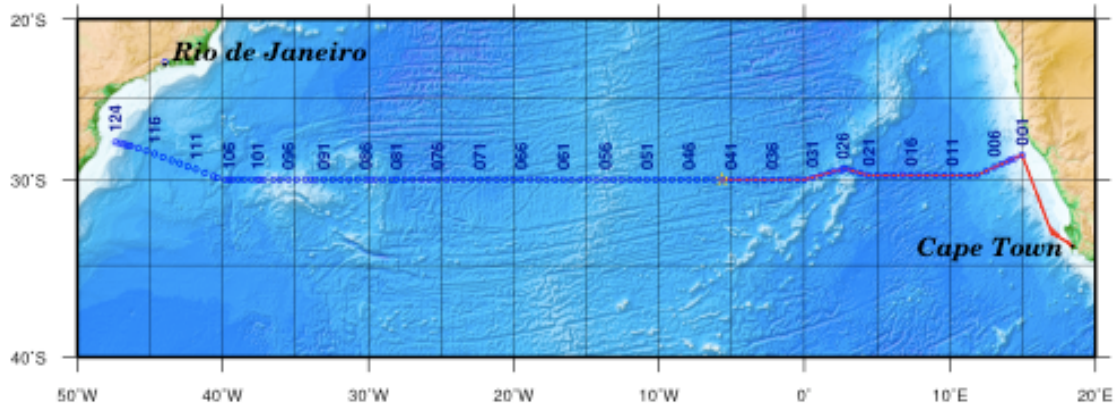
Report 2
Saturday October 8, 2011
(By: Alan Foreman, Scripps/UCSD graduate student volunteer - CFC Watch stander)

We have completed an additional 28 stations since our last update, bringing the cruise total to 42 full-water-column stations sampled. During this time we have covered almost 25 degrees of longitude, passing over the Walvis Ridge and crossing the prime meridian. Despite an initial bit of trouble with the winches used to lower and raise the CTD, everything is now running smoothly and we are averaging slightly more than 4 stations per day. We have also released several ARGO floats and GDP drifters.



The weather has been pleasant for the past week, with sunny skies and daytime air temperatures hovering near 20°C. We have also been treated to some wildlife encounters, with sightings of blue, fin, and humpback whales. The humpback (below left) and fin (below right) whales both put on a show for those that were awake, circling the boat during CTD casts and lounging near the surface for quite some time.

Of the many parameters we are measuring on this cruise, several are anthropogenically-produced tracers that can be used to map ocean circulation. Gasses like chlorofluorocarbons (Freon 11 and 12) and sulfur hexafluoride (SF_6), for example, exist in the atmosphere as the result of human activities. These gasses are taken up from the atmosphere by the surface layer of the ocean and transported

deeper to the ocean's interior. By measuring the distribution of these gasses across different depths on transects like ours (and by knowing their production history and distribution in surface waters) it is possible to estimate the rates and pathways of circulation (i.e. the 'ventilation' of the ocean) in different areas.

It is also possible to measure aspects of ocean circulation using carbon-14 (^{14}C). ^{14}C is radioactive isotope of carbon that is produced in the atmosphere by cosmic rays (and by nuclear testing in the 20th century) and decays at a known rate. ^{14}C is taken up by the surface waters of the ocean and transported along various pathways of ocean circulation. By measuring the radiocarbon content of water samples, it is possible to estimate the ventilation age of water.

Many of the ^{14}C samples obtained over the first few days of this cruise will be used to create a high-resolution vertical profile of ^{14}C near the Namibian margin (i.e. from the surface of the ocean to within 10 m of the bottom). In providing the modern distribution of ^{14}C, the water samples from this cruise will help 'calibrate' ^{14}C measurements from the core-tops of previously obtained sediment cores (i.e. the most modern, or "top" portions of each core) from the same location. These sediment cores (each a ~10m slice of mud) have been taken from ocean depths ranging from 1000 to 3700 m from the Namibian margin (see below). One of the students (Alan Foreman) is using these sediment cores to reconstruct snapshots of past ocean circulation. Each snapshot (essentially a "paleo CTD cast") of the ^{14}C tracer is created by measuring the ^{14}C content of fossil plankton across sediment cores of various depths. This work is part of a larger effort to understand and delineate changes in the boundary between Southern and Northern Source water in the South Atlantic over the past ice age cycle.