Vibracoring in lakes and on landslides

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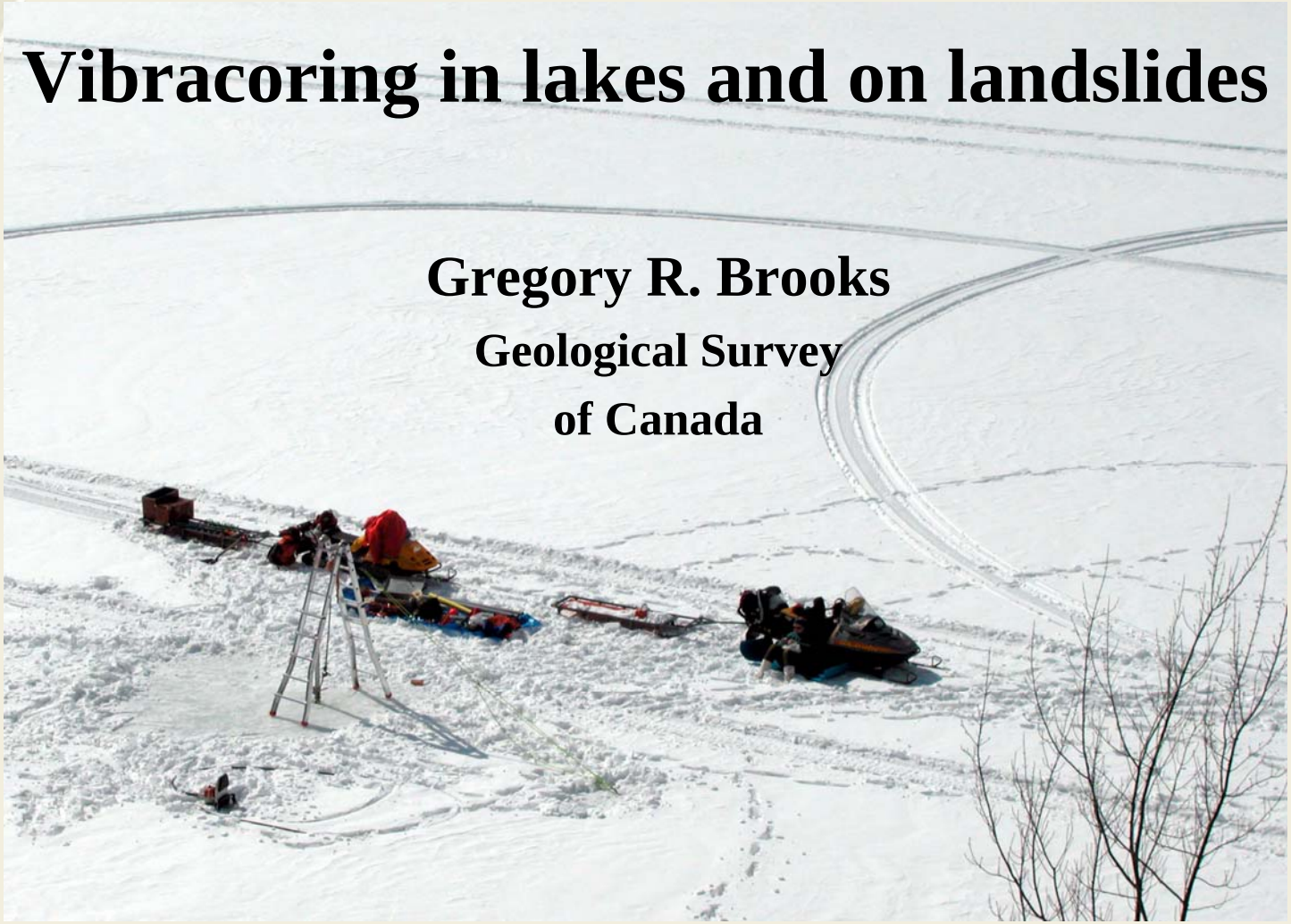
Geological Survey of Canada



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Basic principles

- Vibrating core barrel liquefies immediately surrounding sediment
- Core barrel sinks into the sediment column

Basic principle

- Vibrating core barrel liquefies immediately surrounding sediment
- Core barrel sinks into and around the underlying sediment column

My applications

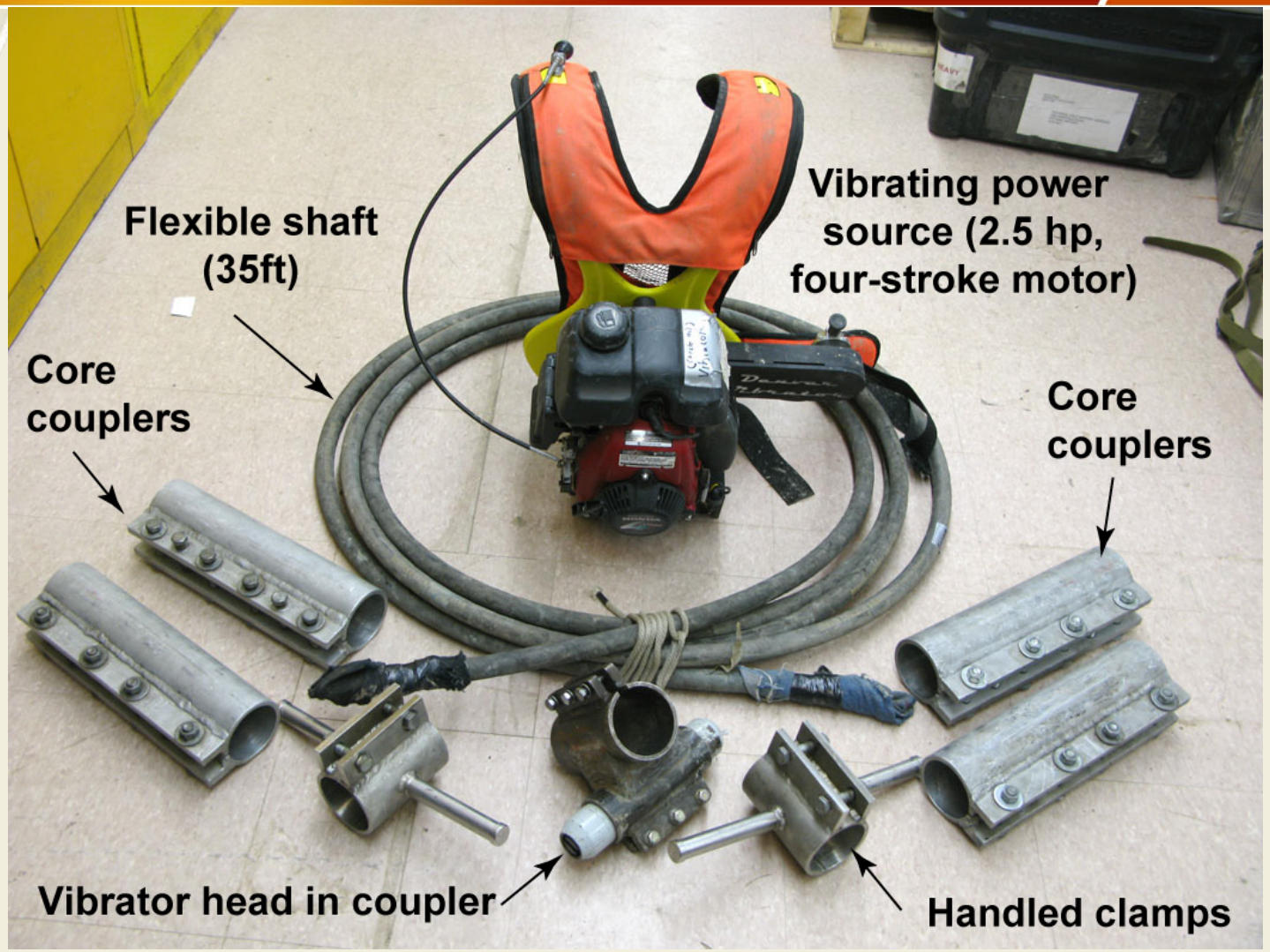
- Investigation of Holocene lake basin deposits along the North Bay outlet of the upper Great Lakes (Climate Change Program)
- Dating prehistoric Leda clay landslide deposits in National Capital Area (Public Safety Geoscience Program)

Applications by others

Includes:

- Floodplain deposits
- Deltaic deposits
- Beaches
- etc.

Basic equipment



Core barrels

- 8 ft long aluminum irrigation pipe
- 3 inch OD
- 0.0625 inch (1/16 inch) side wall
- Length limited by shipping and transporting constraints

Lengthening the core barrel

- Core couplers

Core catcher

All set up and ready to GO!

OK - Now what?

Hoist core barrel

- Shallow core (less than ~ 2 m)
- Muscle power!

Hoist core barrel

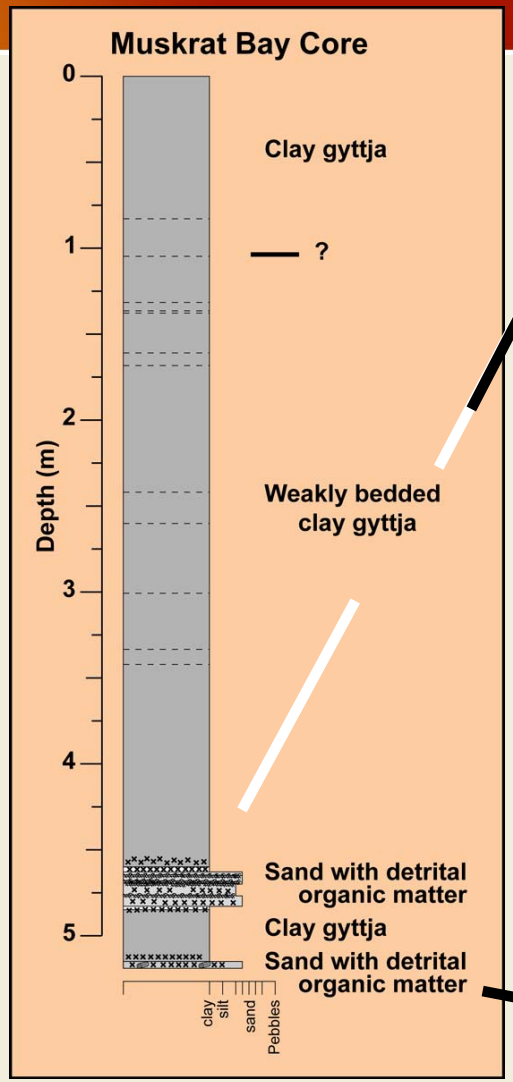
- ‘Jaws’ collapsible ladder as a winching frame

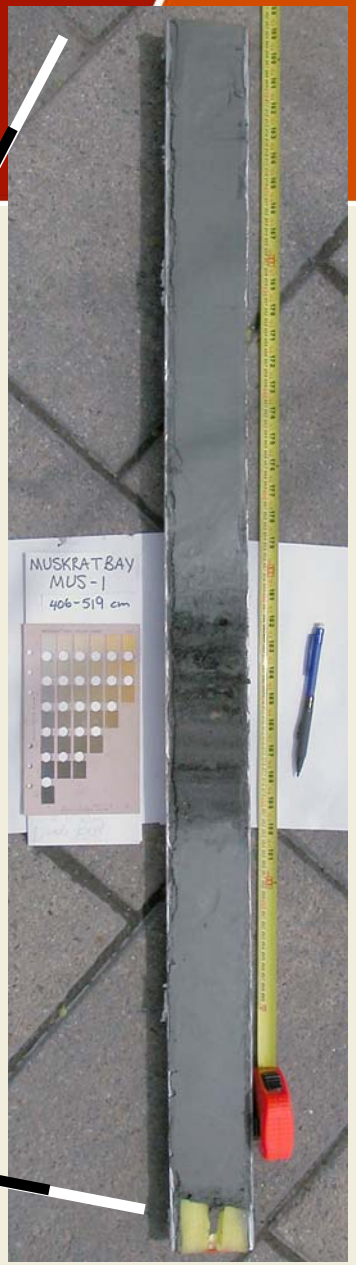
Core preparation

- Disassemble couplers
- Cut core barrel into manageable lengths (1-1.3 m long)
- Cap and tape ends

Laboratory work

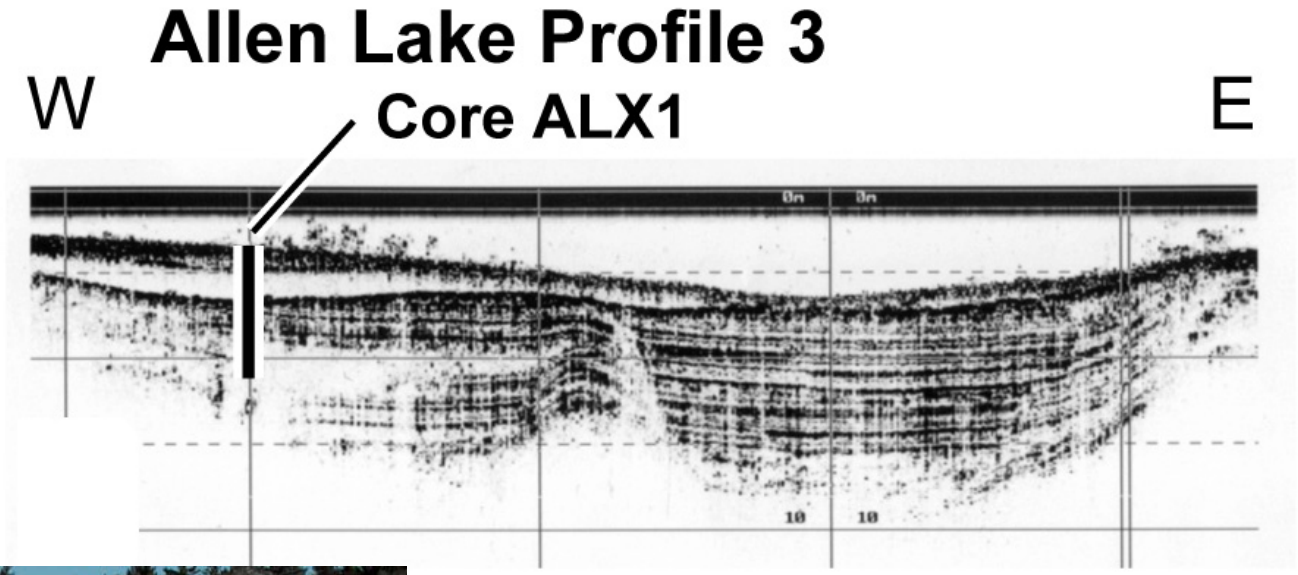
Muskrat Bay, French River





Portability

Sub-bottom profiling data



Coring on ice

- 6 inch hand
- ice auger

Disadvantages

- Can’t inspect collected sediments until core barrel is split
- Lakes - limited to shallow water (<5 m depth) by length of core barrel
- Well-sorted, coarse sand can fall out of the bottom of the core barrel
  - Core recovery as low as 20% (by far the worst)
- Penetration inhibited by coarse gravel, boulders, ‘sound’ wood and stiff sediment (clay, diamicton)
- Sediment-water interface will be disturbed

Advantages

- Yields a continuous core up to 5.5 m long
- High recovery rates in poorly-sorted or cohesive sediments
  - 88 to 94% typical in French River work
- Light-weight, relatively compact
- Two-person operation
- Ideal for saturated sand, silt and soft clay deposits
- Some penetration of stiffer clays possible (with muscle power)

For additional information see:

Lanesky, D.E., Logan, B.W., Brown, R.G., and Hine, A.C., 1979, A new approach to portable vibracoring underwater and on land: Journal of Sedimentary Petrology, v. 49, p. 654-657.

Smith, D.G., 1984, Vibracoring fluvial and deltaic sediments: tips on improving penetration and recovery: Journal of Sedimentary Petrology, v. 54, p. 660-663.

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Smith, D.G., 1992, Vibracoring: recent innovations: Journal of Paleolimnology, v. 7, p. 137-143.

Thompson, T.A., Miller, C.S., Doss, P.K., Thompson, L.D.P., and Baedke, S.J., 1991, Land-based vibracoring and vibracoring analysis: tips, tricks, and traps., Indiana Department of Natural Resources, Geological Survey, Occasional Paper 58, p. 13.

Acknowledgements

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