

**Date: Wed, Dec 16, 2009 at 12:32 PM**

**Subject: Scholes cabin 5: Underway Conductivity Temperature Depth (CTD)**

Dear Stirling,

The instrument that is giving us the biggest headaches right at the moment is the UCTD. It is a metal 'bomb' about 1 m in length and 10 cm diameter. The bottom half contains very sensitive instruments for measuring pressure (i.e. depth below the sea surface, temperature and conductivity of seawater, i.e. salinity). The top half is thinner and forms a spool where we wind on about 400 m of special very strong 'fishing line'. Then we drop the 'bomb' over the stern and it goes straight down, unwinding the line as it goes, and recording the pressure, temperature and conductivity. Because the ship is travelling forward at about 10 knots (nearly 20 km/hour) we have to pay out about a km more of line from a spool on deck to allow the probe to sink to its full depth. Then we apply a brake, engage a clutch and wind it in. It comes skipping back along the sea surface. Remember that the waves are huge, and we are plunging up and down about 10 m every few seconds, so catching the probe as it comes in is quite tricky, not to mention cold and wet. We then download the data from the probe memory to a computer using Bluetooth.

I was up all night two nights ago, because the clutch failed. If we had let go, we would have lost the probe in a few seconds - bye-bye R100 000, but more important, there goes our data and the chance of collecting more. We cranked the line in cm by cm by hand. Eventually the clutch started working again, at about 6 am. But now the probe won't speak to us. It is still collecting data, so we send it back down every two hours, but getting it to cough up the data takes lots of pleading and threats.

Why do we care so much about CTD? Well, it is one of the basic oceanographic measurements, like sending up a weather balloon for meteorologists. It tells us the structure of the ocean in the vertical direction: how thick the mixed layer on the surface is, and if there are any other layers deeper down. Right now it is telling us we have reached the Polar Front, because the temperature below 100 m depth is less than 2 degrees (actually, the surface water is 0.5 C). As you know, warm water usually floats on top of cold water, and fresh water on top of salty water. These differences in temperature and salinity keep the water masses from mixing, which is really important for how carbon dioxide, nutrients and heat is transported around the world. In fact, the 'thermohaline circulation' (translated, that means heat-and-salt) is the machinery that drives the climate system. Sometimes it is drawn as a giant conveyor belt, looping

around the world's oceans, carrying tropical warmth to the poles, and polar freshwater and nutrients to the tropics. If it slows down or changes course, we could be in big trouble.

The piece of ocean between Cape Town and Antarctica is important because it is one of only three 'choke points' that currents need to squeeze through to get from one ocean basin into another. That is why we watch it so closely.

Are you enjoying the holidays? Did you and Mom go to the Wakkerstroom cottage? It is snowing here a lot, and we should start to see icebergs soon.

Love,

Dad