Hot water drilling

— for future projects in Antarctica —

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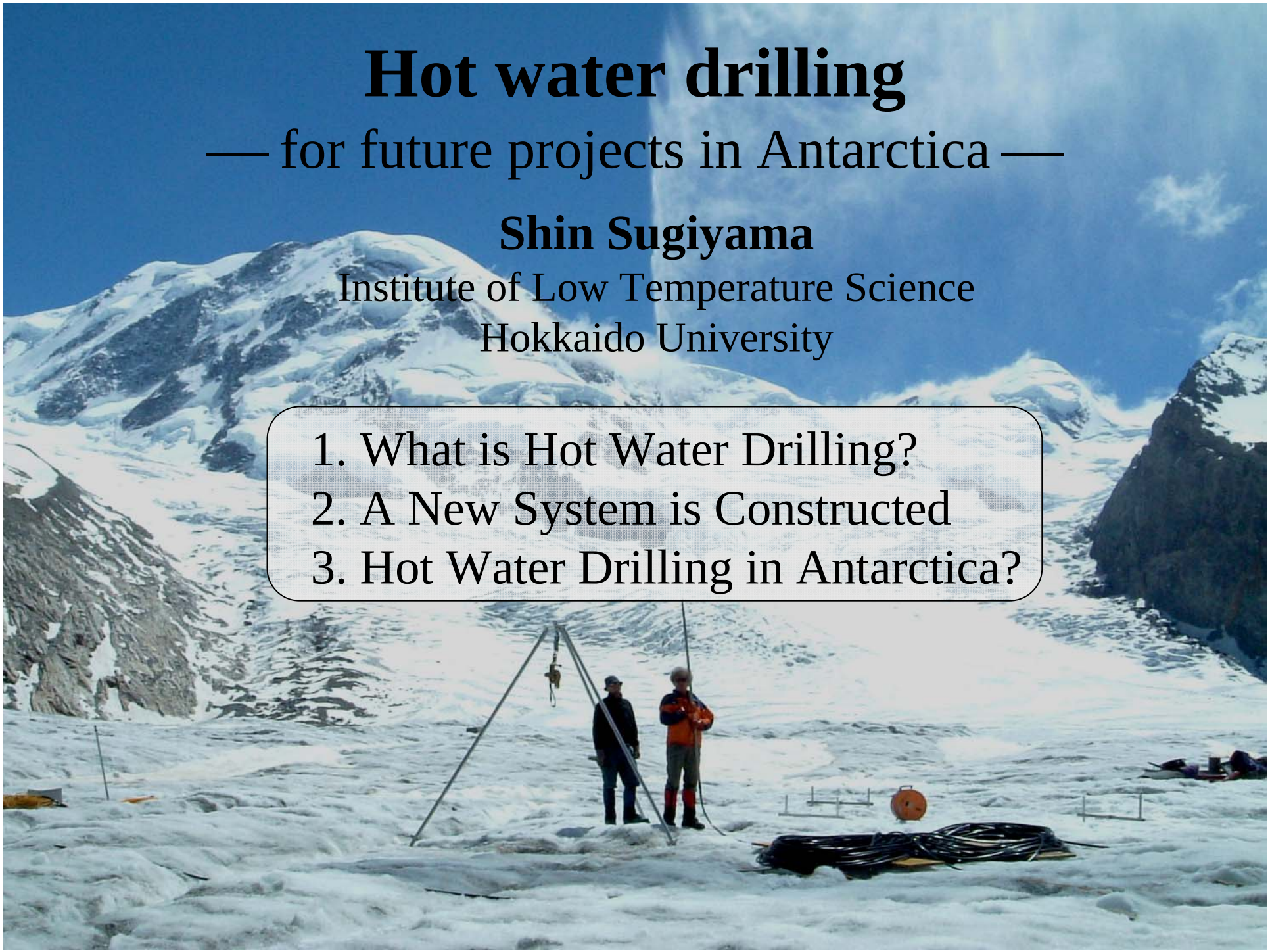
1. What is Hot Water Drilling?
2. A New System is Constructed
3. Hot Water Drilling in Antarctica?

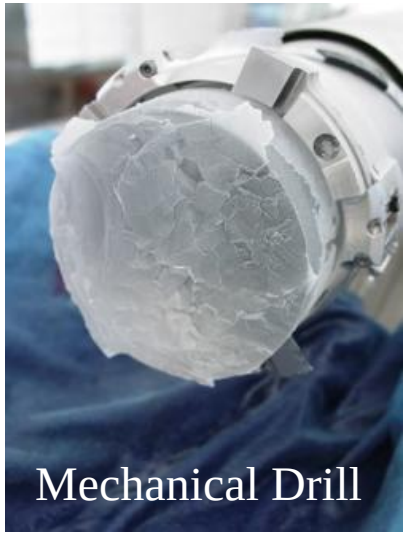


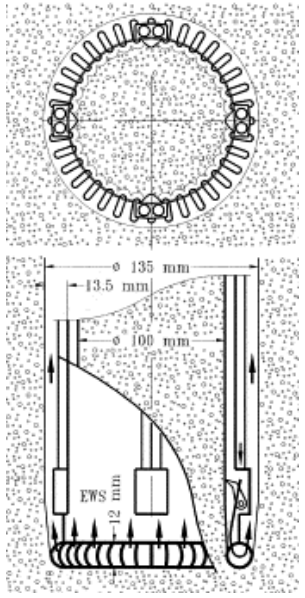
Ice Drilling Devices

Hand Drill

Steam Drill

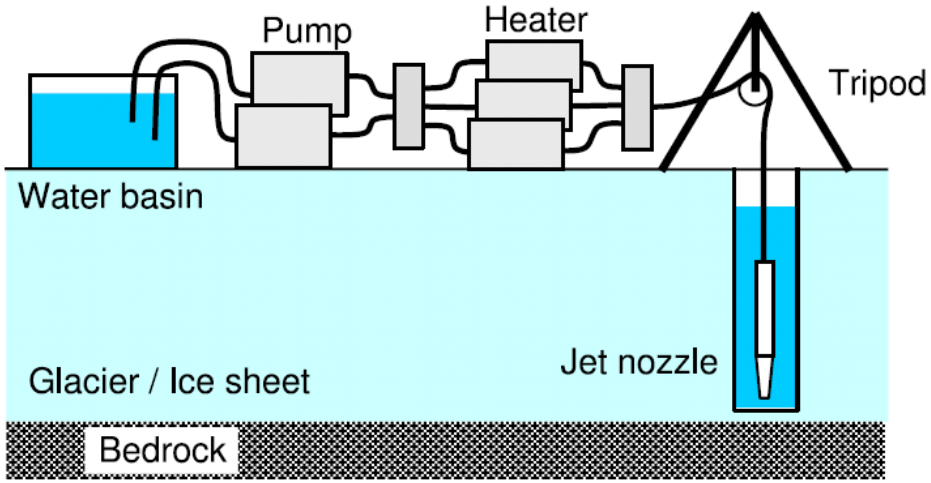
Ice Core Drill

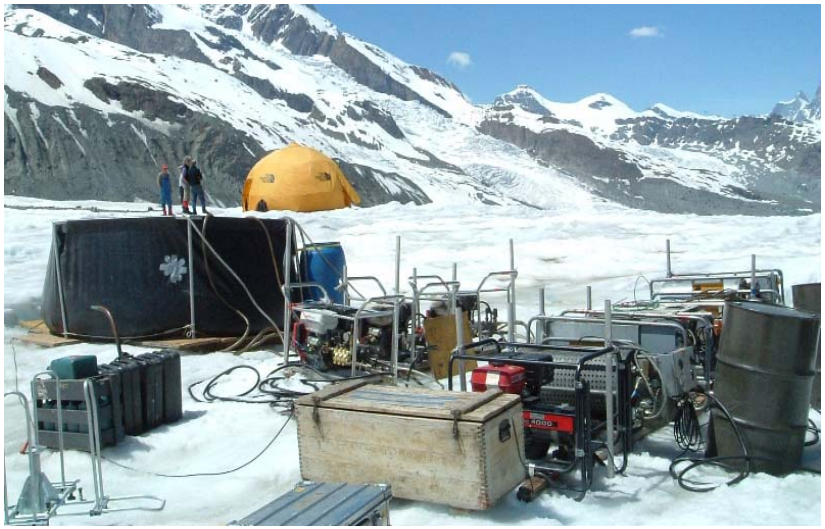


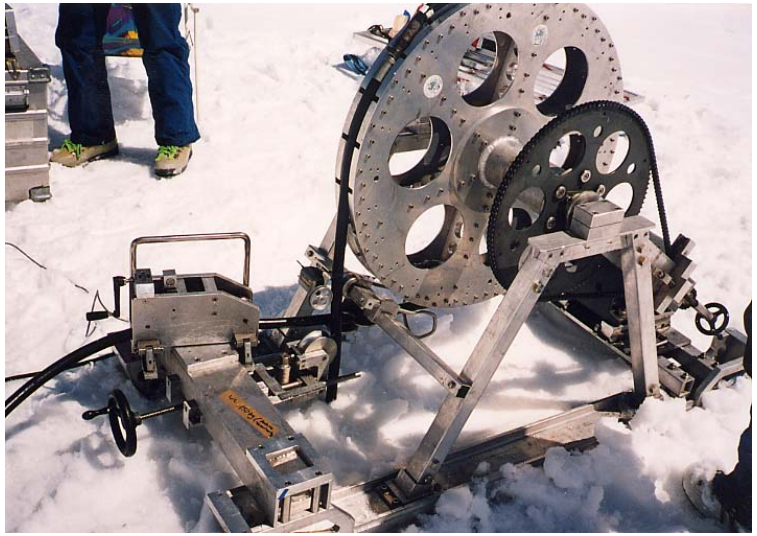


Thermal Drill

Hot Water Drilling System







Why Hot Water Drilling?

1. It drills fast (50 – 100 m h^{-1}).
2. Device is simple and cheap.
3. Operation is easy.
4. It drills cold and temperate ice.
5. It is mobile.

>> A new system is constructed for
300 m drilling in a temperate glacier.

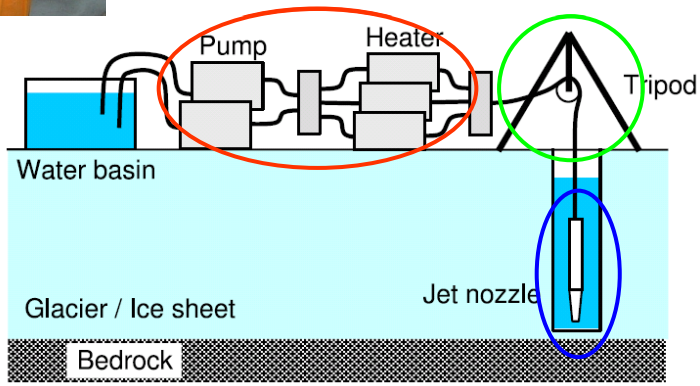
Hot water drilling system

Pressure: 6-21 MPa

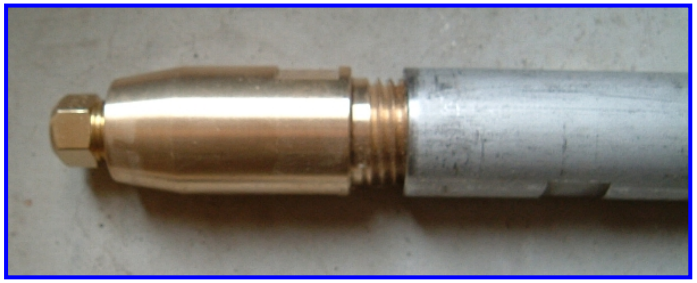
Flow rate: 450-900 *l* h^{-1}

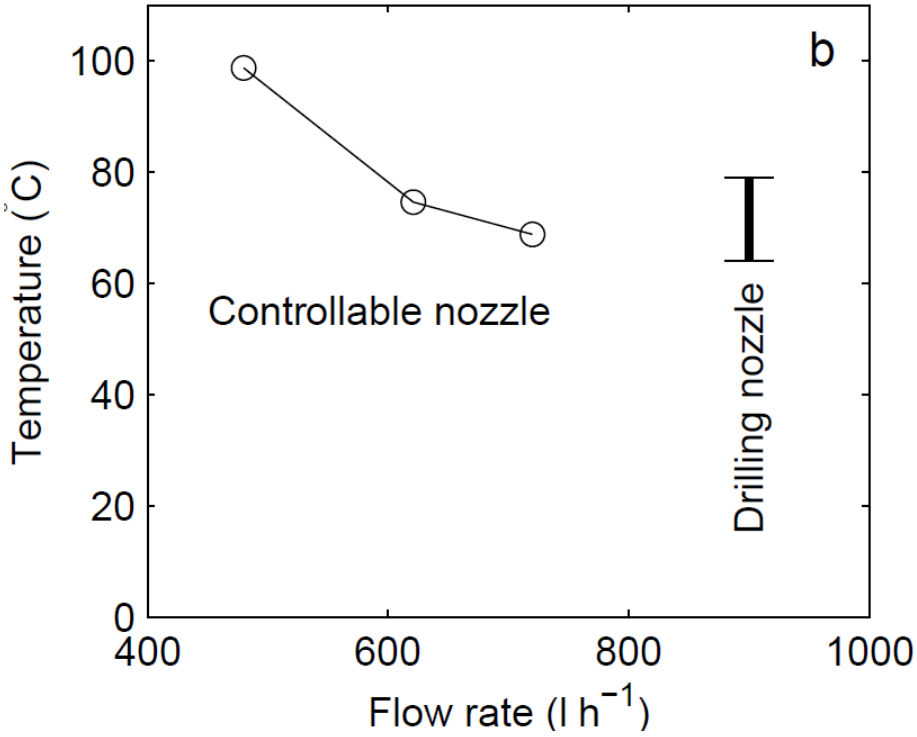
Temperature: 140 ºC

Water basin: 3000 *l*



Water Temperature





Nozzle diameter: 2 mm

Temperature: 70 ºC

Pressure: 8 MPa

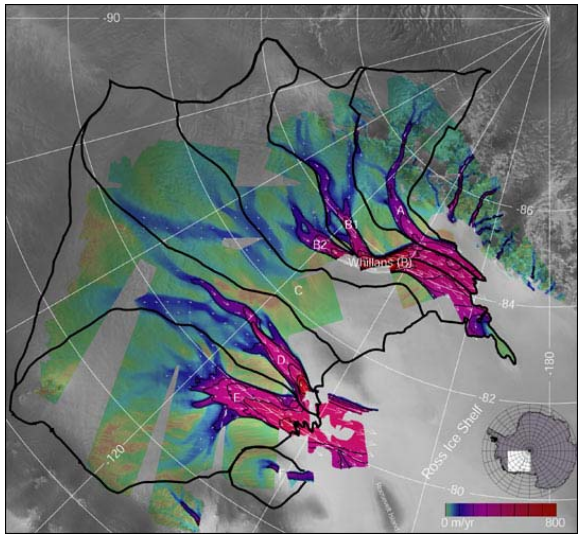
Flow rate: 900 *l* h^{-1}

Test Drilling

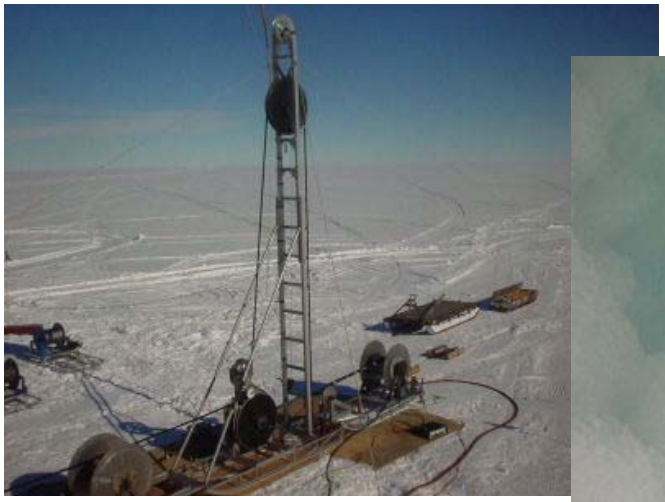
Test Drilling in summer 2007

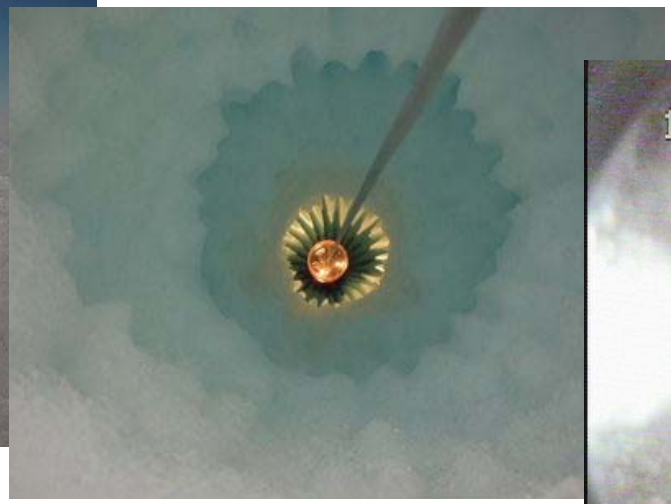
— Rhonegletscher, Switzerland —

Hot water drilling in Antarctica

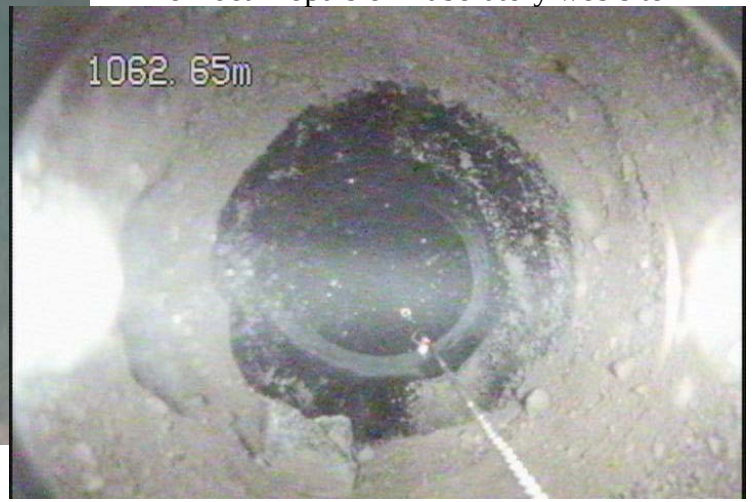


Joughin and Tulaczyk, 2002

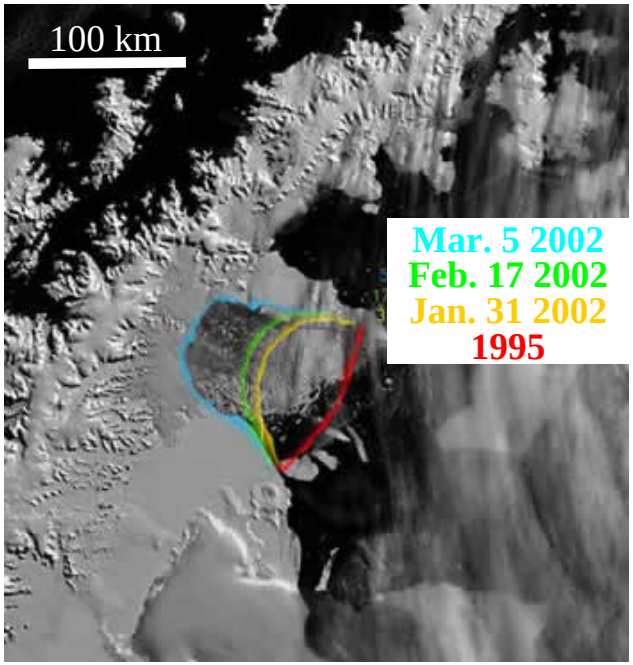


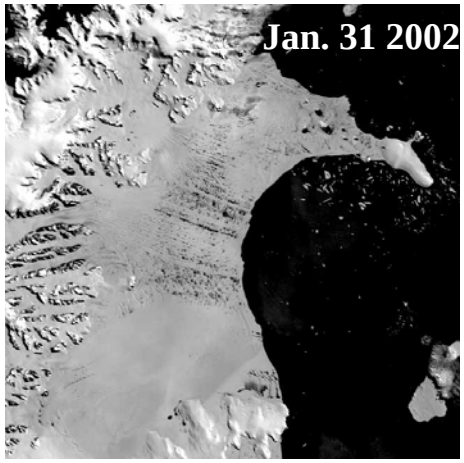


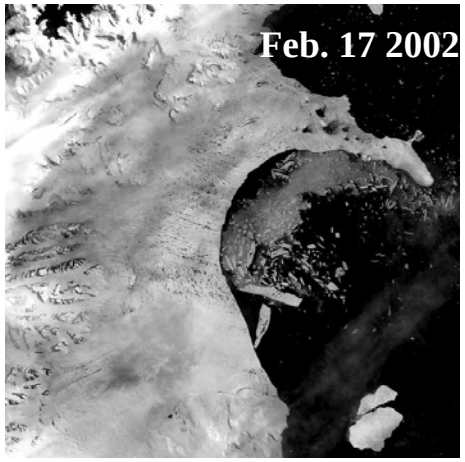
from Jet Propulsion Laboratory web site

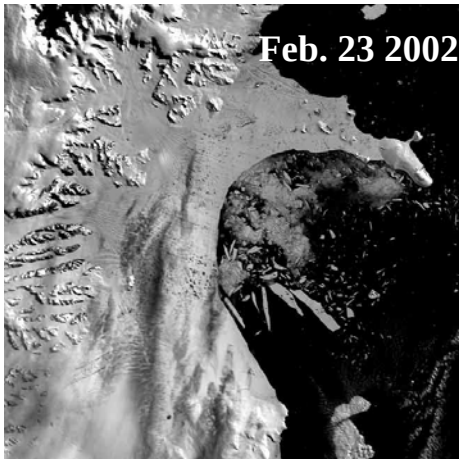


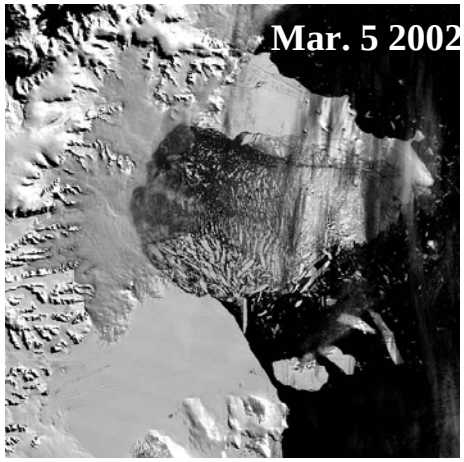
Collapse of Larsen B Ice Shelf in 2002





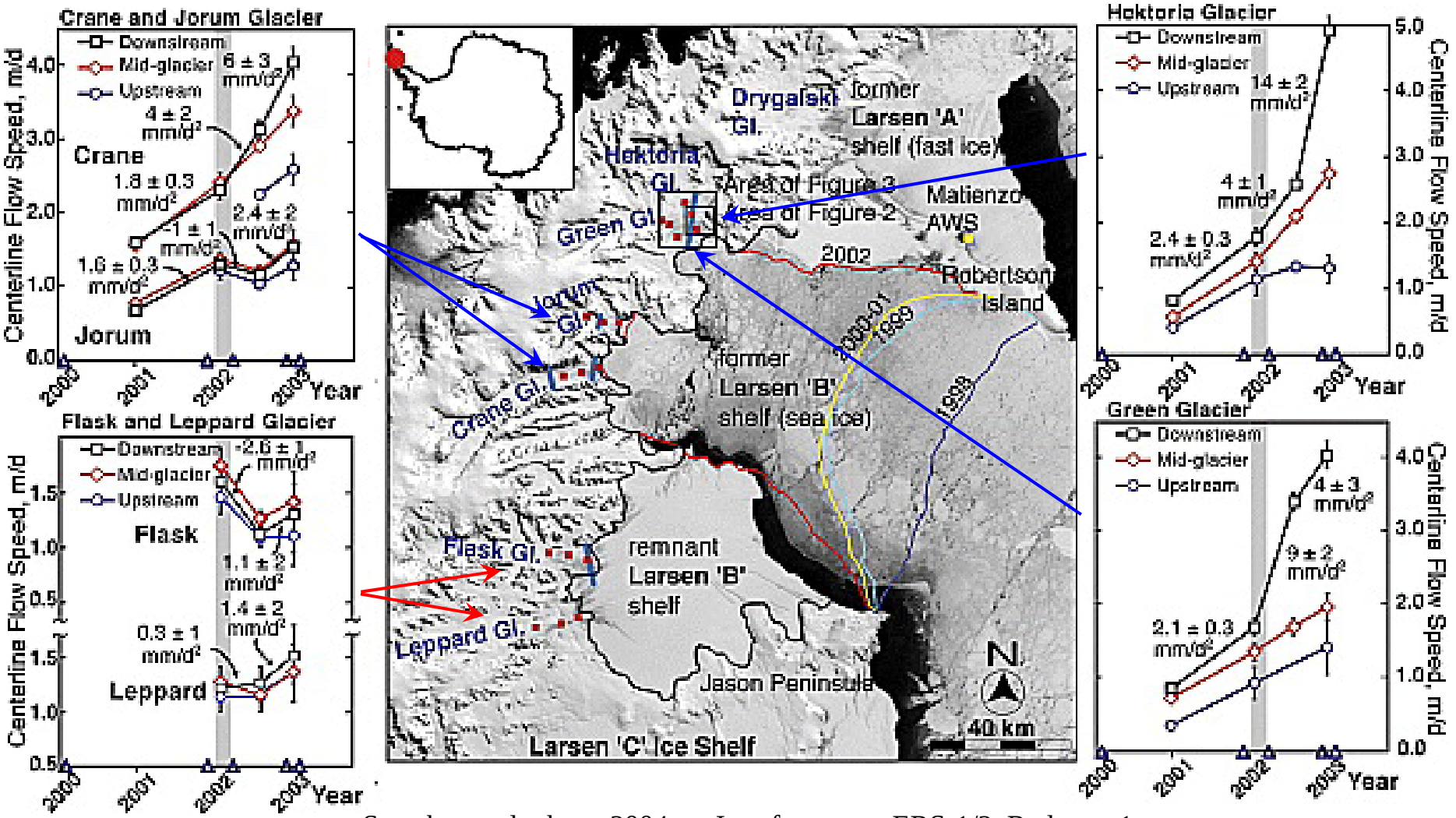






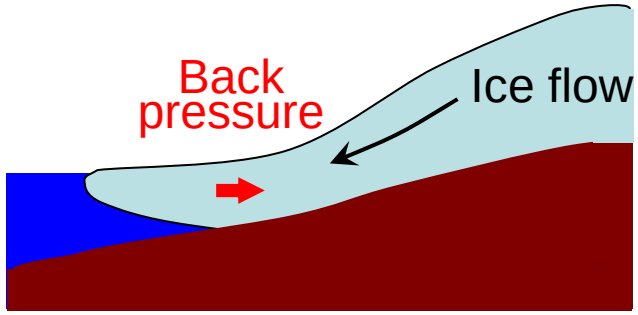
National Snow and Ice Data Center, University of Colorado, Boulder

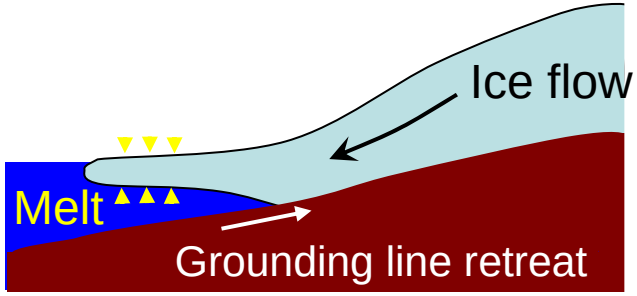
Glacier acceleration after the ice shelf collapse



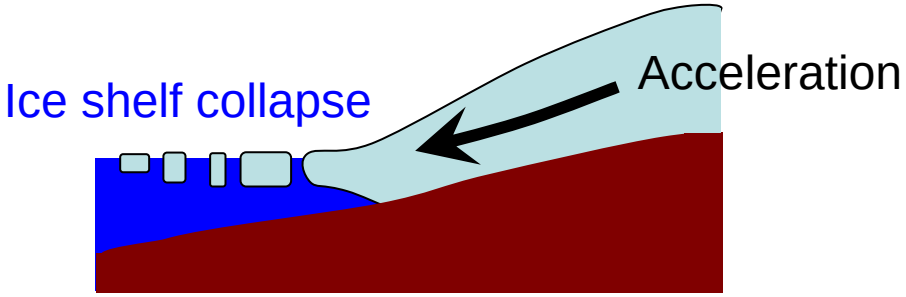
Scambos and others, 2004 Interferometry ERS-1/2, Radarsat-1

Antarctica is Losing Mass by Rapid Ice Discharge?

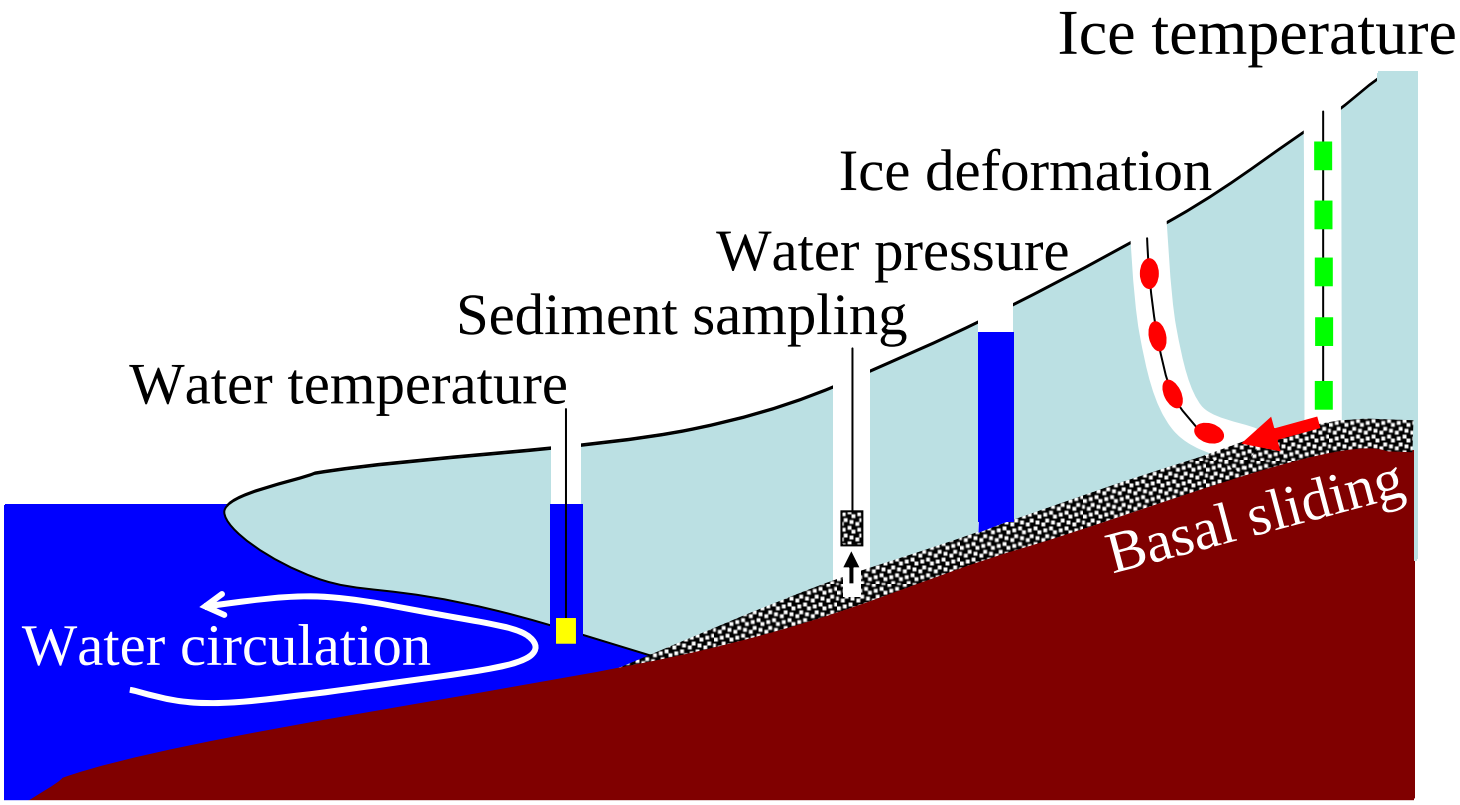




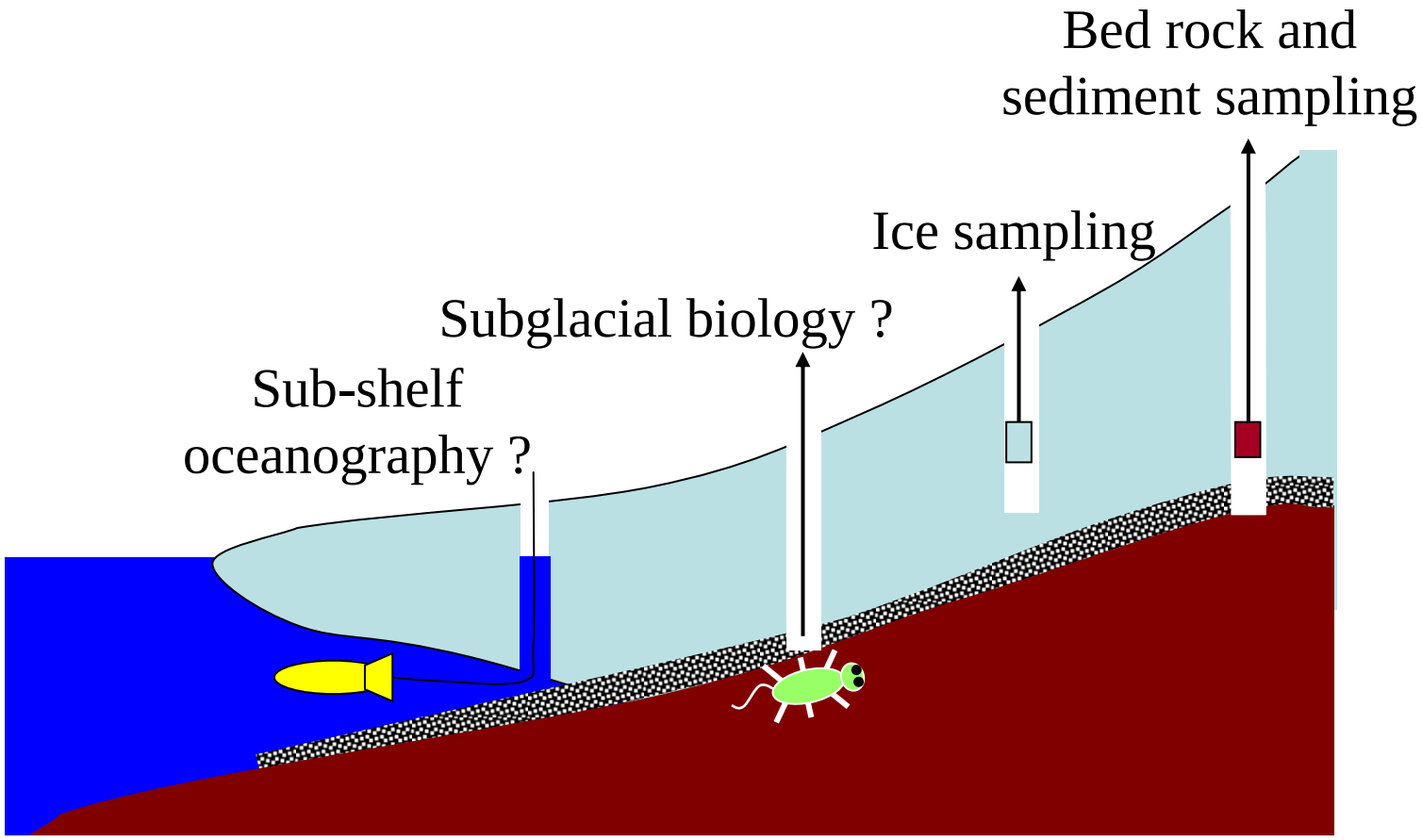
1. Ice shelf melts.
2. Grounding line retreats.
3. Ice shelf collapses.
4. Ice flow accelerates.
5. Ice sheet loses ice mass.



Bore Hole Measurements at the Coastal region of Antarctica



Use of Boreholes for other interests



Conclusion

1. Hot water drilling is fast, easy, cheap and mobile.
2. A new drilling system is tested this summer.
3. Borehole measurements are important to understand the dynamic changes in Antarctica.