Little Dome C

Beyond EPICA Oldest Ice Drilling Site (75.29917 °S, 122.44516 °E)

Situation Report #18; Tuesday 20 December 2022

Personnel @LDC:
Saverio Panichi (ENEA, Camp Leader), Frank Wilhelms (AWI, Chief Driller), Robert Mulvaney (BAS, Chief Scientist), Giuditta Celli (ENEA), Romily Harris Stuart (LSCE), Matthias Hüther (AWI), Gunther Lawer (AWI), Johannes Lemburg (AWI), Martin Leonhardt (AWI), Michele Scalet (ENEA), Julian Westhoff (NBI), Andrea de Vito (ENEA)

Personnel @DC:
Marcus Grimmer (UNIBE), Florian Krauss (UNIBE)

Weather at LDC 5 pm: sunny, 4 knots
Meteo at DC 5 pm: T = −35°C, Wind = SW, 5 knots, Wind Chill T = −46°C

Apologies for the confusion of days and dates in yesterday's SitRep – it was the report for Monday 19th December (not Sunday as I had written in the title box). Days merge together here since we work the full seven days, and there's little to distinguish days except Saturday – which is pizza night!

Although we had success on Monday afternoon with the blended components from both the new AWI drill, and the Danish drill flown here from the EastGrip project in Greenland, the goal is to move to the all-new AWI drill designed and built specifically for the Oldest Ice project. A change overnight from the Danish outer barrel, core barrel and hollow shaft to the AWI system of barrels gave difficult drilling runs early in the day with problems with the tolerances on the fluid pump.

An explanation is needed here: the drill motor drives a hollow shaft inside the upper part of the main outer barrel – this is the chip chamber designed to capture the ice chips produced by the cutters on the drill head. The bottom of the hollow shaft is connected to the core barrel by a connector mechanism we call the 'super-banger' (we'll leave that explanation for another day). Chips are moved away from the drill head by a plastic spiral on the outside of the core barrel (and inside the outer barrel). They pass through the 'super banger' and past a valve, and into the lower part of the chip chamber. Here the chips and fluid mixture are moved on their way by either a 'booster pump' (essentially a short Archimedes screw), or by a clever bellows-style fluid pump.

A good portion of the morning was taken up by trying to reduce the friction on the fluid pump, but we were unable to achieve good drilling results, so we swapped back to the Danish barrels, hollow shaft and fluid pump. We had some good runs in the afternoon, but by the evening we had problems with the fluid pump on this system, and the evening drilling progress was a little disappointing.

Nevertheless, we achieved a creditable seventeen and a half meters of core today, and we are edging closer to a stable drilling platform.

Lemmie adjusts the AWI fluid pump while Frank looks on; to the left of the fluid pump is the connector that holds the core barrel, while to the right of the pump is the lowest part of the 'hollow shaft'. (Photo: Mulvaney, Leica SL2, 16mm, 1/60, f8, ISO100)

The other significant modification to drilling practice today was the change to working a shift pattern. Our aim with this change in working routine is to keep the drill running longer, and continuously, each day, without pauses for meals etc. The timing of the shifts is slightly odd but is designed to fit with regular mealtimes for our chef (and camp chief) Saverio. The first shift starts at 0800, and runs until 1300, then the second shift takes over from 1300 to 1630. We then change back to the first crew, who work from 1630 to 1930, before the second crew take over from 1930 to midnight. This way, both crews work eight hours drilling. Lunch is served at 1230, and the second crew eat theirs before taking over on the drill rig at 1300, while those finishing their shift eat half an hour later at 1300. Similarly, the evening meal is served at 1900, and again one crew eat slightly later at 1930.

The first crew is Romilly, Martin and Robert, and the second crew is Giuditta, Gunther and Julien. Frank, our Chief Driller, roves between shifts keeping an eye on things, while Lemmie (Johannes) fixes things we break, or generally improves the engineering. Matthias is developing the software that runs the drill – essential as the control side of the drill is not yet as well developed as the Danish system which has had decades of improvements.

Martin raises the mast and drill from the horizontal to the vertical, in the midday sun, ready to send the drill down the borehole. (Photo: Mulvaney, Leica SL2, 24mm, 1/800, f8, ISO400)

End of day statistics:

Drillers' depth:	215.89 m;	daily total 17.47 m
Loggers' depth:	221.23 m;	daily total 17.02 m
Processors' depth:	101.0 m;	daily total 21.0 m

An explanation of the daily statistics. The daily totals are the difference in depth logged by either the drillers in the borehole, or the loggers measuring the cores recovered. These can differ slightly if the core breaks at the bottom of the hole, or sometimes just above. The drillers' depth and loggers' depth differ due to the zero point on the drill being the drill head, which hangs about 6m below the snow surface in the inclined trench, while the loggers' depth is measured as the total length of core logged from the surface. Cores are transported to Concordia Station where Florian and Markus carry out the first instrumental physical measurements and cut some of the cores lengthways to transport on to Europe, while leaving the bulk of the ice stored below the surface at around -50°C at Concordia Station.

RM and FW, 22.12.2022