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Written at WAIS Divide

We have focused our week on trying to solve our problem with the inclination of the drill. We are progressing slowly, but our efforts are paying off and we are back in production drilling of about 10 runs, or 32 meters per day. Core quality is still excellent.

I. DRILLING

A. The inclination of the drill is our number 1 concern. The strategy to get it back revolves around 4 things:

i. Stabilizers on the top of the screen section, top of the core barrel and core dog cages. They prevent the drill from flexing under its weight. The flex of the drill is what caused the inclination to increase rapidly.

ii. Keeping the weight on bit as low as possible and keeping the pitch rather small (1.96mm), so that the cutting would be directed by gravity.

iii. Reaming the bottom 6m of the borehole, to give a chance to deviate towards vertical in between runs. It takes about 10 min to ream 6 meters.

iv. Adjusting the cutters to a different design, which gives them the ability to cut sideways.

B. The inclination has been steady this week, around 4.7 degrees. Improvements will be slow. There are indications on the ice core itself that we are doing something: Ridges on the outside of the core show that the borehole is trying to realign. We have noticed slight changes (~1mm) in the diameter on the top 10 cm of the core, which also indicate the possibility of a change of direction.

II. NUMBERS

A. 50 runs were drilled this past week, which corresponds to 158.67m of ice core, or 26.4m/day (6 days). The bottom depth of the ice on Jan 1st was 1940.82m. We started the week around 20m/day, and progressively speeded up to 38m/day. A drill run takes about 2:15hr and is 3.2m long.

III. ICE CORE LOGGING

A. The core quality is excellent overall. The new cutters introduce some unusual ridges on the outside of the core, which can be a millimeter thick. They do not affect core quality.

From 1901m to 1909m, the diameter decreased by 5mm. It is likely to affect sampling. It corresponds to the time when the new cutters were introduced: There must have been some wobbling of the core barrel. The problem suddenly disappeared once the whole drill sonde reached the newly drilled borehole. We have been monitoring the diameter of the core every meter this week. Except for this excursion at 116.0mm, the diameter has been consistent at 121.7mm (+/- 0.3mm). We are watching closely for non-circularity of the core, which could be an indicator of a shift of the borehole.

IV. AZIMUTH

A. The drill records the azimuth of the ice. There is a compass in the instrument package. At the end of the run, it records the orientation of the barrel, and when the drill gets to the surface, the barrel rotates so that north is pointing up. Drillers write an arrow on the bottom of the core, and core handlers write a line along the core reflecting the orientation of the ice.

Sadly, there is a problem in the software behind the orientation of the barrel, and the azimuth of one run is not necessarily consistent with the azimuth of the next run. The drillers are working on correcting the software. It's not a simple problem, and will require us to stop drilling for a day or two.

In addition to recording the driller's azimuth, core handlers have started to draw a "lifeline" along the core at the start of run 1257, 1844.36m depth. This line is an azimuth line consistent from run to run. We do not know the numerical value of the direction of the lifeline, but we will be able to get it when the software is repaired, and correct the azimuth for the ice we are drilling now.

At NICL, we will be able to draw such a lifeline on the brittle ice, and recover an azimuth over all the ice below the last rubble core.

V. PACKING

A. This week we sent 2 air force pallets (AFP) of ice to McMurdo on Wednesday, 31-Dec. We have room for one more AFP to go into safe core. It will likely go out next Wednesday. After that, we will hold onto the last 8 ISC boxes to go out until the end of the season, so that most of the physical properties samples can make it to NICL. The remainder of the ice will be packed on wood skids and stored in the basement, for retro at the beginning of next season.

VI. ARCH TEMPERATURE

A. The fourth AC unit is in operation and it is cold in the arch now. The temperature went from -20C to -27C. It is a good thing to have some buffer in case the AC or the power breaks down. One of the main side effects of having all four AC units working is that there is considerably more frost deposition. It snows a lot inside the arch! We have to keep sweeping the floor ~6 times per day. Core handlers make a good use of the glove heater boxes: We each have 2 pairs of gloves that we can swap every ~30min to keep our fingers warm. It is working very well.

VII. WEATHER

A. The weather has been changing. It could be sunny, snowing and back to sunny in a matter of hours. We saw some cumulus clouds on 31-Dec, which is very unusual for Antarctica. Overall, it has been mild, with beautiful halos, but the forecast caused planes to be canceled.

VIII. FLIGHTS

A. We completed 2 LC-130 mission, bringing in much needed fuel and taking out 2 AFPs of ice cores. The Basler MKB visited us once. The surveying twin otter CKB visited us 5 times to refuel. CKB is part of CReSIS, and specially equipped with radar antennas. Three (3) LC-130, five (5) MKB and one (1) CKB flights were canceled due to weather.

Anna McKee (artist), Todd Rampendahl (electrician) and Sridar Anandakrishnan (I-188) left for McMurdo.

IX. CAMP ACTIVITY

A. Lots of weather observations for the numerous planned flights. The winter berms are finished and have started being furbished. Camp population went up to 50 and is now back to 39.

X. HEALTH

A. We are done with the crud, but the last LC-130 brought us stomach flu. It lasts 24hr and 5 people have been affected so far.

XI. OTHER SCIENCE GROUPS

A. CReSIS groom team R-789 has finally departed, after waiting for 14 days for the Basler to pick them up.

B. A-140, "BESS recovery", is a team of six scientists and two support crew whose aim is to recover the payload of a long-range balloon experiment to measure antimatter. You can learn about their project at bess.kek.jp They arrived on 31-Dec and left on 3-Jan to their site, where they will stay for 2 weeks, and disassemble the payload so that it can fit into three Basler flights.

C. The drillers of CReSIS I-205 have finished drilling. They left their field camp at noon on Tuesday, 29-Dec and arrived on Thursday at 2am. They brought back the broken Tucker Sno-Cat. Sridhar Anandakrishnan quickly left from McMurdo on 1-Jan. The mechanic went back to pick-up the drill and compressors. The drillers Mike Jayred and Jim Koeller are waiting for the drill to come back to WSD and get it ready for retro.

XII. NEW YEAR CELEBRATION

A. We celebrated New Years' on Friday, 1-Jan with prime rib steak and other delicacies. Drillers and core handlers had a day off (Friday 3pm-Saturday 3pm). Camp staff had Saturday off, and Sunday off for those not affected by KBA flights. Charlie Virnig shaved and surprised everyone with soda wine, or champagne in a can. We celebrated each US time zone passing midnight, depending on people's origin.

Overall, we are back into production drilling. We are at about 11.6kaBP, and ready to cross the 2000m landmark. We have not seen any ash layers this week, but we keep our eyes open!