

## RAPID ACCESS ICE DRILLING TO RECOVER BEDROCK MATERIAL

*Monday 15 September 2025 15:40 (5 minutes)*

The project “Interglacial Collapse of Ice Sheets revealed by Subglacial Drilling of Bedrock”(INCISED) seeks to recover geological samples from beneath the ice sheet for cosmogenic isotope analysis. This ERC Advanced Grant funded project (PI Mike Bentley, Durham) aims to determine the extent of the loss of the West Antarctic Ice Sheet during the Last Interglacial period (approximately 125 kyrs before present) and the consequence for global sea level rise. The approach is to drill a series of boreholes through increasingly deep ice down the slope of several incompletely buried nunataks, taking samples for cosmogenic isotope analysis from the surface rock on the nunatak, and from the bedrock beneath the ice sheet. Cosmogenic isotopes only accumulate when the bedrock is exposed at the surface to cosmic rays, and hence when the ice sheet cover was absent. A series of bedrock samples from progressively deeper ice cover should reveal dateable horizons of when the ice sheet was absent.

Our approach was to deploy the BAS RAID drill, a rapid access drilling system based on a winch and cable suspended motor-driven enclosed auger that had been successfully used in the past for depths of more than 460 m in East Antarctica (Rix et al, 2019) and to 330 m in West Antarctica (Mulvaney et al., 2022), to drill from the surface to the bedrock in a matter of days. Then, the motor and auger barrel of the BAS RAID drill would be replaced by a percussive rock drill (P-RAID), developed by the University of Glasgow, attached to the RAID antitorque section, and deployed to the bottom of the ice borehole using the same winch system to recover a 20 mm diameter core of bedrock material up to 400 mm deep. Once a sample of bedrock had been recovered, the drill system was to be moved to a new site and the ice and rock drilling repeated. Experience with the BAS RAID drill suggested a turnaround at each site of around one week for ice depths of 100 to 250 m. During tests in Antarctica we have drilled two boreholes each of around 175 m, but we have so far not been able to recover basal rock samples.

### References

- Rix J, Mulvaney R, Hong J L, Ashurst D (2019) Development of the British Antarctic Survey Rapid Access Isotope Drill. *Journal of Glaciology* 65 (250): 288-298. <https://doi.org/10.1017/jog.2019.9>
- Mulvaney R, Rix J, Polfrey S, Grieman M, Martin C, Nehrbass-Ahles C, Rowell I, Tuckwell R, Wolff E (2022) Ice drilling on Skytrain Ice Rise and Sherman Island, Antarctica. *Annals of Glaciology* 62(85-86): 311-323. <https://doi.org/10.1017/aog.2021.7>

**Primary author:** MULVANEY, Robert (British Antarctic Survey)

**Co-authors:** Dr FISHER, Emma (British Antarctic Survey); Dr WORRALL, Kevin (University of Glasgow); Prof. BENTLEY, Mike (University of Durham); Prof. HARKNESS, Patrick (University of Glasgow)

**Presenter:** MULVANEY, Robert (British Antarctic Survey)

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