PolarTREC: Expedition Iceland

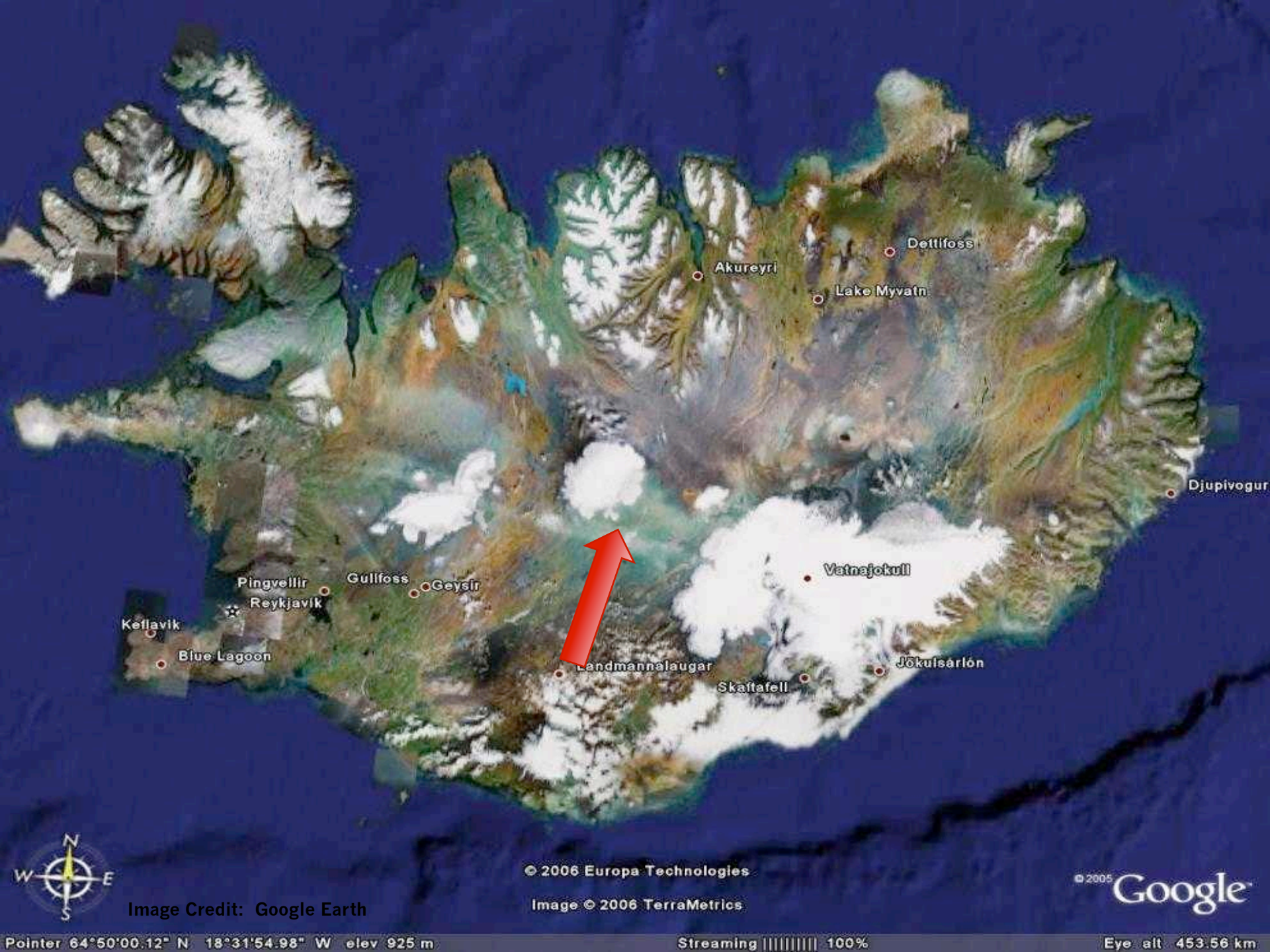

Image Credit: Google Earth

Image Credit: Google Earth

POLAR TREC

Image Credit:
National Science Foundation

Meet the Team

U.S. Researchers

- Lead by Dr. Neal Iverson (Iowa State University) and Dr. Tom Hooyer (University of Wisconsin-Milwaukee)

Nordic Researchers (SweDARP)

- Lead by Dr. Anders Schomacker (Norwegian University of Science and Technology)

The Science:

Why Iceland? Why Múlajökull?

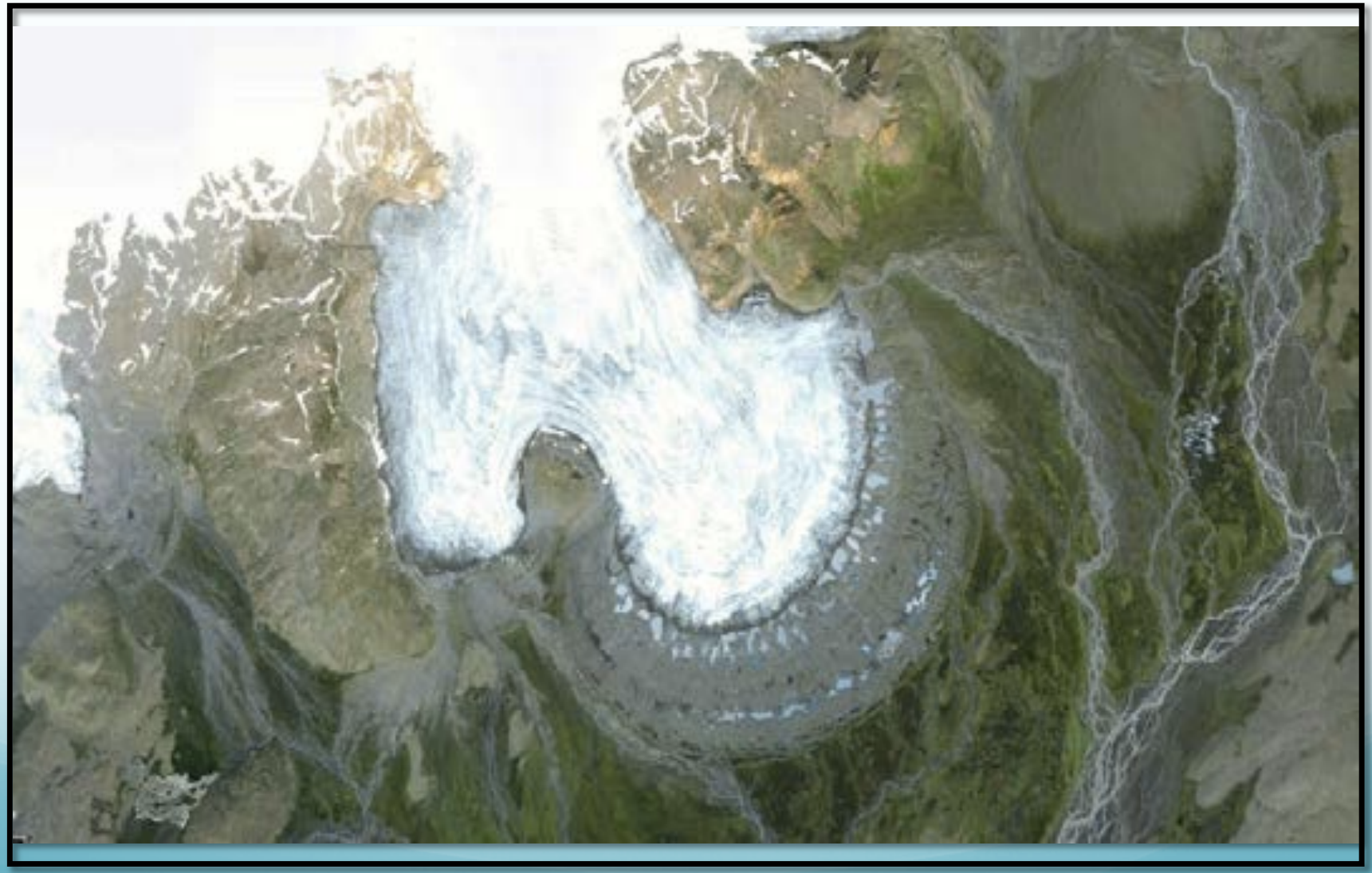

Image Courtesy of Google Earth

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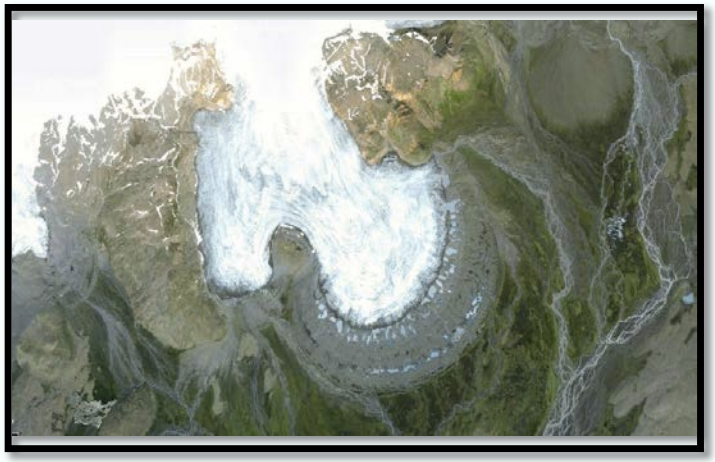


Research Project Goals: This project sought to understand the formation of drumlins, some of the most mysterious and poorly understood of glacial landforms. Drumlins are elongated, aligned hills that form hidden from view beneath glaciers. The first modern drumlin field has recently been exposed by the retreat of Múlajökul. Previously this kind of landform could be studied only by focusing on drumlin fields that formed long ago in the Pleistocene, so this study provided a unique opportunity to understand drumlin formation better.

Image Courtesy of Google Earth

The Science:

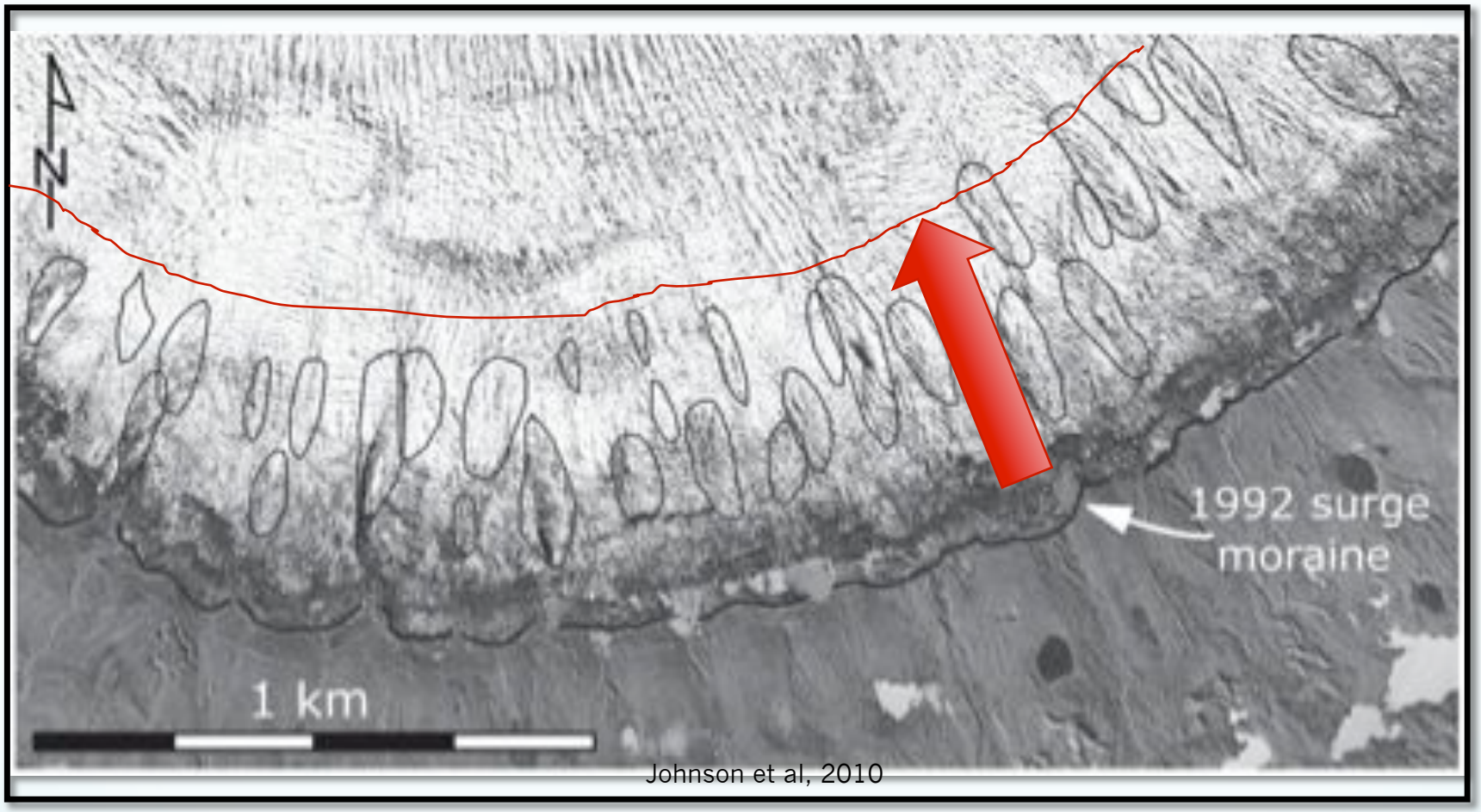
Testing Hypotheses for Drumlin Formation

The Science:
Testing Hypotheses for Drumlin Formation

The research team used collected intact till (rocks and finely ground material picked up by a glacier, and deposited as sediment along its path) samples, as well as GPR data, from the drumlins and the surrounding area. The till samples were taken back to Iowa State University and the University of Wisconsin Milwaukee and subjected to geotechnical tests and magnetic fabric analyses. This testing determined the former distribution of stresses on the till and patterns of subglacial till deformation that were likely central to the formation of the drumlins. In addition to helping determine the internal structure of drumlins and how drumlins form, this research will shed light on the distribution of basal drag (friction) beneath glaciers—an important and poorly understood factor in their dynamics and movement.

This elongated hill of glacial till is a DRUMLIN.
These tiny things are scientists from the research team!

The team walks along a fresh drumlin emerging from the ice margin of Múlajökull.



Johnson et al, 2010

•Aerial photographs, like this one from 1995, can be used in conjuction with LIDAR data to observe the recent and rapid retreat of Múlajökull from the air. (Black elongate shapes are approximate locations of Múlajökull's rare and unique drumlin formations.)

•As of 2013, Múlajökull's ice margin has receded to approximately this red line.

Johnson et al, 2010

•Recent and rapid retreat of Múlajökull has exposed this only known modern drumlin field on the planet.

•Until now, drumlin research has only been completed on ancient drumlins from the Pleistocene Epoch, which are many thousands of years old.

The Science:
Research and Data Collection

Ground Penetrating Radar (GPR) was one of three types of data collected at Múlajökull to help understand how drumlins are forming there.

After this activity, you can learn more about **ALL** of the data collected by visiting the research expedition's Virtual Base Camp.

The Science:
Ground Penetrating Radar

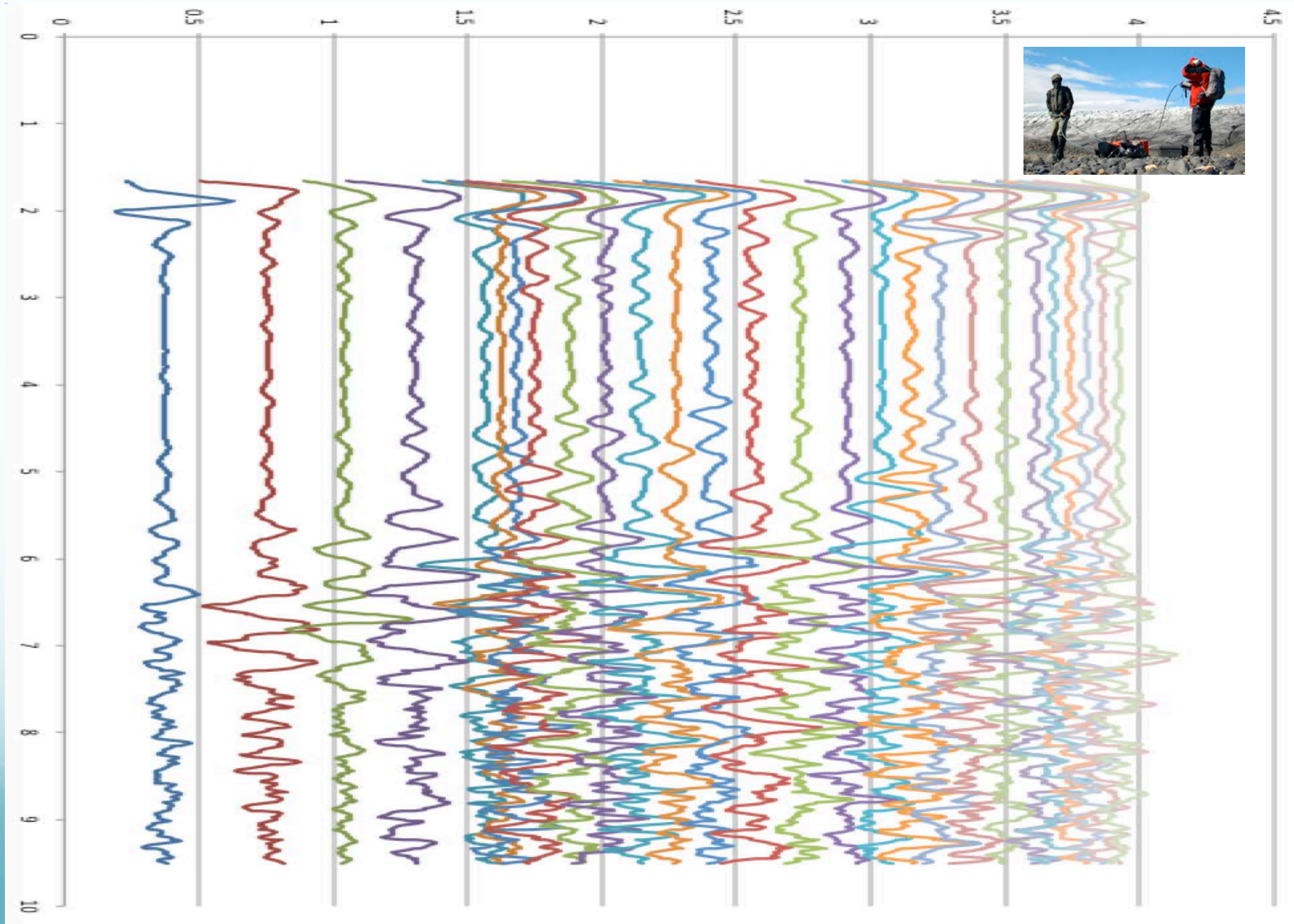
The GPR unit was used by the team to determine the structure of subsurface till layers composing the drumlins. The GPR was pulled across the drumlins while collecting data. It was also used on the glacier's ice margin to get information about how the drumlins emerge from underneath the glacier.

Using GPR at Múlajökull

- **Video 1:** https://youtu.be/UHVzErCtObI
- **Video 2:** https://youtu.be/tVTL_6k_yBQ
- **Video 3:** http://youtu.be/qqZwpTiUK44

After watching all three videos and completing the appropriate questions on your handout, use the GPR data on the next slide to analyze what the team might find out about the mysterious drumlins at Múlajökull.

Signal Amplitude



Why This is Valuable Research

- The more that is known about how glaciers move and behave (drumlins being only one small aspect of this), the more accurately scientists can predict future movements of glaciers.
- This is significant for computer models predicting future climate change and associated sea level rise due to the observed recession of a majority of Earth's glaciers.