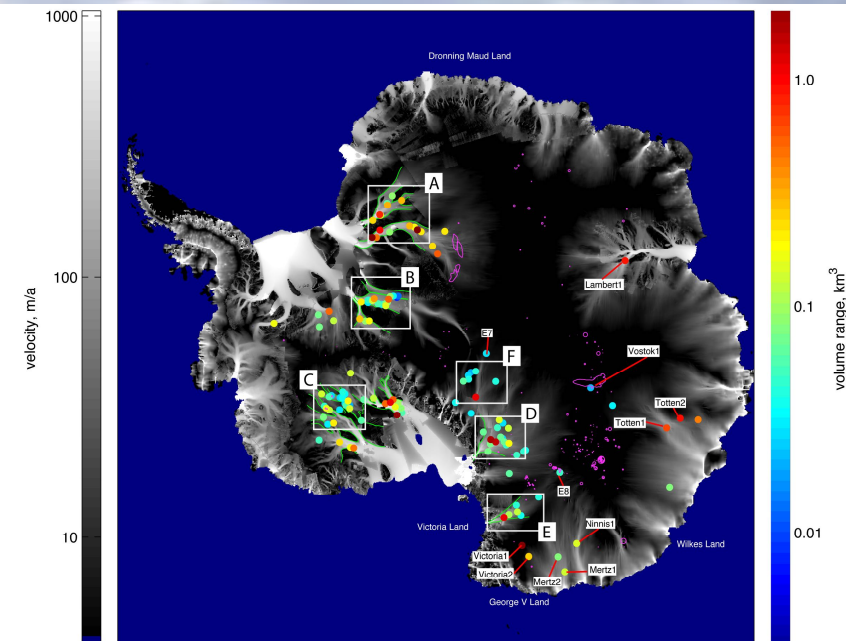




Going deep: drilling targets beyond meteoric ice (FASTDRILL flashback)

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2002 FASTDRILL Workshop
Interdisciplinary Polar Research Based on Fast Ice-Sheet Drilling



***FASTDRILL: Interdisciplinary
Polar Research Based on Fast
Ice-Sheet Drilling***

**Report of an NSF-Sponsored Workshop Held at University of
California, Santa Cruz, October 23-25, 2002**

<http://www.es.ucsc.edu/~tulaczyk/fastdrill.htm>

Scientific applications of a fast access drill:

- Opening of access to subglacial lakes and water drainage systems;**
- Detection of life in ice through sampling and borehole logging;**
- Subglacial geologic sampling to improve understanding of the Antarctic Plate;**
- Measuring the physical properties of the Antarctic crust;**
- Investigation of basal conditions and their control on ice sheet motion and stability;**
- Ice rheology studies;**
- Acquisition of paleoclimate data through targeted sampling of ice and subglacial sediments;**
- Logging of climate proxies with geophysical tools;**
- Borehole paleothermometry;**
- Search for Eemian and older ice, and**
- Site selection for deep ice cores.**

FASTDRILL Biology – Life in Icy Environments

Drilling targets:

1. Subglacial lakes
2. Subglacial sediments (wetlands)
3. Basal ice
4. Englacial environments
5. Grounding zones and sub-ice shelf environs




FASTDRILL Geology:

Geodynamics,

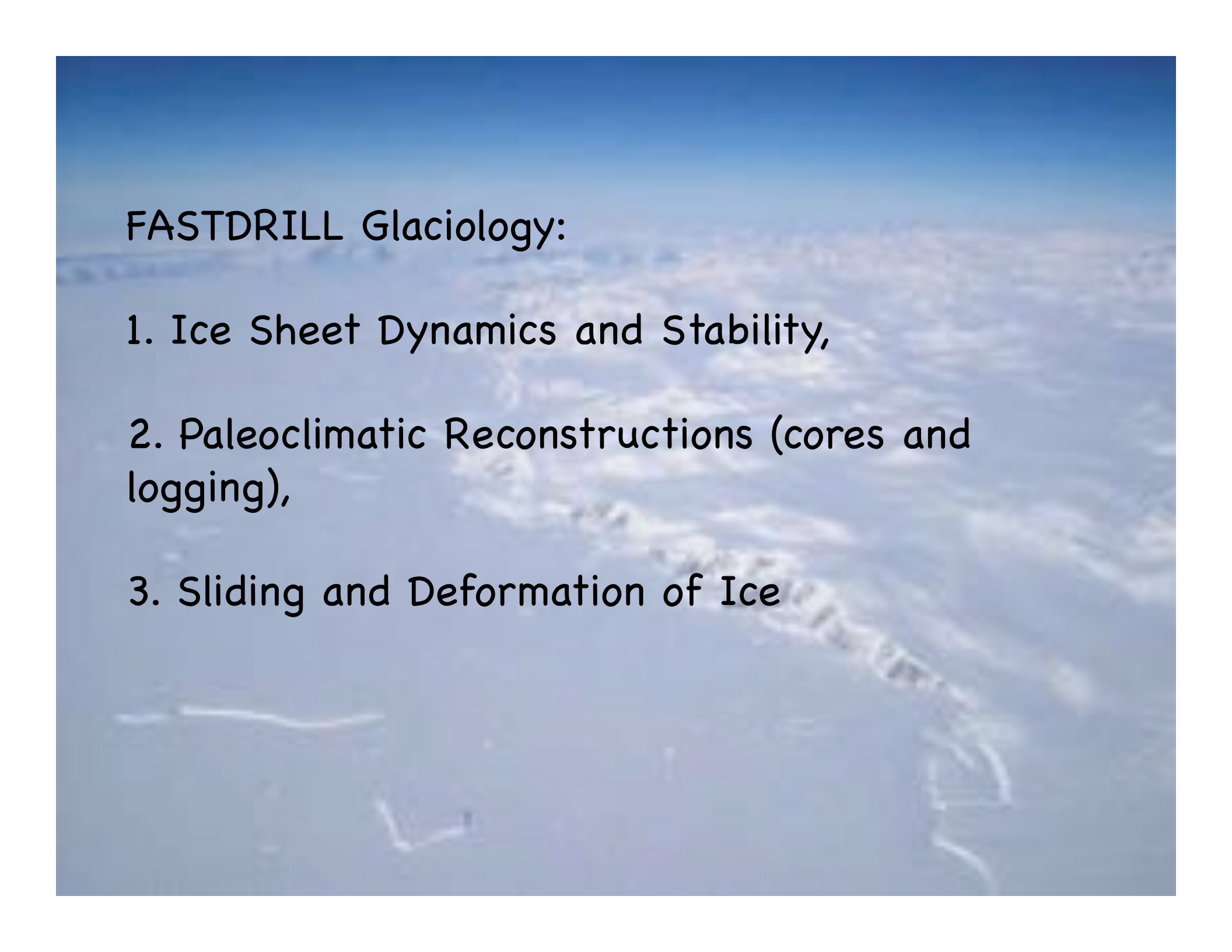
Geological Controls on Ice Sheet Behavior,

Climate History



FASTDRILL Geology Drilling Targets:

1. Gamburtsev Subglacial Mountains,
2. Subglacial Volcanoes,
3. Grounding Zones and Sub-Ice Shelf Environs
4. Sedimentary Basins (Rift and Epeirogenic)

An aerial photograph of a vast, flat, white ice sheet under a clear blue sky. The ice surface is mostly uniform in color but shows subtle textures and some darker patches, possibly indicating different ice types or meltwater. The horizon is visible in the distance.

FASTDRILL Glaciology:

1. Ice Sheet Dynamics and Stability,
2. Paleoclimatic Reconstructions (cores and logging),
3. Sliding and Deformation of Ice

FASTDRILL Glaciology Drilling Targets:

1. Eemian and older ice,
2. Inland WAIS divide (WAIS Divide)
3. West Antarctic transect from Ross to PIG (WISSARD and PIG projects),
4. Antarctic Peninsula (LARISSA)
5. Head of NE Greenland ice stream
6. Measurements of geothermal flux (WISSARD)
7. Hydrologic connections between subglacial lakes
8. Lake accretion ice

An aerial photograph of a vast, white glacier landscape. A prominent, dark, winding line runs diagonally across the middle of the frame, representing a divide or a crevasse in the ice. The surrounding ice surface is textured with subtle ridges and depressions.

Science goals common to at least two disciplines:

1. Understanding of subglacial hydrology on regional and continental scales (biology and glaciology)
2. History of ice sheet behavior (geology and glac)
3. Studies of sub-ice shelf processes (bio and glac)
4. Distribution and assemblage of microbes in ice cores (biology and glaciology)
5. Improved understanding of Earth's climate (geology and glaciology)

An aerial photograph of a vast, cracked ice sheet in Antarctica, showing a network of white and blue fissures across a pale blue landscape. The image serves as a background for the text.

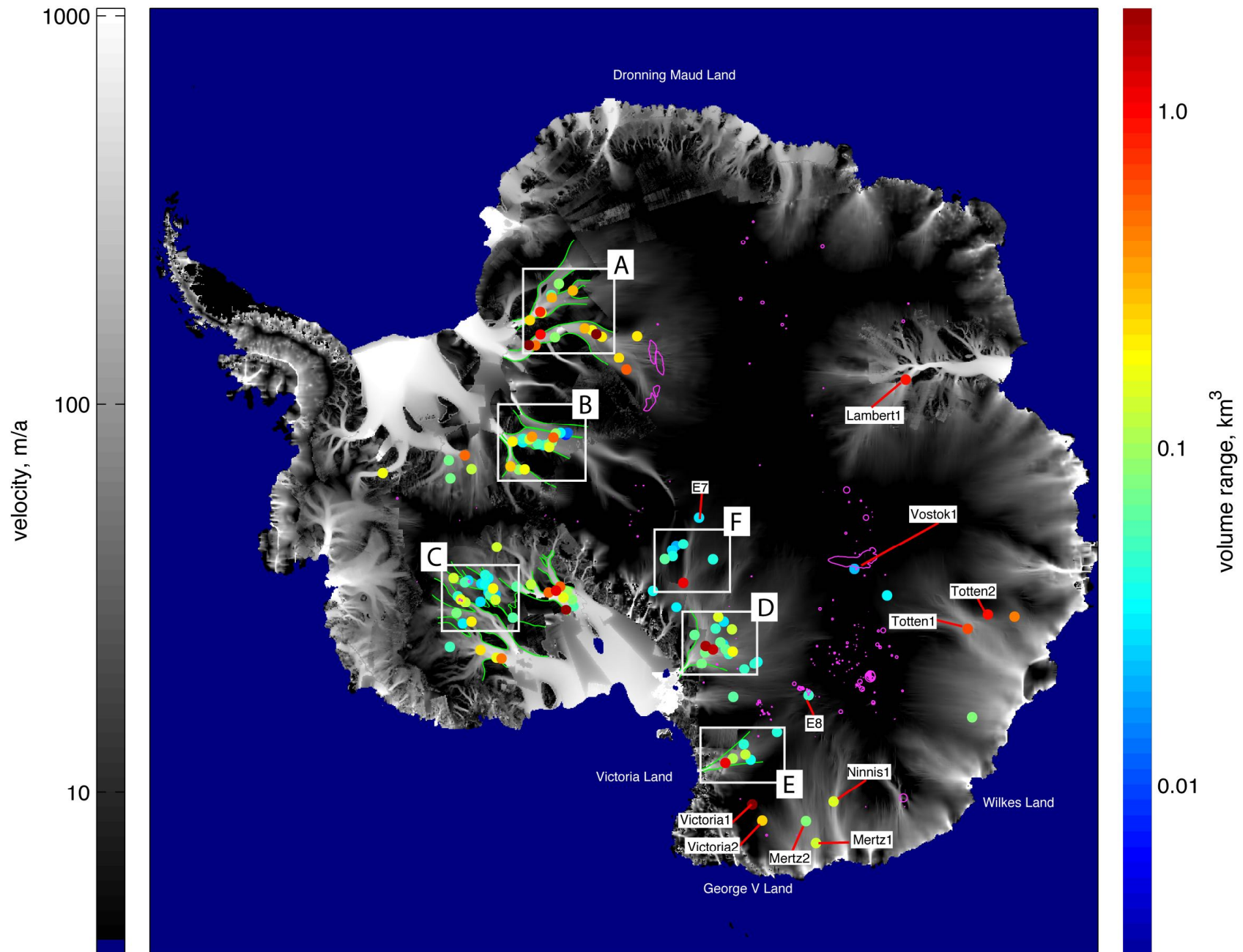
Drilling targets common to at least two disciplines:

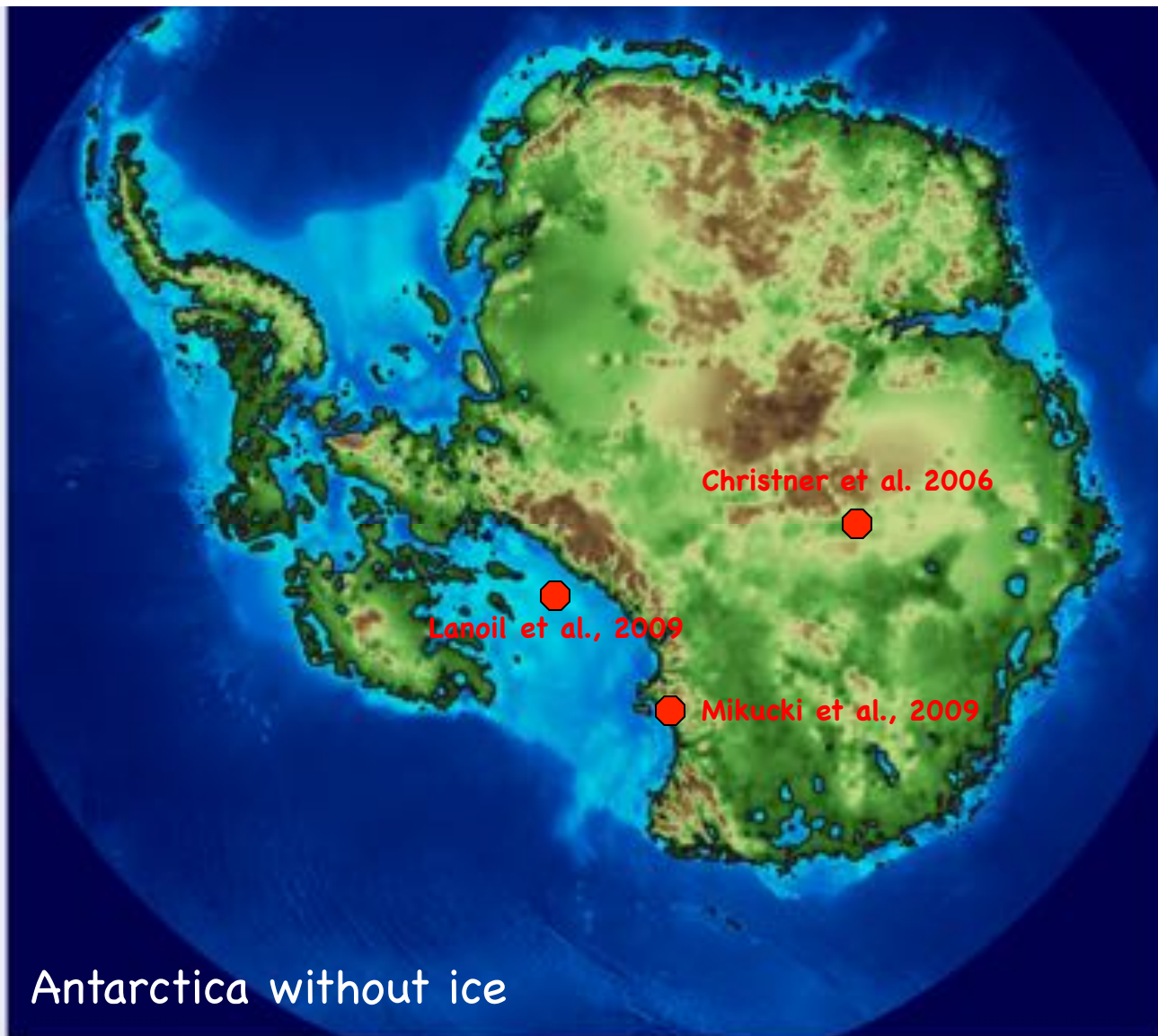
1. Antarctic subglacial lakes and other elements of subglacial hydrology
2. Basal accretion ice
3. West Antarctic ice sheet transect
4. Gamburtsev Mountains
5. NE Greenland or other geothermal/volcanic areas

FASTDRILL enabling capabilities:

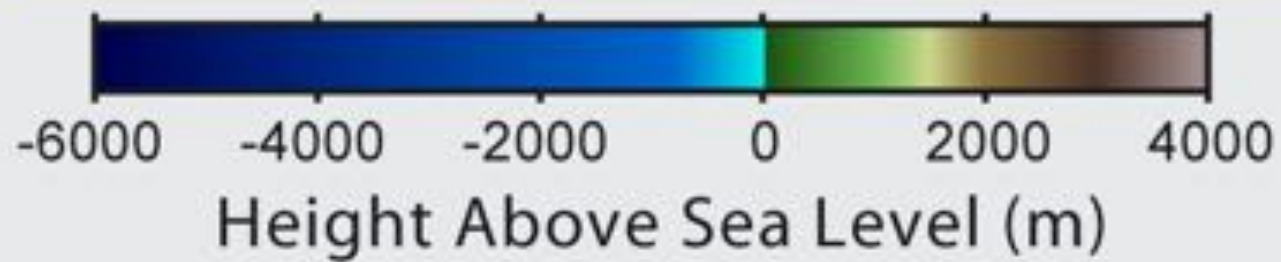
1. Rapid drilling rate
2. Drill rig mobility
3. Recovery of short ice cores
4. Provision for deployment of geophysical and chemical sensors
5. Suitability of boreholes for logging
6. Directional drilling
7. Telemetry during drilling
8. Access for AUVs and ROVs
9. Ability to recover geologic cores (10–1000m)

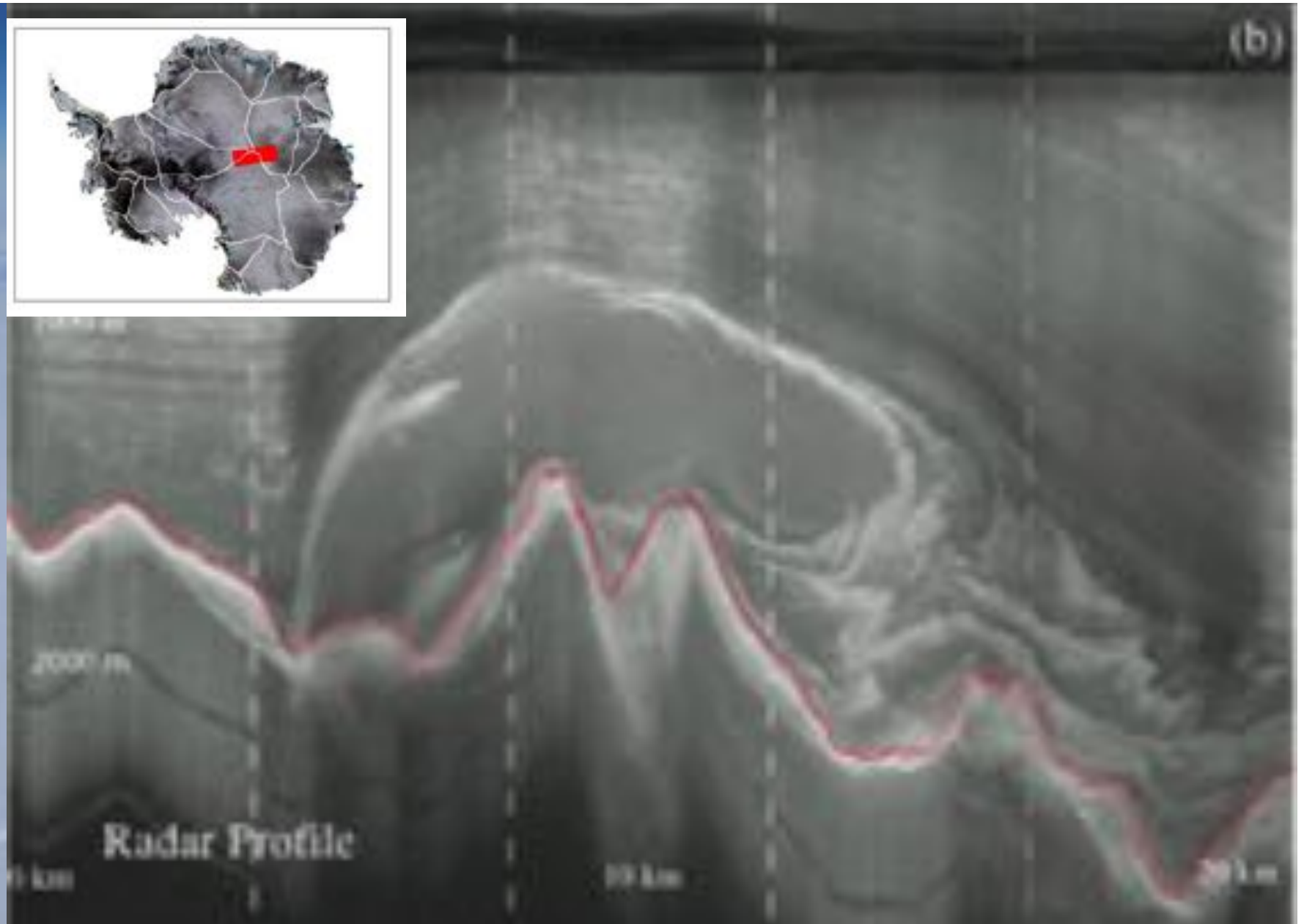
>120 active subglacial lakes mapped out in 2003–08





Antarctica without ice





Antarctica's frozen 'lakes' - flowing subglacial water freezes to the underside of the ice sheet (Bell et al., 2011)



Ice base seen from a subglacial water cavity below 1200m of ice

1049. 30m

