Subglacial Aquatic Environments Access Drilling

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Subglacial Environmental Code of Conduct:

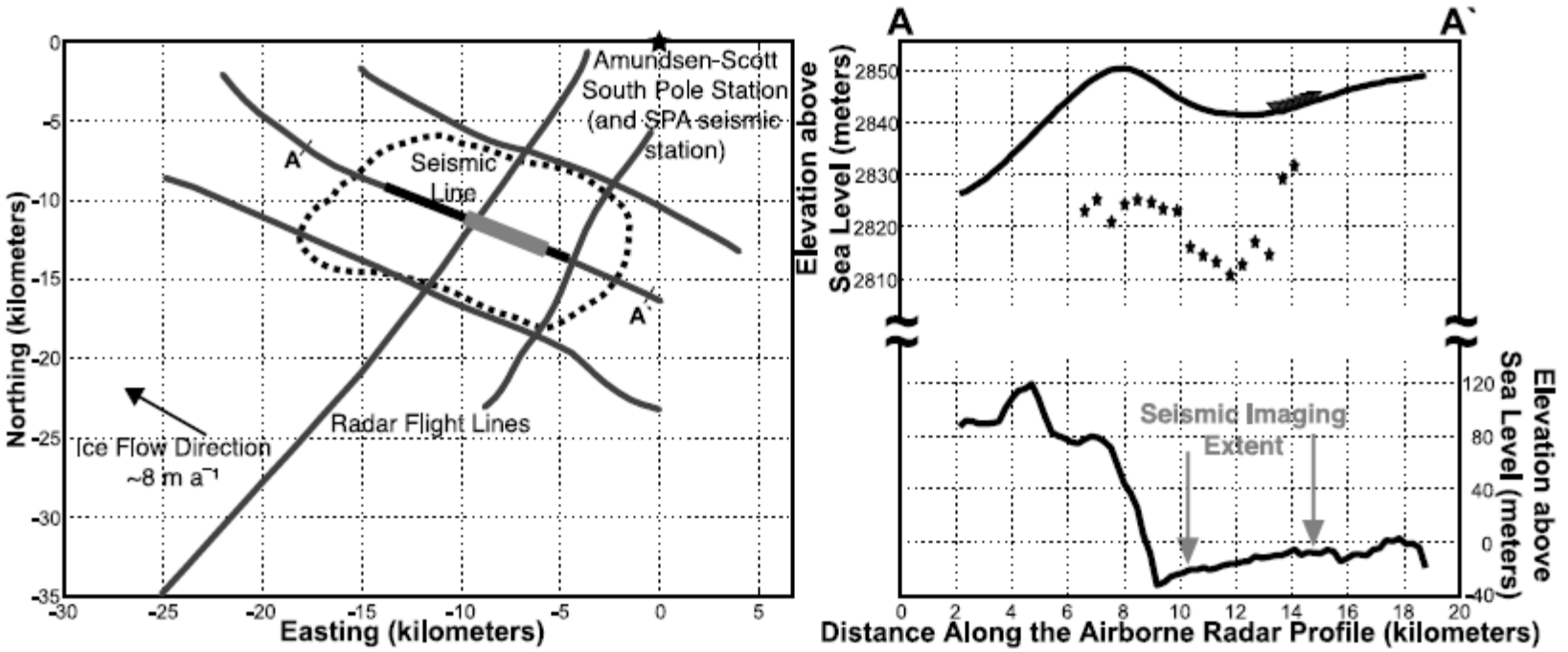
•NSF and SCAR Code of Conduct require that any project where subglacial water or saturated sediment is present at the base [ice coring or access drilling] – regardless of whether or not there is biology in the project will require clean access

•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

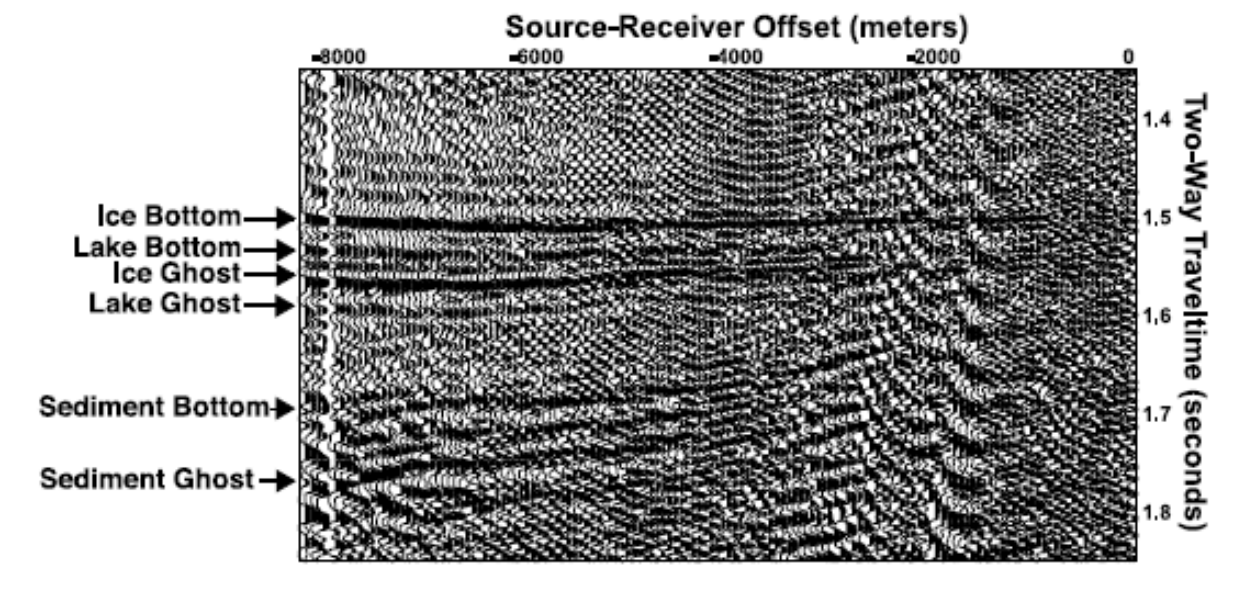
• Need for additional Clean Access approaches for other drills

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

Timeline for South Pole Lake

	2010				2011				2012				2013				2014				2015				2016				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Submit Science Proposal to NSF							X																						
Science planning									X	X	X	X	X	X	X														
Reconnaissance – seismic, drill refurbishment, camp set up at South Pole Lake																X	X												
Field Season																				X	X								

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