NOAA Teacher at Sea
Philip J. Hertzog
Onboard NOAA Ship RAINIER
July 24 - August 13, 2005

Log 5

Day 5: July 29, 2005
Time: 1600 hours
Latitude: 58˚ 53.36' N
Longitude: 158˚ 50.4' W
Visibility: 10 nm
Wind Direction: light
Wind Speed: airs
Sea Wave Height: 0 feet
Sea Water Temperature: 12.2˚ C
Sea Level Pressure: 1013.5 mb
Cloud Cover: 8, cumulus, stratocumulus, altocumulus

Science and Technology Log

Today I worked on what the hydrographic map makers call "vertical control" and "horizontal control." When NOAA makes maps showing how deep the water is, they have a problem in that the depth changes when the tides come in and go out. If a rock exists in the water, there may be no problem at high tide, but ships can run into the same rock at low tide.

To overcome this problem, NOAA measures bottom depths on their charts starting at a constant elevation called mean lower low water. Low tide occurs twice a day, but one low tide is always lower than the other. By keeping track of all the lowest, low tides of the day and averaging their elevations over many years, scientists can come up with an elevation for mean lower low water (MLLW). You want to start measuring from your lowest tide level to ensure that ship captains can trust the chart to protect them from danger even during low tide.

All of the ocean bottom charts are based on depth below MLLW. However, when you collect sonar data, your height above MLLW constantly changes with the tide in a vertical position (up and down). Hence the term "vertical control" because the chart maker needs to know how to correct the sonar data so the maps are based on MLLW, not the current tide height.

In remote areas like Alaska, limited tide data exists so the RAINIER crew installed a device called a tide gauge to measure and record the rise and fall of the tide in the mapping area. The information from the tide gauge will help us to correct the sonar data so we can make the charts based on MLLW.

The RAINIER crew installed a tide gauge on Mitrofania Island 1.5 weeks ago before I got on board. Today I rode in an open boat to help the crew check the tide gauge. Ensign Andrew Halbach led our mission with assistance from Survey Technician Matt Foss and

Ensign Laurel Jennings. Mike Laird, the other Teacher at Sea also joined our group. Carl Verplank, Ordinary Seaman, drove the skiff and stayed off shore after dropping us off to ensure the boat won't get stuck when the tide goes out. Carl had the best job because he fished for salmon until we needed a pick up. I hope he shares some fish with us tonight!

Upon reaching shore, Matt Foss and I walked over to the tide gauge station to check it out. Matt carried "bear repellant" with him which is pressurized pepper put into a spray can. If a grizzly bear should approach and attack us, the pepper spray might keep the bear from eating us. On the other hand, maybe bears like to have a little pepper on their steaks. In any event, we need to stay alert in bear country.

We found the tide gauge in good working order. Matt told me that Scuba Divers helped to put the gauge in and that it sends tide information via satellite back to Washington, DC for further analysis. Here are some photos of Matt and the tide gauge equipment:

Now that our vertical control (up and down movement) has been taken care of, Matt and I hiked over to join Ensign Halbach and Ensign Jennings who are working on "horizontal control" or side-to-side motion.

Normally, the crew of the RAINIER knows its horizontal position through the use of global positioning satellite (GPS). As discussed in previous log entries, GPS works by using signals from several satellites to locate your horizontal position on the Earth in terms of latitude and longitude. The chart makers combine sonar data with GPS data to create accurate maps of ocean bottom depth. Atmospheric conditions can affect the satellite signals so scientists calculate correction factors. Special radio stations transmit these factors which allow the launch crews to correct the GPS data. These corrections are called "horizontal control."

Unfortunately, the remoteness and steep mountains of the Mitrofania Island area prevent the RAINIER from receiving good radio signals. We need to set up our own radio transmission and GPS base station to get good control. This task took up the rest of our day.

Matt and I found the others busily setting up the GPS station and taking measurements to ensure good location information. Ensign Halbach carefully leveled the GPS antenna and

oriented it towards north. He then showed Ensign Jennings how to program the data receiver as soon in the following photos:

After setting up the GPS station, Carl picked us up and drove the open boat to another location about a mile away where we repeated the process and set up a second GPS station. However, constructing the radio transmitter tower proved to be our big challenge. Nobody in our group ever set up a tower before so we worked as a team to figure it out. We returned to the RAINIER and hit the machine shop where we measured out metal, drilled boltholes and scavenged any thing to help us build the tower.

We carefully load the skiff and quickly motored back the mile across the water to the transmitter site located on a sand bar that sticks out into Mitrofania Bay. Ensign Halbach led us in constructing the tower and it went up faster than planned. Two people hold the tower straight up and balance it while the other three string guy ropes to metal stakes pounded in the ground. The tower made us proud of our team work, but no one dares to climb it. Maybe some of you students reading this log entry would like to come to Alaska and try to climb it. Take a look at these photos before you decide, but don't worry too much about the slight tilt to the right:

We returned to the RAINIER and could see our tower on the horizon where it will transmit horizontal control data to all the launches conducting sonar work over the next two weeks.

Personal Log

This was the most physical day yet on the research vessel. I actively participated in setting up the tower instead of just observing. I really enjoyed working in a team today and helping to solve problems. I also had a good physical workout by carrying heavy equipment to the GPS and radio transmitter sites. The work out really helped because the food on board the RAINIER is delicious and plentiful with three large cooked meals a day. I need to watch my weight on this trip.

The tower project showed me you need both technical training and practical construction skills when out in a remote area like Alaska. My students tend to be either hands-on or all academic, but you need a balance of both these skills to be successful upon graduation. Many of the crew on the RAINIER learned their jobs while on the boat and had to solve difficult problems without any outside help. Hopefully my students can use the RAINIER's crew as an example on the importance of seeking balance in their lives. Speaking of balance, it's time for me to catch a salmon. Here I am ready to go. See you tomorrow.

Question of the Day

What causes the tide to rise and fall and how does it change over the course of an entire month?