NOAA Teacher at Sea
Ginger Redlinger
Onboard NOAA Ship RAINIER
July 15 – August 1, 2007

NOAA Teacher at Sea: Ginger Redlinger
NOAA ship RAINIER
Mission: Hydrographic Survey –Baranof Island Project
Date: July 23 - 25, 2007
Gulf of Esquibel – Steamboat Harbor & Nossuk Bay

Weather Data from the Bridge 1100 hours
Visibility: 10 Nautical Miles
Wind directions: 150°
Wind Speed: 10 Knots
Sea Wave Height: none
Seawater Temperature: 14.4° C
Sea level Pressure: 1015.9 millibars (mb)
Temperature: 15.5° C

Mariner Word of the Day: Geodesy
Geodesy is the science of measuring and monitoring the size and shape of the Earth and the location of points on its surface.

Science and Technology Log: Charts vs. Maps
The RAINIER returned to the Gulf of Esquibel to gather a few more swaths of data to complete their survey of this area. The ship is anchored in Steamboat Bay and several boats are out gathering data around the shoals in the area to identify navigational hazards. Tomorrow I will be on one of those boats – I can't wait!

Since I am on the ship today, I can tackle a bigger question in my journal entry. This question popped into my head (it didn't hurt :) when I was talking with the data processing crew. I want to know what the difference is between *charts* and *maps*? Based on the attention to detail that the RAINIER pays to the collection and quality of data to put into their charts I knew it had to be very different than maps! I am figuring there is a clear distinction that is important for everyone to know since we all use maps at some point for driving, cycling, hiking, or boating. I will begin to tackle this question now, but a fuller, more rigorous explanation will evolve as I develop lessons to support this TAS assignment! Let's start with some basic information:

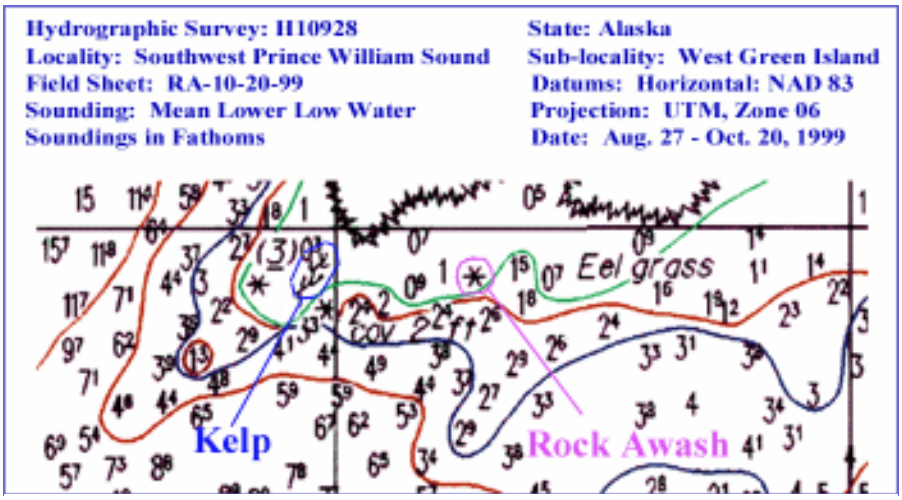
"What is the difference between a chart and a map?

A **chart**, especially a nautical chart, has	A **map**, on the other hand, emphasizes

special unique characteristics including a very detailed and accurate representation of the coastline, which takes into account varying tidal levels and water forms, critical to a navigator.	landforms, including the representation of relief, with shoreline represented as an approximate delineation usually at mean sea level.
A **chart** is a working document. It is used to plot courses for navigators to follow in order to transit a certain area It takes into account special conditions required for one's vessel, such as draft, bottom clearance, wrecks and obstructions which can be hazardous. Way points are identified to indicate relative position and points at which specific maneuver such as changing courses, must be performed.	A **map** on the other hand is a static document, which serves as a reference guide. A map is not, and cannot be used to plot a course. Rather it provides a predetermined course, usually a road, path, etc., to be followed. Special consideration for the type of vehicle is rarely a consideration. Further, maps provide predetermined points-road intersections-to allow one a choice to change to another predetermined direction.
Charts provide detailed information on the area beneath the water surface, normally not visible to the naked eye, which can and is very critical for the safe and efficient navigation.	**Maps** merely indicate a surface path providing no information of the condition of the road. For instance a map will not provide information on whether the road is under repair (except when it is a new road) or how many potholes or other obstructions it may contain. However the driver is able to make a visual assessment of such conditions.

Source of the above information? You guessed it – NOAA! Here is the website. http://chartmaker.ncd.noaa.gov/staff/map-cht.htm

Charts and maps are clearly different. Now lets look at the science behind creating charts. The science is called Hydrography. (I found the next set of information on this site http://chartmaker.ncd.noaa.gov/hsd/hydrog.htm) Hydrography is “the science which deals with the measurement and description of the physical features of bodies of water and their land areas.” (CDR Gerd Glang - Chief, Hydrographic Surveys Division) To paraphrase: Special emphasis is placed on elements that affect safe navigation. Side scan sonars are often deployed to detect submerged dangers to navigation. Hydrographic data are collected and processed with specialized computer systems that store data in digital form and generate graphic displays. Charts must include enough hydrographic detail in order to adequately depict the bottom topography and portray the least (lowest) depths over critical features. (Like rocks that your boat will hit if you don’t know they are there!) This paragraph describes exactly what we are doing here in Alaska!



An example of one type of chart made from Hydrographic survey data

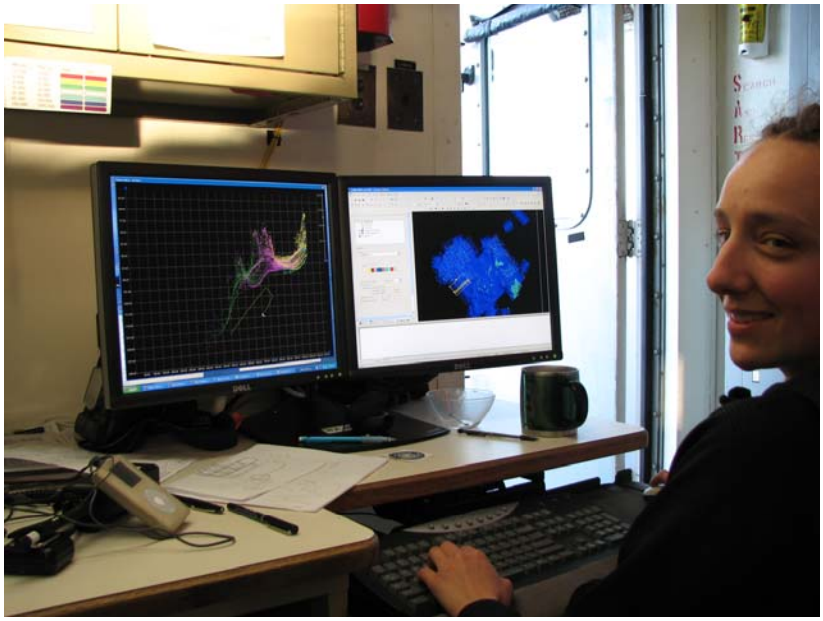
Survey Tech Boles holds a Navigational Chart developed by NOAA that also includes Hydrographic survey data

Navigational charts contain accurate and reliable information about features that assist ships in their travel. It can take up to two years to create a navigational chart! There are multiple sets of data that are used to ensure the charts are accurate. Just think about the data I have discussed so far. There are ELAC sonar readings of the deep water. The RAINIER takes ELAC readings in the deeper waters off the coastline, and the smaller boats take ELAC readings of the deeper waters closer to shore where navigational hazards to the RAINIER are present. This is also data the smaller boats using RESON sonar readings of shallower waters, the gathering of tide gauge readings, and the measurement of GPS benchmark levels.

While it is unusual for both the RAINIER and the smaller boats to be surveying at the same time, it helped complete this project in good time. Usually, the six smaller research boats complete the survey work while

the RAINIER serves as a command, logistics, and data processing center. Layers upon layers of data from all the boats and ship go into making charts. Like I said before, it can take up to two years to complete a chart with all the new survey information.

While charts are being developed, sometimes new information becomes available that is critical to navigators, like a new hazard. This information is communicated immediately and notices are sent out monthly so mariners can update their charts. NOAA has set a goal to move from survey to chart in 90 days – based on the amount of time it takes to gather data safely, this will be challenging! But if newer technologies can provider quicker turn around time it will speed up the process.



Survey Tech Krynytzky reviews ELAC data

I watched the careful and deliberate review of data gathered by multibeam sonar, and as with any technology, there are limitations. Human oversight, review, and careful analysis of the data are important links between the gathering and use of the survey.

Here is a link to a picture of a shipwreck that was found by the RAINIER (in color): http://chartmaker.ncd.noaa.gov/hsd/hsd-3.html

Other information about charts can be found at http://www.noaa.gov/charts.html

Would you like to see where the RAINIER traveled since I have been on board? Go to this site. http://shiptracker.noaa.gov

A note of interest pertaining to navigational charts:
Did you know that Thomas Jefferson created the US Coast Guard & Geodetic Survey Office in 1807? (1807 – 2007… NOAA is celebrating its 200th anniversary!). The US Coast Guard & Survey Office was the first scientific agency of the United States government. The Coast Survey Office and the USGS benchmarked, mapped, and charted the United States as it grew, and now there are multiple agencies providing data that describe a global model.

This mathematical model is called Geodesy (Pronounced Ge-oh–des- see.) It has helped us understand the actual shape of the earth – it is not a perfectly round sphere, it is an oblate spheroid squashed down at the poles and bulging a bit at the equator! The Geodesy group is developing and refining a mathematical model that starts from the center of the earth and works its way out in to solar system. It takes into account the movement of the earth around the sun, and the sun within the spiral of the galaxy. As the entire unit of our solar system moves, subtle changes to the tides occur. It seems that this occurs on a nineteen-year cycle. Being able to track data over time at different locations – satellites, sonar readings, survey readings, etc. help us understand changes from the earth's core, to the surface (tectonic plates, sea floor and land formations), and the oceans tides. It is quite amazing to think that a mathematical model can take all of that into account.
(Visit this site for more information - http://www.photolib.noaa.gov/geodesy/index.html)

Think about how important it was to back in Thomas Jefferson's day to understand navigation to and from the United States. For example, how to travel in order to trade and discover where to develop ports, and where not to! Think now about how important it is to understand how changes in earth impact human activity – trade, recreation, where to build homes away from storm zones, flooding, etc. What are safe numbers of fish to harvest so they can replenish? With the melting of the polar caps, imagine how important knowing how the mean high and low tides will change. The Tide Gauge survey that we completed in Dorothy Cove was last done in 1924! The work of NOAA, its' agencies and that of the RAINIER are very important.

In the week since I have boarded this ship, the RAINIER and it's crew have surveyed 462 Nautical miles, checked tide gauge data, reviewed data from the surveys to ensure their quality, and planned the next stage of their journey. In 2006, 1,464 Square Nautical Miles (SNM) were surveyed. There are 21,660 SNM that are considered critically important and have yet to be surveyed. (2007 Hydrographic Survey Priorities Report). Find out more about this at http://chartmaker.ncd.noaa.gov/staff/nhsp/NHSP_2007_Text.pdf

Personal Log: Food equals Happiness
I have yet to talk about the food, and since my students love to eat I have to let them know how well fed I am on this ship! Imagine keeping sixty people of various taste-preferences happy. This is job of the cooks and stewards in charge of feeding and providing stores to the crew. I have never had such a variety of food before! There are always two or three choices or combinations of foods for every meal in hopes of making everyone happy. Fresh soups every night! There are fresh vegetables cooked just right – never over cooked! The salad bar and the ice cream freezer are always available (and a banana sundae with two or more ice cream types, chocolate sauce and chopped nuts is a great dessert. My favorite end of the day treat is "Foye Hot Coco" – a recipe he shared with me. If you meet him, be sure to ask him to teach you how to make it!) Over the week I have had the choice of barbque ribs, prime rib, beef tips, roast veal, chicken, different varieties of rice, different styles of potatoes, and a host of tasty vegetarian dishes (yams masala, gado gado, pesto wraps). (Did I mention the gravies – they are delicious!) There are six different types of hot sauce and a host of condiments! Fresh fruit is always

available (pineapple, mango, melons, grapes, cherries, you name it!) There are fresh made desserts every night and fresh-baked cookies during break times. All the water, coffee, juices, Nesquick, hot coco, tea, etc. that you could want.) I haven't even started to talk about breakfast and lunch –there are treats galore- at least six kinds of cereal- and I will be lucky to leave this ship at the same weight as when I climbed aboard. There are even special occasions – like when Raul caught a 50-pound halibut the other day and donated it to our dinner one night. He made his own homemade batter and deep-fried pieces of halibut so we could have fish tacos! They were awesome! (Guacamole and mango salsa on top!) Floyd, Sergio, and Raul know how to keep us happy, healthy, and keep our bellies full!

The other really cool thing I have learned about here is satellite radio! I have got to get it installed in my boat, camper, truck, heck even the lawn tractor! The sound quality and choice of programming (without commercials) is incredible! Speaking of music, there are two really cool bands I have learned about on this trip – Great Big Sea, and Flogging Molly (which my students who love My Chemical Romance will really enjoy!)

Question of the Day:
Topic 1: Are there internship opportunities for students who are interested in exploring careers in navigation, charting, mapping, computer sciences, Officer Corp, etc? How many NOAA agencies are there?

Topic 2: What geometric theorem can you use to determine the length of an unknown side? Hint: Hypotenuse.

Topic 3: What other expeditions and scientific endeavors did Thomas Jefferson initiate?