RABID: Drilling to the bed of Rutford Ice Stream, 2004/05

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We report on preparations to access the bed of Rutford Ice Stream, West Antarctica, during the 2004/05 austral summer. Holes will be drilled to the bed using the BAS hot-water drill, used successfully many times over the last 15 years and now upgraded to the required 2.5 km capability. We plan to drill in two locations: first where the bed is believed to comprise dilatant, deforming sediments; and second where the bed is non-deforming and ice motion is by basal sliding. Sediment samples will be retrieved from the bed using a gravity corer. Short sections of ice will also be collected at specific target depths, using a hot-water corer. Tethered stakes (copies of the CalTech design) will be inserted into the bed, to detect differential motion between the basal ice and the bed. Instruments measuring water pressure, temperature, tilt and orientation will be deployed in the boreholes. Sensor packages will span the whole ice column but will be concentrated towards the bed. On the surface there will be a combined network of GPS receivers and passive seismic recording stations. These will be supplemented by seismic reflection and shallow radar (GPR) surveys. Finally, we are in the process of arranging a collaboration with NASA-JPL to enable their upgraded high-resolution video camera to be deployed in the boreholes.

The project will contribute to a number of research areas, including:
1. West Antarctic Ice Sheet history in the Weddell Sea sector
2. Ice Stream basal processes and conditions
3. Ice Stream dynamics

Preparation for this project has already been underway for more than 4 years. The field location is 1300 km from the main support base at Rothera and everything must be input by Twin Otter. A depot containing 200 fuel drums and approximately 15,000 kg of equipment (mostly for drilling) was completed at the end of the 2003/04 season. A further 9,000 kg of equipment will be deployed, along with up to 8 personnel, for the field project itself.