



NOAA Teacher at Sea
Dave Grant
Onboard NOAA Ship *Ronald H. Brown*
November 6 – December 3, 2008

NOAA Teacher at Sea: Dave Grant

NOAA Ship *Ronald H. Brown*

Mission: VOCALS, an international field experiment designed to better understand the physical and chemical processes of the Southeast Pacific climate system.

Date: November 12-13, 2008

Weather Data from the Bridge

Wind: AM Calm; PM 5kts

Seas: 5'

Precipitation: 0.0

Pressure: 1016

Science and Technology Log

*Big whirls have little whirls
That feed on their velocity,
And little whirls have lesser whirls
And so on to viscosity.*

(L.F. Richardson)

This little imitation of Jonathon Swift's ditty helps illustrate the parallels between the atmosphere and ocean. Just as in the atmosphere, but much slower because of the increased density, turbulence in the water is expressed by meandering currents, and vortices. Good examples of this are observable when an oar is dipped into the water to push a boat, or a spoon is drawn across a bowl of soup.

One of the mysteries of the SEP (South East Pacific) region is the presence of large oceanic vortices (Eddies), the mechanisms that generate them, and the length of time they persist as identifiable entities slowly spinning in the surrounding waters.

In a number of coastal areas fishermen and oceanographers have discovered that some important fish species can be found associated with these so-called mesoscale water structures, like upwelling areas, meandering currents and eddies. Such links are fairly well known and heavily exploited in the vicinity of the boundary currents off eastern North America (Gulf Stream), California (California Current) and Japan (Kuroshio Current); for tuna, swordfish, sardines and anchovies.

The coast of Peru and Chile is swept by the northward flowing Humboldt (Peru-Chile) Current and the area is famous for the upwelling that brings deep, cold, nutrient-rich water to the surface (and every 5-7 years when it doesn't, El Nino conditions). Exposed to sunlight, phytoplankton

utilize the nutrients to form the base of the world's largest industrial fishery for fish meal and oil. The area also supports a large commercial tuna fishery.

Poorly understood is the role of eddies that spin off the major current; vortices averaging about 50-Km (30-miles) wide (i.e. *mesoscale*). These may be either cold or warm water eddies that may last offshore for months, and move as discrete masses to the west. In general these vortices have more energy than the surrounding waters, circulate faster; and are important because they transport heat, masses of water and nutrients to less productive regions towards the mid-ocean.

The eddies also transport marine life and the mechanisms for this are also poorly understood, however the outcome is not. Moored buoys out here collect and support masses of fouling organisms like goose-neck barnacles that must be cleaned off periodically, along with other routine maintenance of the batteries and recording instruments. Servicing these buoys is also part of the mission of the Ron Brown.



Gooseneck barnacles and Grapsid crab

Chasing “Eddy”

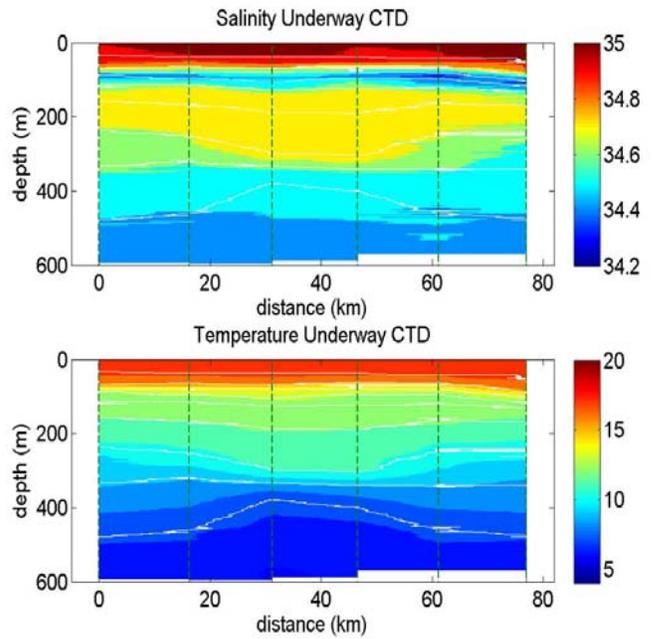
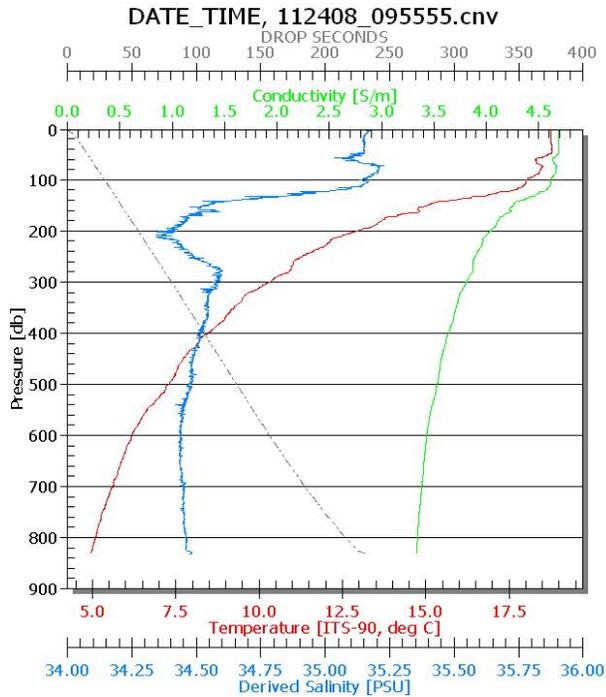
Tracking these “cyclones in the sea” requires interpreting daily satellite images that measure water temperature and by data collected by the UCTD (Underway Conductivity Temperature Depth) probe. This is a torpedo-shaped device cast off the stern of the Brown while we are underway. It rapidly sinks to several hundred meters. Then, like a big, expensive (\$15,000.) fishing lure, it is retrieved with an electric motor that winds back over 600 meters of line. The whole process takes about 20-minutes (including the 2-minute plunge of the UCTD).



Dave holding the UCTD

The information acquired is phenomenal, and if collected any other way, would involve stopping the ship and repeatedly lowering Niskin or

Nansen bottles; and adding weeks or months to a cruise schedule. Once back onboard the ship, the data is downloaded and plotted to give us a continuous picture of the upper layers of the ocean along our sailing route. All of this hourly data allows the tracing of water currents.



Plotted UCTD data



Teeth marks on a UCTD: “The ocean is a 3-D environment...Deep, Dark and Dangerous.” (Deirdre Sullivan – MATE

The procedure is not without trials and tribulations. Lines can tangle or break, and there is always the possibility that the probe will bump into something – or something will bump into it down in the deep, dark ocean. However, any data retrieved is invaluable to our studies, and each cast produces a wealth of information.

Personal Log

Today’s weather is fabulous. Most mornings are heavily overcast, but we are still close enough to the coast to enjoy breaks in the clouds. So, everyone is taking *their* breaks in folding chairs on the foredeck at “Steel Beach” since we are never certain when we’ll again have a sunny moment, or how long it will last.

“Gamming.”

After lunch there was a bit of excitement; we saw other mariners. In the old days of sailing, ships passing each other at sea would often stop to exchange greetings, information and mail. This practice was known as *gamming*. We sighted our first ship of the cruise; a cargo

carrier heading north and piled high with shipping containers. It was too far off for gamming or even waving (The scientists who are sampling air want to keep their instruments free of exhaust from any nearby sources) so it would have been out of the question anyway.



Group watching a ship on the horizon

*Of ships sailing the seas, each with its special flag or ship-signal,
Of unnamed heroes in the ships – of waves spreading and spreading
As far as the eye can reach,
Of dashing spray, and the winds piping and blowing,
And out of these a chant for the sailors of all nations...*

(Song for All Seas, All Ships - Walt Whitman)

The bridge gave it a wide berth; so wide that even with binoculars I could not be certain of the ship's flag, name or registry, other than oversize lettering on containers that spelled JUDPER. Presumably it was carrying agricultural goods from southern Chile or manufactured goods and minerals from the central part of the country. Chile is a major exporter of copper; and the smelters, factories and vehicles in this upscale corner of South America (And the sulfur and particulate matter they spew into the sky) are a interesting land *signatures* for the atmospheric scientists and their delicate instruments.

So the only *gamming* today is in the narrow passageways throughout the Brown. There is no wasted space on a ship, so in many areas there is “barely enough room to swing a cat.” (The *cat* being the *cat-o-nine-tails* once used to flog sailors. “The cat is out of the bag” when someone is to be punished.*)

I am still not certain what the proper ship's etiquette is in passageways and stairways, but I am quick to relinquish the right-of-way to anyone who is carrying something, looks like they are in a hurry or on a mission, or in uniform (obviously) or kitchen staff in particular.

Because the ship is always rocking, I've found that I tend to lean against the right wall while moving about. By lightly supporting myself leaning with a hand, elbow or shoulder (depending on the how significant the ship is rolling, pitching or yawing) I slide along the wall, and probably

look like a clumsy puppy scampering down the hall, but it works...except for a few bruises here and there.

Often I come face-to-face with the same shipmates repetitively during the day. (How many times a day can you say “Hello” to someone?) Everyone is polite and considerate, especially when moving about the ship, and in spite of repeatedly passing the same people many times every day. So generally, since everyone is busy for most of their shift, when meeting in the hallways, you resort to awkward routines like: muttered *Hey, Hi, Yo* or *What’s-up*; tipping your hat or a dumb half-salute; or a nod...or if from New England, what is known as the *reverse nod*.

***Flogging:**

There was a science to this horrible practice, not only with the number of lashes imposed, but what they were administered with: a *colt* (a single whip) or a *cat* (They varied in size from “king size” to “boy’s cats”).

Although the U.S. admirals reported that “it would be utterly impossible to have an efficient Navy without this form of punishment” Congress abolished flogging on July 17, 1862. And the last official British Navy flogging was in 1882 - although the captain’s authority remained on the books until 1949. (To politely paraphrase Winston Churchill, the British Navy was bound together by...*#@#&!, *rum and the lash*.)

One Final Note

We discovered stowaways onboard...two cattle egrets. Egrets are wading birds that feed in shallow ponds and marshy areas; and the cattle egret regularly feed along roadsides and upland



fields where cattle or tractors stir up insects. Even when threatened, they tend to fly only short distances, so it is odd to see them so far from land. However, in the 1950’s a small flock of these African birds crossed the South Atlantic to Brazil and establish a breeding colony. I remember spotting them for the first time on the Mexican border near Yuma in the 1970’s and today they have managed to thrive and spread all the way across the warmer half of North America.

Stowaways – cattle egrets