Subglacial Aquatic Environments Access Drilling

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Subglacial Environmental Code of Conduct:

• NSF and SCAR Code of Conduct require that any project where subglacial water or saturated sediment is present at the base [ice coring or access drilling] – regardless of whether or not there is biology in the project will require clean access

• Requirements: clean instruments and clean drilling water (less then $10^2$ cells/mL)

• WISSARD technology:
  • Filtration (0.2 um), UV treatment and pasteurization of drilling water
  • Instrument cleaning with hydrogen peroxide and UV treatment

• Need for additional Clean Access approaches for other drills
Drilling Target 1: South Pole Lake

Peters et al. 2008
Drilling Target: South Pole Lake

• Approximately 7–8 km from South Pole Station (and current storage site for Ice Cube drill)
  • 4.2 km wide, 10 km diameter
  • In a basin of thick sedimentary strata
  • 30 +/- 10 meters of water
  • Evidence for sediments 100m +/- 60m
  • Estimated Fuel needs: ~5,000 gallons/hole for 55 cm
Science Drivers

**Biology:**

Descriptive: Community structure (distribution) and function (diversity, productivity) of microbial communities in basal ice, water column and sediments

Adaptation to cold, dark isolation

Comparison of community structure to other subglacial environments (Whillans, Ellsworth, Vostok accretion ice, Blood Falls, Kamb sediments, etc.)

Revision of Code of Conduct?

**Geology:** Paleoclimate/paleoenvironment records, lake basin origin, subglacial erosion and sedimentation, regional geology from sediment provenance

**Glaciology:** Ice rheology, subglacial hydrology (including temporal dynamics), ice temperature, heat budget
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Conclusions

- Need clean access drill
- Hot water best for clean access
- One borehole can be kept open to great depth even in cold parts of the continent
- If EHWD (Ice Cube) Drill is available, this is the most efficient way to go
- Otherwise, need a copy version customized for clean penetration (proven technology)
- SP Lake, Vostok, Wilkes Basin, Deep WAIS