Little Dome C

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

Situation Report #34; Thursday 05 January 2023

Personnel @LDC:
Saverio Panichi (ENEA, Camp Leader), Frank Wilhelms (AWI, Chief Driller), Robert Mulvaney (BAS, Chief Scientist), Markus Grimmer (UNIBE), Romilly Harris Stuart (LSCE), Matthias Hüther (AWI), Gunther Lawer (AWI), Johannes Lemburg (AWI) , Martin Leonhardt (AWI), Florian Krauss (UNIBE), Michele Scalet (ENEA), Julien Westhoff (NBI), Andrea de Vito (ENEA)

Personnel @DC: Giuditta Celli (ENEA)

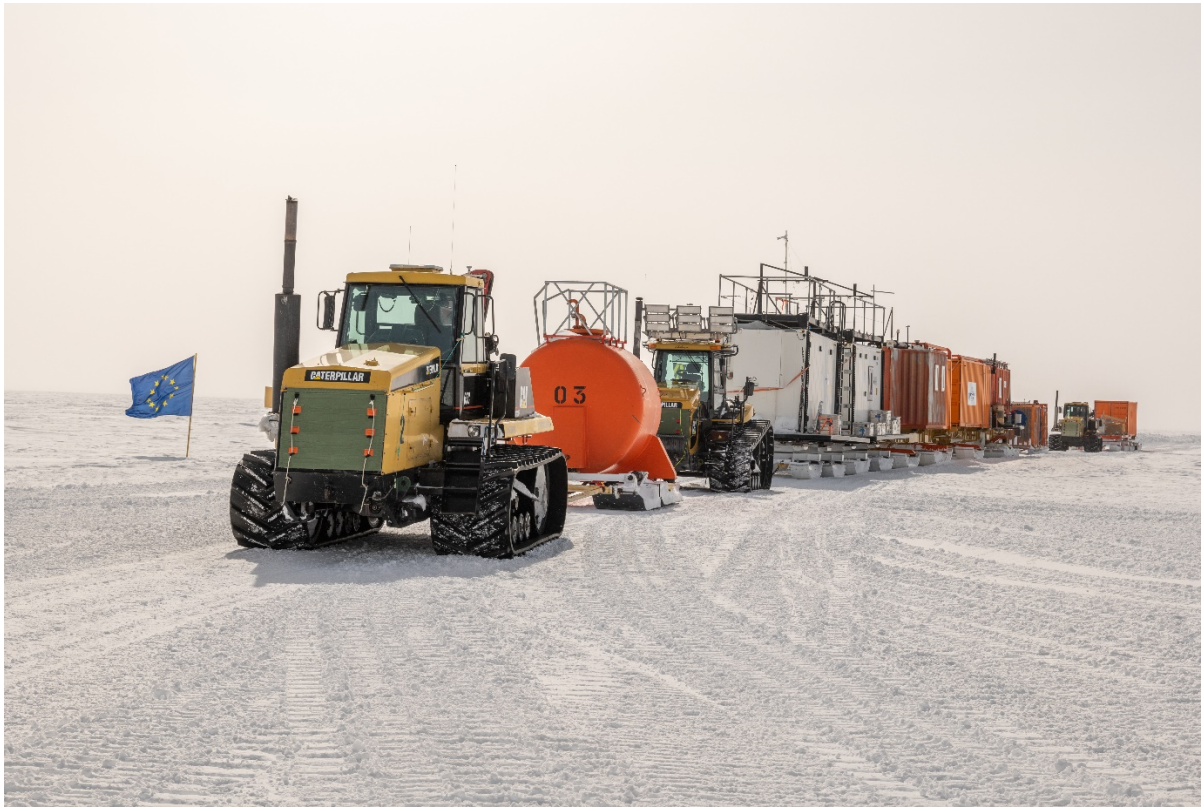
Weather at LDC 5 pm: cloudy, 10 knots
Meteo at DC 5 pm: T = −34°C, Wind = SE 10 knots, Wind Chill T = −50°C (wind chill warning)

Easy drilling after a difficult start; arrival of the French science traverse, drillers reach 500m depth; a BE-OIC EXCOMM meeting; establishing a geophysics survey site

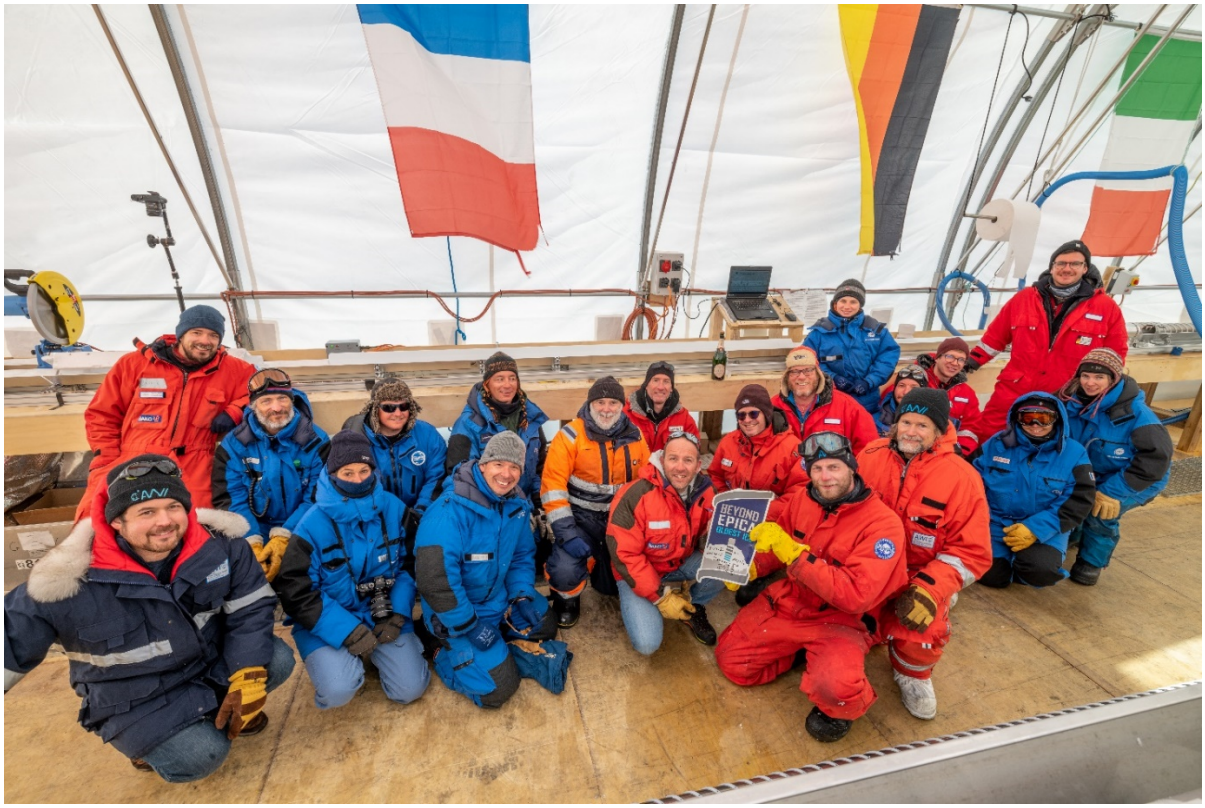
After a few days of relatively easy drilling, we changed late last night to the 4 m long drill barrels again for another test (this implies changing the outer barrel, hollow shaft, and core barrel). With the long barrels we could hope for longer cores, which will become important the deeper we drill when the transit time down and up the borehole is significantly longer than at present, and the extra length of core will be welcome. However, the first two runs with these longer barrels showed that the drill motor is not yet well tuned to give us sufficient power to drive the core barrel without the motor cutting out. There is still hope that this can be solved, but we chose to switch back to the relatively successful 3 m barrel system (which allows us to recover cores up to 3.5 m long).

During the late morning, the French scientific traverse vehicles arrived in camp. This traverse team had set out from the French station Dumont D'Urville in early November and has been carrying out research at several sites along their route to Concordia Station, including drilling shallow ice cores and collecting the air from the porous firn layer. They will remain about 2km from us until the end of the season, drilling another 120 m borehole to collect firn-air.

Their arrival coincided with the recovery of the first long core of the day (with the shorter barrel) and the marking of the 500 m drillers' depth. Time for a group photo and a little celebration, and Saverio provided us with a bottle of sparkling wine to toast our success.



The arrival of the French scientific traverse on a rather dull cloudy day. (Photo: Mulvaney. Leica SL2-S, 63mm, 1/640, f11 ISO100)

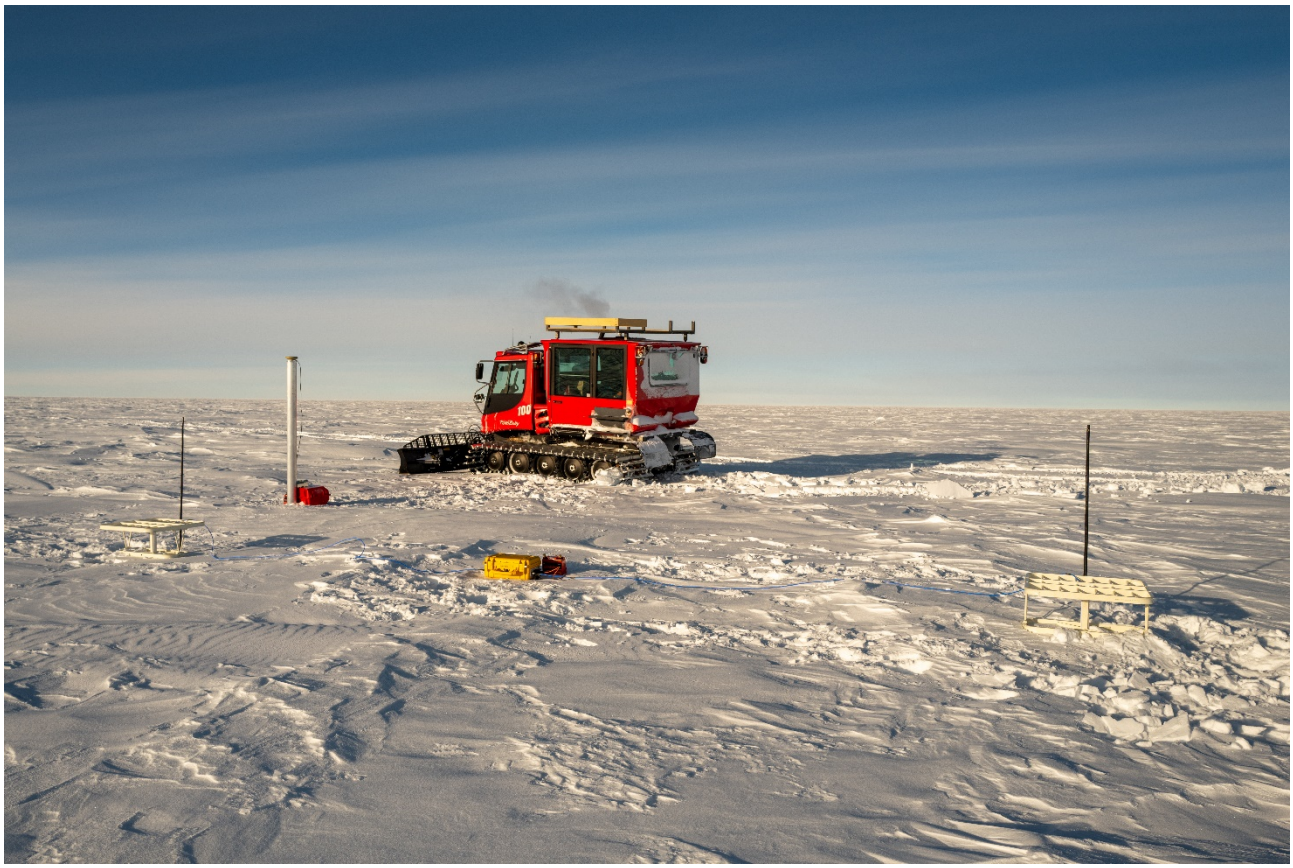


We celebrate the 500 m drillers' depth with all the BE-OIC team and with members of the French scientific traverse team with a perfect 3 m core on the loggers' bench in the background. (Photo: Leica SL2, 16mm, 1/40, f9 ISO100)

For Frank and Robert, the celebration was brief as they had to leave immediately in the PistenBully 100 for Concordia Station to join a Zoom meeting (yes, even in Antarctica) of the BE-OIC Executive Committee to discuss the developments of the past week and make decisions about the project infrastructure at Little Dome C and Concordia for the future seasons. It's a 2.5-hour drive to Concordia and they managed to arrive just a few minutes after the meeting started.

Following that, they had a short break for a cup of tea, then it was time to re-fuel the PB100, load up with some items of food for the BELDC camp, then start driving back.

On the return leg, they diverted 2.5 km off the main road to set up one of the BE-OIC geophysics survey sites with a large diameter aluminum pole for a precise GPS position, and two stakes to mark the positions of the ApRES (Autonomous phase-sensitive Radio Echo Sounder). The two instruments will be allowed to record overnight before being collected and moved to the next survey site.



A geophysics survey site and the PB100 in the late-evening light. The aluminum pole closest to the PB100 carries the GPS antenna. With a recording period of several hours, and some clever post-processing of the data to remove atmospheric and satellite vehicle orbital errors on the signal, the GPS can record a position to cm-scale accuracy. A 'base-station' GPS close to the drill camp records data continuously during the season to allow differential processing of the position between sites to mm accuracy. Revisiting the site to re-survey the pole in subsequent field seasons allows us to calculate the surface ice flow speed and direction. In this area, the horizontal flow speeds are of the order 20 to 80 mm per year. In the foreground are the two ApRES radar antennas, with the yellow box containing the radar electronics. This radar can not only see the bedrock 3000 m below the ice, but also precisely record the depth of distinct layers in the ice. Re-visiting the same site in subsequent seasons with the same ApRES radar and antenna allows us to calculate the vertical component of the ice flow (how fast a grain of ice moves downwards towards the base of the ice sheet). The radar is so sensitive that it can measure the vertical velocity of the ice layers to mm-scale precision through most of the ice sheet depth. (Photo: Mulvaney, Leica Q2, 28mm, 1/1000, f6.3, ISO100)

End of day statistics:

Individual runs of the drill were recorded as: 0.76, 0.65, 3.05, 3.15, 3.21, 3.40, 3.46, 3.40, 3.26, 3.31 m

Drillers' depth: 525.00 m; daily total 27.82 m

Loggers' depth: 528.90 m; daily total 27.50 m

RM and FW, 08 Jan 2023