

Subject: Scholes Cabin 5 (P): Pumping fuel

12 January 2010 1438 UTM 70.2318 S 2.5731 W

Dear Stirling,

Thanks for the email about your new invention ideas. I am intrigued by the hat that feeds you things.

We are nose-in to the ice-shelf. It is about 40 m high here, which is much taller than even the big crane in the front of the ship, and overhanging in a rather scary way in most places. We chose a fairly vertical bit that did not look likely to fall on top of us with a little nudge. We are not allowed forward of the bridge, just in case it does crumble unexpectedly. There is a special rubber bumper on our prow just for this job. We keep the engines running and the prop pitch set on slow ahead, and use the fore and aft thrusters to keep us perpendicular to the ice cliff.

Big rubber fuel pipes, like fat snakes, have been draped over the deck to the forecandle (that little raised deck in the front of the ship - pronounced folksill). There they connect to thick orange hoses that lead straight up to the top of the ice-shelf. Some distance back are about ten 25 000 litre tanks on sleds. We will pump them full of diesel. Then they have to be dragged to SANAE IV, which will take about 24 hours and emptied into tanks there. Then they will be dragged back (12 hours if the weather is fine - it is downhill and the tractors can go faster without a load) and we pump a second batch.

The whole ice-shelf is afloat since the sea here is 300 m deep. So although there are tides, we don't notice them because the ice-shelf and the ship both rise and fall by the same amount. You can see the layers in the ice matching the different years of snowfall. That is a really important source of climate data for the period before there were weather stations and atmospheric samplers. In the middle of Antarctica the ice is about 3 km thick, and they have drilled cores a long way down. When the ice is that thick it is under a lot of pressure, so it is hard and blue, not semi-compact as it is here (what they call firn). The atmosphere that was trapped in between the snowflakes gets squeezed into bubbles in the ice, and is perfectly preserved there. The scientists keep the ice cores frozen until they get back to the lab, then they cut them up into sections, thaw them out under vacuum, and analyse the atmosphere from hundreds of thousands of years ago. That is how we know that the carbon dioxide concentration in the atmosphere has fluctuated in a very predictable way over the past half-a-million years, between 180 parts per million (ppm) during cold, glacial periods ('ice ages') and 280 ppm during warm periods. It is also how we know that the steep rise to 385 ppm over the past 150 years is not one of those natural cycles, but caused by humans.

Good luck at high school. Sorry I am not there for your first day. I am sure you are going to have a lot of fun, and do really well. The main thing is to have an attitude of making the most of all the opportunities it provides.

Love,

Dad