NOAA Teacher at Sea
Patricia Donahue
Onboard NOAA Ship *Rainier*
August 18 – 23, 2008

NOAA Teacher at Sea: Patricia Donahue
NOAA Ship *Rainier*
Mission: Hydrographic Survey of Halibut Cove
Geographical Area: Kachemak Bay, Alaska, 59.43.7 N, 151.02.9 W
Date: August 22, 2008

Science and Technology Log
Much of today had to do with technology. The small boat I went out on, pictured to the right, was filled with computer equipment. Each day at the survey technology department meetings, I've listened but not entirely understood the reports of computer issues on the small boats. This morning I witnessed one such incident. Something didn't work. Fortunately, there was a work-around and the data collection proceeded smoothly.

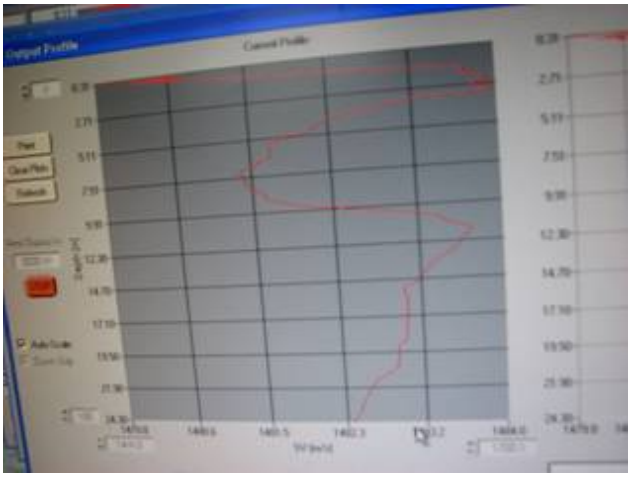
One of the *Rainier*'s small boats, also called a launch

I was reminded of the early 18th century efforts to determine longitude. The problem was so pressing that kings of various countries offered rewards for the development of a clock that could keep time at sea. In 1772, James Cook, for whom Cook Inlet in Alaska is named, sailed with the first marine chronometer. The chronometer was a clock that kept accurate time for the home port. On board Cook's ship, *Resolution*, there was another clock that kept local time. Since the Earth turns 15 degrees of longitude each hour, by using the difference between the two clocks, seamen would know how far east or west they had traveled. They already knew how to determine latitude with an instrument called a sextant so by using the marine chronometer they could actually plot their coordinates. Now, of course, we take GPS for granted. Many people even have GPS in their cars. These devices and the hand held ones I use with my students at school are accurate to within 4 to 10 meters. Well, the boat I was on today has DGPS, which is even better. It is accurate to within 5 centimeters! With this high-tech equipment, NOAA is able to take

Sonar equipment is lowered into the water.

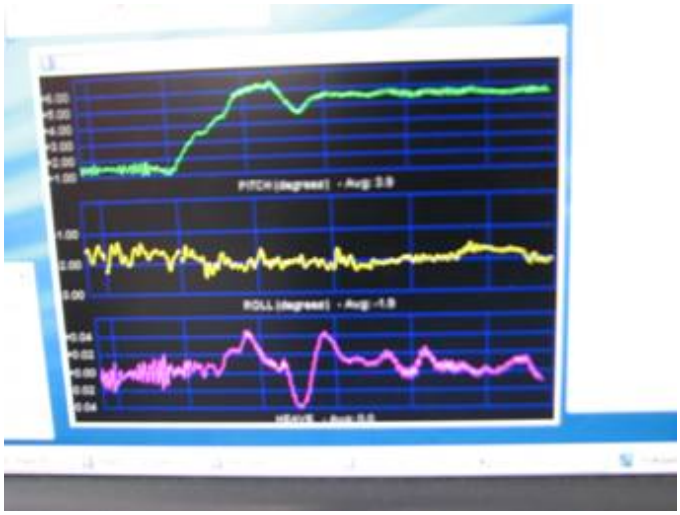
very accurate measurements and make very accurate maps.

The boat I was on today used multi-beam sonar to determine the depth of the ocean floor. This is similar in concept to the single beam in that ping return-times are used. The multi-beam uses a lot more pings, sometimes as many as 200 per second. In the picture above, the sonar equipment is being lowered into the ocean. I learned that salinity, temperature and depth (which is another way of saying pressure) determine the electrical conductivity and density of the water. These two factors then determine the sound velocity.



This graph depicts the velocity of sound through water.

In the graph to the right, depth is on the Y axis and velocity is on the X axis. Notice the bulge in the plotted line. This represents an area nearer the surface where glacial melt water and ocean water are mixing. The velocity of sound through this water is slower than deeper down where it's mostly salt water.
Measurements of salinity, temperature, electrical conductivity, depth and density were taken 27 times today. This data will be used to adjust the sound velocity to get the most accurate picture of the ocean bottom.



This graph displays the pitch, roll, and heave of the boat.

The movement of the boat also has an effect on the sonar equipment. NOAA is using the moving vessel profiler or MVP to eliminate the interference caused by the boat's movement. A boat has a pitch, roll and heave. The computer screen to the left shows graphs of these three types of movement. What do you think was happening on the boat at about halfway across the graph? Remember, the boat is "mowing the lawn" as it collects data. Lastly, the tides also affect the data. Upon return to *Rainier*, the data is processed and also corrected for the effect of the tides.

Personal Log

Several crewmembers have tried fishing from the boat and we've seen many small boats with fishermen aboard but no one has caught anything. Using the binoculars aboard the small boat today I watched someone land a fish. I think it was a halibut, which makes sense since we're in Halibut Cove.

The most exciting part of the day was driving the small boat. Data was not collected from a small piece of sea bottom so the boat had to make one last pass over it with the sonar equipment. I've driven many different vehicles, even a motorcycle, but a boat is different. I couldn't make it stay straight!

TAS Donahue gets a chance to drive the launch.

The scariest thing that happened today didn't happen to us at all. The United States Coast Guard broadcast a message all afternoon over the marine radio. The message would also start with "pan, pan, pan," which is the appropriate way to begin a distress call. Most of us have heard of "may day" calls. Those are used when there is immediate danger. A "pan" call is more similar to a warning. A boat carrying two adults and one child had not returned as expected and was missing. The Coast Guard was asking all other boaters to keep an eye out for them. I hope they've been found and that everyone is okay.

Animals Seen Today
A raft of otters
Common Murres
Marbled Murrelets
Barrow's Goldeneye

Vocabulary of the Day
The *coxswain* is the person who drives the boat.

Challenge Yourself
What is 5 cm in inches?
What types of movements are pitch, roll and heave?