NOAA Teacher at Sea
Jim Jenkins
Onboard NOAA Ship MILLER FREEMAN
April 18 - 30, 2005

Day 9: April 26, 2005
Latitude: 51, 31, 15 N
Longitude: 170, 12, 03 W
Visibility: 3 Nautical Miles
Wind Direction: 090
Wind Speed: 29 Knots
Sea Wave Height: 1-2 Feet
Sea Wave Swell: 8 Feet
Sea Water Temperature: 4.5 Degrees C
Sea Level Pressure: 994.6 Millibars
Cloud Cover:

Science and Technology Log: I am going to leave out cloud cover today. Can you look at the data above and fill in the space for cloud cover? I think you may also be able to know what current weather conditions are for today.

Did you get the photos of the mooring, chain and cable which were covered with barnacles, brittle stars, worms, starfish and bivalves? I thought these were pretty interesting and spent some time yesterday looking carefully at the photos to see what was identifiable.

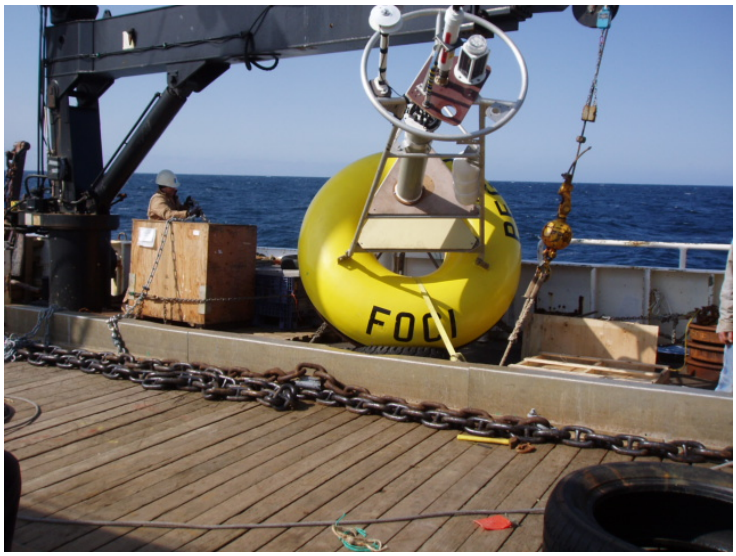
By the way, the barnacle and associated organisms I am holding up in one of the photos are now in a jar which is wrapped in bubble wrap and inserted in a zip lock bag. I am thinking that we will put it in a mesh bag and hang it from a tree limb to dry once I get back to school.

Yesterday, after dinner, I spent a long time talking with Mr. Rick Miller a mechanical engineer who has helped to design a lot of the moorings we are deploying or recovering on this cruise. Mr. Miller has an absolute passion for his work and I think he said a lot of things that you are going to find extremely interesting.

The mooring named Peggy was partly designed by Mr. Miller. Do you remember that the top part of the mooring weighed 5,600 pounds? You may be surprised to learn that the anchor and the chain holding Peggy to the ocean floor also weigh 5,600 pounds. Mr. Miller went on to say that winds in the Bering Sea can be quite ferocious. Long ago, engineers learned that a mooring with too much weight holding it to the ocean floor is not a good thing; the wind will simply blow the mooring over and push it below the water. This would prevent transmission of data that comes from the tower which is supposed to be above the water.

The fact that the anchor and chain for Peggy is the same weight as the surface part makes it possible for the anchor to move slightly when pulled on in a gale. This keeps the mooring above water and close to the location in which it was dropped!

A second interesting design feature was made more interesting after looking at the barnacle cover on the mooring brought up yesterday. Mr. Miller and his team looked at the history of barnacle cover on submerged instruments in the Bering Sea and calculated that a half ton of barnacles would likely cover the underside of Peggy the Mooring within a 6-month period. To counter this, they painted the bottom of the floating piece with a paint which repels barnacles and sea life that might attach to the surface. What do you think might have happened if the surface had not been treated and the expected half ton of barnacles accumulated?



Here you can see the heavy chain that keeps Peggy the Mooring in place.

Chains used by NOAA to anchor moorings are tested so that each link is capable of holding a 42,000-pound weight. This would be strong enough to pick up approximately 20 of the cars that I drive to school each day. This seems plenty strong to counter the weight of a mooring in even the strongest wind, or current, doesn't it?

Mr. Miller was very surprised, as were a lot of scientists and engineers, when they came out to pick up moorings anchored with this chain and found them missing. The breakthrough came when they recovered a link of a chain that was broken! They took the chain to a metallurgist (a scientist who studies metals). The metallurgist discovered that the fact that NOAA chains were heat-treated tended to form a strong crystal lattice in the metal. Hydrogen atoms had a tendency to get trapped in this lattice. The hydrogen expanded and forced a crack in the metal. A force much less than 42,000 pounds was then able to break the chain.

The solution: NOAA chains are still tested to be able to hold 42,000 pounds, but they are NOT heat-treated. No problems with broken chains have been noted since this change.

I think Mr. Miller summed up his thoughts about design well with this statement: "Overall strength is not the answer to all problems. The key to success is to design to the requirements of the project."

You may want to spend some time discussing the above statement with your classmates. I think that there is a lot of wisdom in these words.

A lot of time was spent today doing CTD tests. You probably already know this because all of the pictures sent today related to CTD tests. The tests took a bit longer than usual because all of the tests were at a depth of about 1,500 meters.

Personal Log:
I think that Mr. Miller is an outstanding human being, in addition to being an outstanding engineer and scientist. Let me know what you think after reading the words he spoke in response to my request for a comment to some bright fifth graders in Purcellville, Virginia:

"Encourage them to go into a field for which they have a passion. I would urge them to go into something that makes them smile when they think about it. I would encourage going into something with which you can have fun. Having fun has nothing to do with being easy. Challenges are fun.

Encourage them to keep life fun, and not be too heavy with life.

Remember that there are things equally important as academic endeavors. Remember to be good stewards of the planet.

Encourage them to think about outcomes which are up to the individual."

I leave you now to contemplate Mr. Miller's words. Have a great evening. I look forward to talking with you tomorrow.

Question of the day: An instrument descends to a depth of 1,500 Meters at a speed of 50 meters per minute. How long does it need to travel the 1,500 meters?

Bye for now,

Mr. Jenkins