



Ice Drilling Program

Dartmouth _ University of Wisconsin-Madison _ UNH

DOCUMENT IDENTIFICATION	
Title:	SCIENCE REQUIREMENTS: BASAL ACCESS AND SUBGLACIAL EXPLORATION (BASE) DRILL
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DOCUMENT APPROVAL	
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REVISION HISTORY (maintain last 3 versions)			
REV	DESCRIPTION	DATE	APPROVAL
1.0	Initial Science Requirements	April 2022	Schaefer, Briner, Goehring
2.0	Updated Science Requirements	November 2023	Schaefer, Briner

Science Requirements: Basal Access and Subglacial Exploration (BASE) Drill

Background:

The 2021 IDP Long Range Science Plan identified science goals for ice drilling that spanned a wide range of science targets, including a goal to develop a better understanding of the extent and volume of glaciers and ice sheets under paleoclimatic conditions warmer than the present. Cosmogenic nuclides in rock beneath glaciers and ice sheets can reveal former ice sheet extent and the timing and duration of past exposure periods. Under ice approximately 200m thick and less, logistically nimble methods for recovery of rock cores are needed for use near outcrops and near the ice margins. From discussions between representatives of the research community and with IDP, the following are the science requirements for the BASE Drill:

Scientific Requirements

1. Produce 200 m borehole to base of ice with drilling and retrieval of 10 m of bedrock core and / or unconsolidated frozen sediment core.
2. Drilling will include the possibility that the ice is entrained with rocks and vice-versa.
3. Ice drilling will be to dry, frozen-bed conditions, and will not be done in areas where there is subglacial water.
4. Retrieve several short ice cores (~50 cm long) at up to 200 m depth.
5. Ice drilling may be in ice that is within 2.0 C of the pressure melting point.
6. Required ability to drill at ice borehole temperatures as low as -40 C, and surface temperatures as low as -30 C.
7. Retrieve 10 m of bedrock cores with minimum 33 mm diameter beneath the ice sheet.
8. Maximum site altitude for the design should not impede drill performance; if possible maximum of 4,000 m for drilling in alpine glaciers.
9. Maximum time at a site, including set up and core retrieval, should be 6 days.
10. Stand-alone capability is needed for operation at small field camps at remote sites.
11. Minimal staff (3) for drilling operations in the field.
12. Drilling fluid or a fluid "system" (to be determined) will be immiscible with water.
13. Drilling fluid should not be a boron-rich fluid.
14. Fuel should be gasoline.
15. Drill system must be transportable by Twin Otter, or helicopter with sling load.
16. Drilling depth of each core collected should be determined and recorded.
17. Drilling and core handling history should be recorded.

Notes: *Transport of the drill system and fluid by either Twin Otter or helicopter may require more than one flight.*