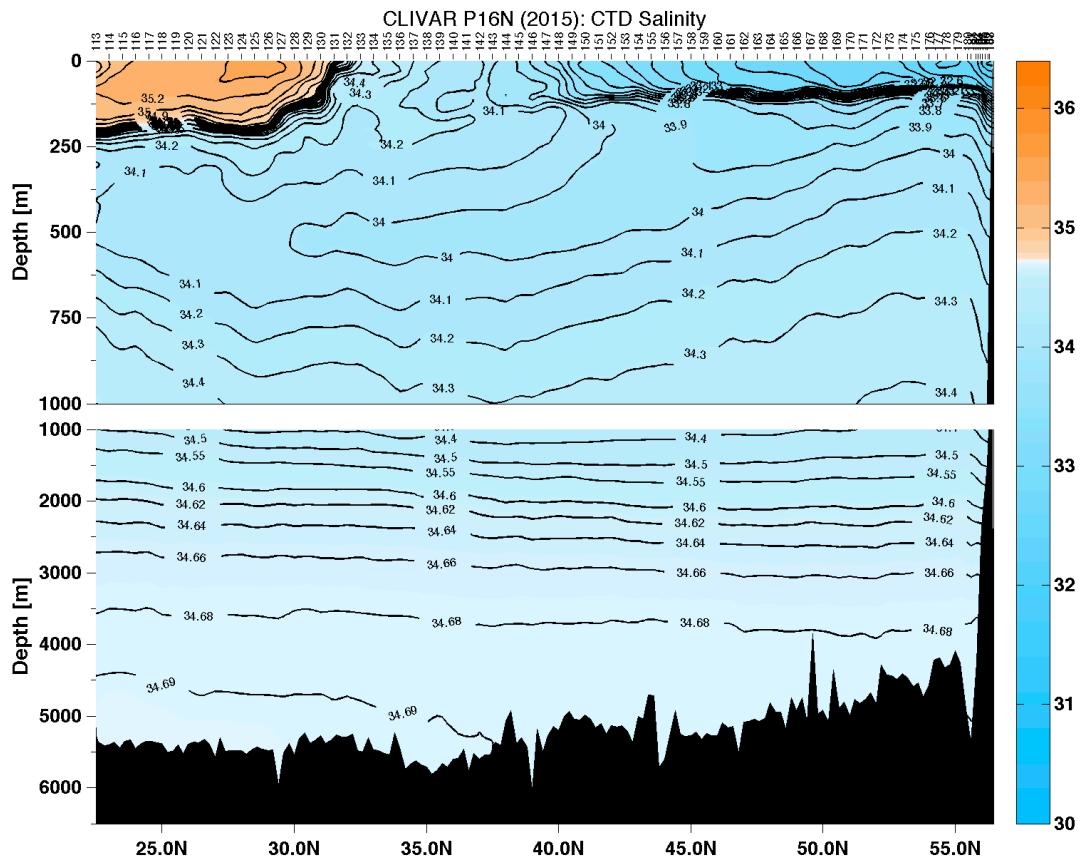
Thank you also to the funding agencies, NOAA and NSF. We are more than grateful for your continued support of the U.S. GO-SHIP/CLIVAR operations.

Heading south toward Seattle, bucking the current and a little weather,

*Alison and Sabine*



**Figure 5:1 Underway SST versus climatology from satellite (interpolated to daily).** Greater than normal SSTs (positive anomalies) north of 36°N (passed on June 4<sup>th</sup>) on both the 152°W and the cross-gyre section (with a latitude range of 54°-57°N) are related to the “warm blob” that has been hovering in the northeastern Pacific for some time (1-2 years). The cross-gyre section presumably skirts the northern edge of the “blob.” (Figure by A. Shao)



**Figure 6: 2015 P16N/leg 2 CTD salinity along 152°W.** Salty subtropical surface waters (orange, excess evaporation) and very fresh subpolar surface waters (blue, excess precipitation and runoff) with the lowest values evident in the north off the Alaska coast. Below the surface layers north of the 55°N, contours slope downward within the westward flowing Alaska Coastal Current. Also evident is subsurface salinity minimum, associated with North Pacific Intermediate Water, at about 500m. Our 2015 GO-SHIP/CLIVAR section repeats the high-resolution 2006 (CLIVAR), 1991 (WOCE) and 1984 (Marathon II) occupation along the same meridian. Property comparisons will be a major focus of ensuing investigations.

Figure Captions not shown above:

**Figure 1: Map of station locations for the northern segments of the 2015 P16N track.**

**Figure 2: Fogged in on the Alaskan slope and shelf.**

**Figure 3: Reflections from our most halcyon of days, June 21<sup>st</sup> 2015.**

**Figure 4: Image of multi-beam readout at about 54°N, 149°N.** The >6000m deep “crater”, not seen on any chart, is presumably a false result; an artifact of anomalous sonar behavior induced by a nearby seamount while steaming at >11 knots.