Expedition Log for IODP Expedition 313
New Jersey Shallow Shelf

Week 11 – 10th July

Life on board the Kayd lift boat - en-route to understand the ups and downs of sea level in Earth history and the relations to past climate change. Christian J. Bjerrum, University of Copenhagen, Denmark

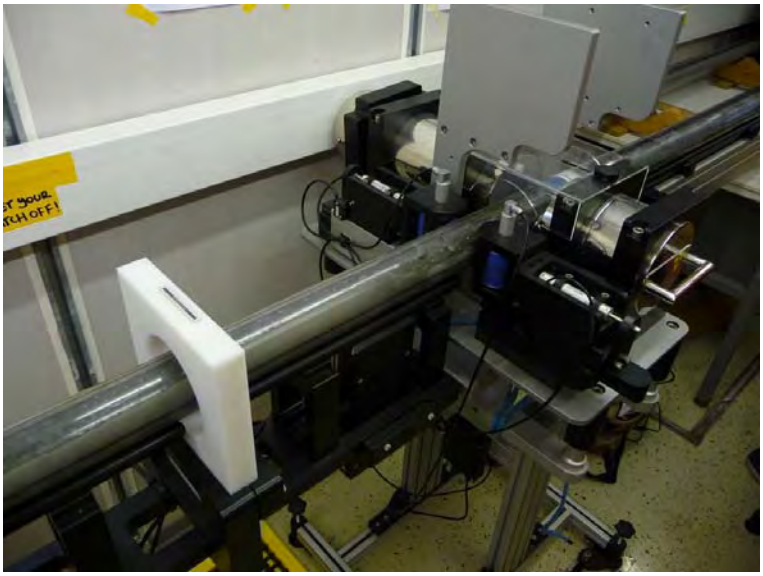
Little human ants busy going from shipping container to shipping container - of the type you see passing on trains – each person carrying a stick of compact mud and sand, little plastic beakers or syringes. They go back empty handed only to return with another object. “What is it with you scientists” one of the ship crew men asked me one day – “when I go on a job to service a platform in the Gulf of Mexico I go there for the money but you seem to be really into what you are doing?” So I have been wondering about this good question - what it is that keeps us going, on and on, even though the work en-route to our goal is quite monotonous?

D_McInroy©ECORD_IODP_The core comes into the curation container first

In my case I go to the core logging container at six in the morning to start my 12 hour shift. I talk with my fellow scientist, from the previous shift, about his problems or increased understanding in our scientific endeavour. I then go to the curation container. Here I get the next piece of drill core that has been labelled and catalogued in the database after it came on deck from the drill hole - a stick of consolidated mud and sand drilled from 600 m below the seafloor. The stick contains a record of sea level and climate changes millions of years ago that we are trying to unravel.

C_Cotterill©ECORD_IODP_Any metal core catcher pieces are identified in core curation, as they may affect MSCL measurements

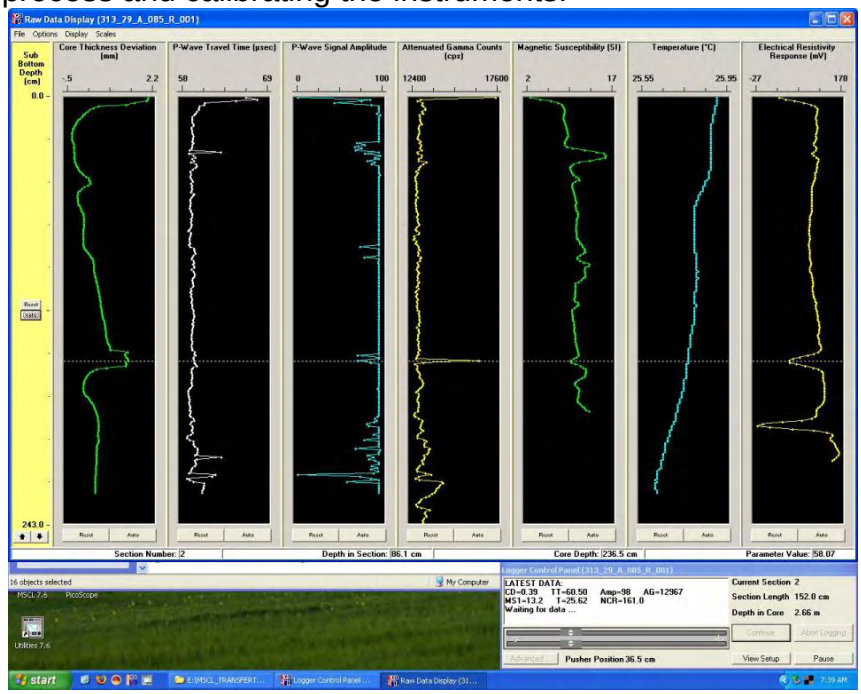
I then carry the 1.5 meter stick of core to the scanning bench and start the scanning process.



C_Cotterill©ECORD_IODP_Multi-sensor Core Logger (MSCL)

After about 60 min I see the results of the scan. With a few clicks on the computer I can evaluate the processed results. Are they good or did something in the measurement scan go wrong? If ok, I bring the drill core to the cold storage container. I then get a new core in

the curation container and the process repeats. I do this about twelve times in my shift; monitoring the process and calibrating the instruments.



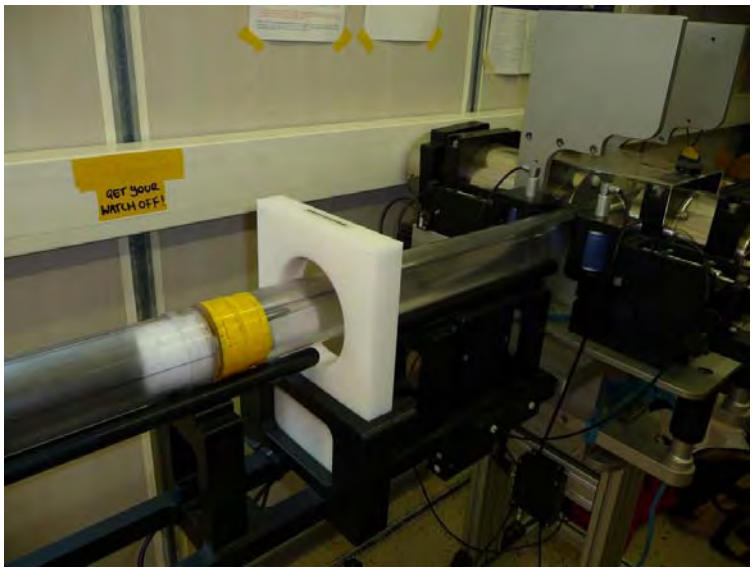
D_McInroy©ECORD_IODP_MSCL measurements appear on-screen

Other scientists on the ship perform analyses on the cores before I get them. They also carry the sticks of core back and forth. From the outside it probably looks as if we are all busying around like little ants carrying sticks back and forth. So what fun is there about this?

The work here at sea is repetitious and we work long hours. So the question from the ship crewman is very good and difficult to answer. To answer it I think we need to understand science – that is observing things in nature (and mud), asking yourself why something is the way it is or looks, or why it came to be like it is, and importantly what can we use it for. We then propose a hypothesis - a likely explanation of the initial observation. Then we create experiments to disprove or prove our hypothesis in an objective manor. What drives us scientists is a deep urge to understand through enquiry and probably, importantly, getting recognition and fame among peers. In that way we are probably a bit childish. To a scientist observing or getting data, with the aid of, for example the core scanner, is like getting money in the bank. With this you can do more – eventually leading to further data and a deeper understanding of nature. What we do is our hobby, we simply have fun with it.

En route to our understanding the coupling between sea level and climate change, the monotonous world of our core handling is speckled with practical fun science questions. We come across new things that trigger our curiosity or need a solution. A couple of days ago one of our instruments was starting to give fewer and fewer readings, and eventually it gave no readings at all! This is not good – no data = “no money in the bank”. One hypothesis could be that the instrument broke. Another would be that something with the core or the fluid around it had changed.

Checking if the instrument is broken is easy. Using a plastic container filled with water we see if we get a good signal reading. So what could it be that had changed? Are we getting different types of mud or rock up in the core now? We check the computer database from when other scientists on the ship had been entering descriptions. The core material is a little bit different but not enough to explain the problem. Hmmm- what now?



C_Cotterill©ECORD_IODP_A liner of water follows a core through the MSCL as a calibration

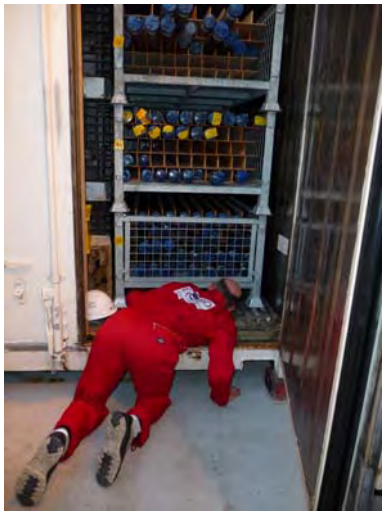
We can't go on like this? In going over my notes I find that the drill fluid was watery before, but now has changed to a milky gel like substance. One hypothesis could be that the change in the drill fluid could be the cause. We need to test it. So we ask the drillers for a sample of the drill fluid. Could this be the explanation? We place the sample on the scanner and wait for the results. No signal. So our initial hypothesis was right. But what now?

C_Cotterill©ECORD_IODP_Different drill fluid mixes have their physical properties measured as baselines

If we want data from core scanning we need a deeper understanding of why there is no signal with this drill fluid. We look carefully at it with a microscope. Then we see it – the drill fluid is filled with tiny air bubbles. It seems likely that the air bubbles absorb the pressure wave that we are trying to send through the core. We again test this hypothesis by taking a core from the cold storage container that has been sitting for 24 hours. Our notes tell us that the drill fluid was milky white before but now is a bit clearer. There are no bubbles in the fluid any more and we get good data readings. We now understand our troubles in getting to our scientific goal.

C_Cotterill©ECORD_IODP_The core now goes into the reefer to cool before MSCL measurements are taken

So what in the beginning looked like another day of “anting” around with sticks of core for fun, became a little science project on our journey to understand the up and downs of sea level changes earlier in Earth history.



C_Cotterill©ECORD_IODP_Frank retrieves a core from the reefer (cold storage container)