WINTER 2016/17

ICE BITS

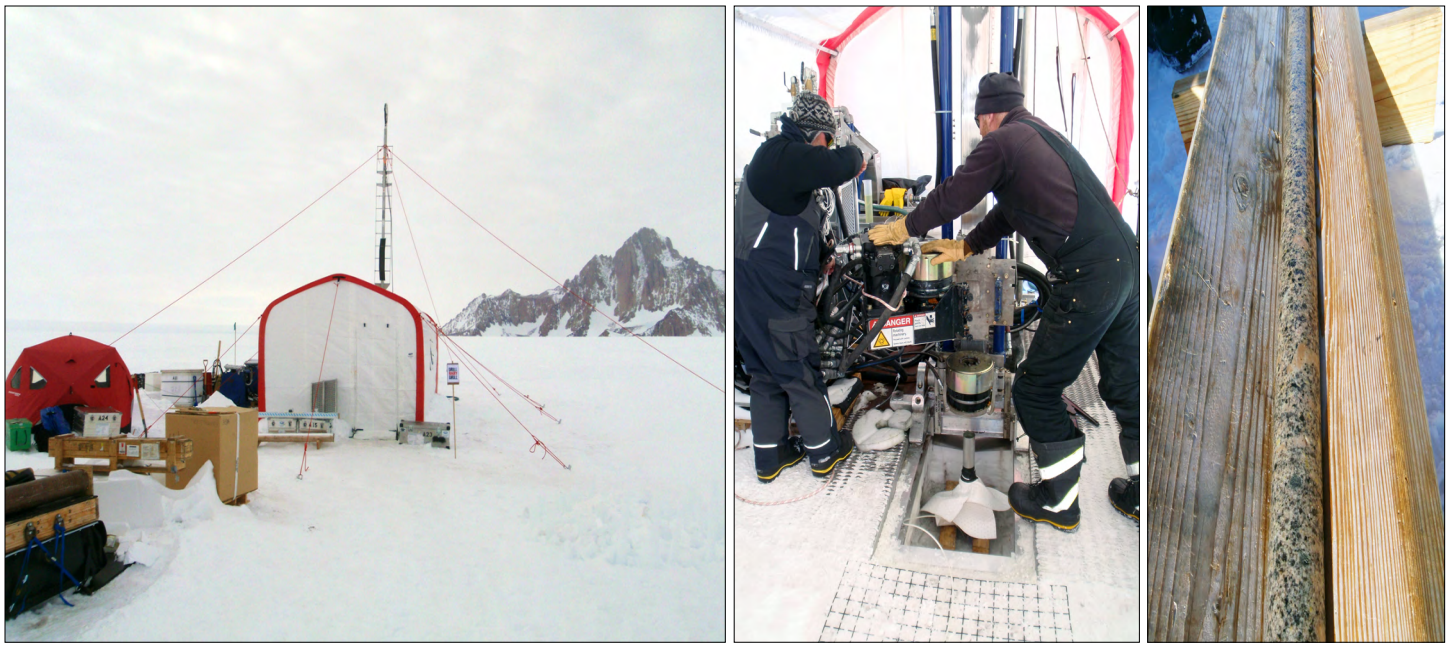
U.S. Ice Drilling Program
Ice Drilling Program Office | Ice Drilling Design and Operations

Quarterly update of Ice Drilling Program Office (IDPO) and Ice Drilling Design and Operations (IDDO) activities

Successful Deployment of IDDO's Two New Rock Coring Drills

In the first quarter, IDDO's Antarctic field efforts included the successful deployment of two new rock coring drills.

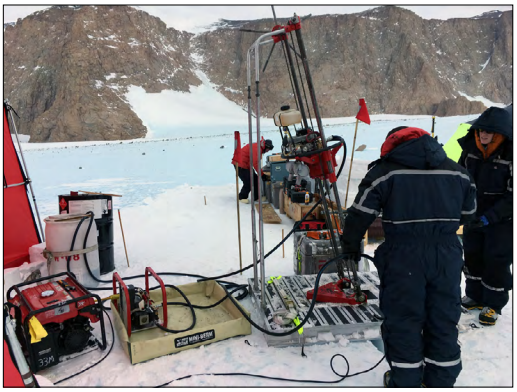
The Agile Sub-Ice Geological (ASIG) Drill was deployed to the Pirrit Hills (PI John Stone; I-277-M) by traverse from WAIS Divide in December. IDDO Drillers Tanner Kuhl, Mike Jayred and Clayton Armstrong recovered more than 7 meters of ice core and 8 meters of rock core at a depth of 150 meters. Development of the new drill system, which is based on a field-proven minerals exploration drill rig, was completed in PY 2016. The system is capable of coring rock below 700 meters of ice. IDDO will work during the upcoming summer to perform maintenance and upgrades on the system to ready it for future field work.

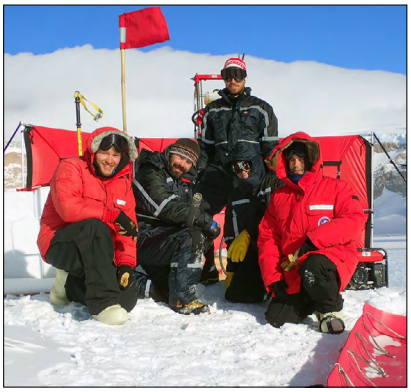


Left: ASIG Drill in operation at Pirrit Hills. Credit: Tanner Kuhl. Middle: IDDO drillers operating the ASIG Drill at Pirrit Hills. Credit: Tanner Kuhl. Right: A section of the 8 meters of rock core collected with the ASIG Drill. Credit: Tanner Kuhl.

The Winkie Drill was deployed to the Ohio Range region (PI Sujoy Mukhopadhyay: G-438-M) in late November for its first funded field project. IDDO engineer Grant Boeckmann and the science team drilled a series of shallow boreholes that resulted in the successful collection of five rock core samples and one sample of frozen and largely unconsolidated debris. The Winkie Drill system functioned very well for its first official deployment. Refinements will be made when the equipment returns from Antarctica this spring.

The Antarctic Support Contract (ASC) team made significant contributions to the successes this season through exceptional efforts to expedite additional drill equipment to both sites during the season and to swiftly return the equipment to McMurdo Station to meet the cargo vessel returning to the U.S.



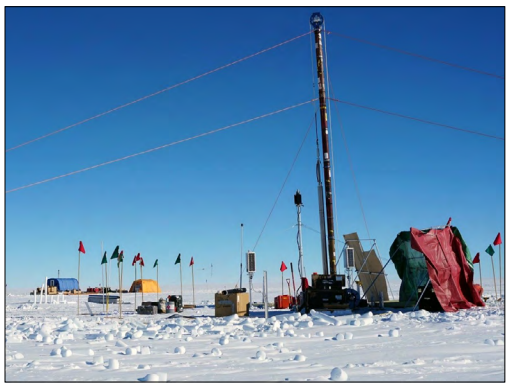
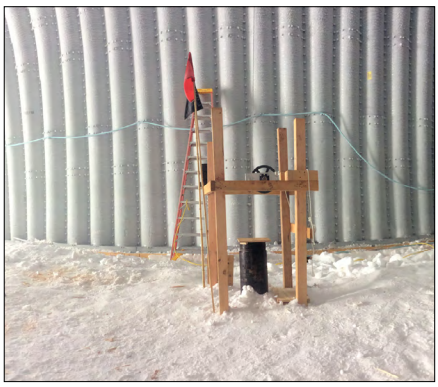


Left: The assembled Winkie Drill system at the Ohio Range. Credit: Grant Boeckmann. Middle: Packaged rock cores drilled with the Winkie Drill. Credit: Sujoy Mukhopadhyay. Right: The Ohio Range field team after their first successful rock core with the Winkie Drill Credit: Sujoy Mukhopadhyay.

2016-2017 Antarctic Field Season Wraps Up

Laser dust logging of the SPICECORE borehole. Credit: Jay Johnson.

In addition to the two sub-glacial rock drilling projects described above, IDDO successfully supported three projects at or near the South Pole, and one at WAIS Divide, during the 2016-2017 Antarctic field season. South Pole Ice Core (SPICECORE; PI Murat Aydin; I-164-S) operations were completed in just three years at South Pole, with 1751 meters of ice core drilled, one round of borehole logging (PI Ryan Bay; I-194-S) with the Intermediate Depth Logging Winch completed, and all equipment has now been removed from the site. Engineers Jay Johnson and Josh Goetz completed all remaining activities this season, with help from the science team onsite. Also near South Pole Station, drillers Mike Waszkiewicz and Elizabeth Morton completed a number of holes ranging from 5 to 125 meters depth using the IDDO 4-Inch Drill system (PI Michelle Koutnik; I-193-S). In West Antarctica, despite needing to make a last-minute operator change, borehole logging the Deep Logging Winch was also successfully completed at WAIS Divide (PI Erin Pettit; I-166-M).


Left: The IDDO 4-Inch Drill near South Pole Station. Credit: Mike Waszkiewicz. Middle: Borehole logging at WAIS Divide. Credit: Elizabeth Morton. Right: Decommissioning of the SPICECORE drill site. Credit: Joe Souney.

Equipment Development

Stampfli 2-Inch Drill

In late PY 2016, and in response to the U.S. Ice Drilling Program Long Range Science Plan, IDDO procured an off-the-shelf Fast Electromechanical Lightweight Ice Coring System (FELICS) 2-inch coring system from Dieter Stampfli in Switzerland. The drill was purchased to meet requests by the community for a very lightweight, PI-operable system capable of collecting core down to

100-meters depth. IDDO expects to receive the drill during the second quarter.

Rapid Air Movement (RAM) Drill

During the first quarter, IDDO worked with IDPO and community scientists to define the science requirements for intended modifications and upgrades to this drill system. The requirements target a system capable of drilling as fast as the existing Rapid Air Movement (RAM) Drill, but at a small fraction of the current system weight. The speed required is not achievable with double-walled drill rod used in a typical Reverse Circulation drill system. Alternative solutions, including two approaches using a hose like the existing RAM drill, are being analyzed. Numerical models and testing will be used to identify both the hose and drill head configurations required to achieve the desired results. A system-level concept will also be completed.

Dartmouth post-doc, Dr. Bess Koffman, teaches about glacier flow during the Montshire Museum outreach event.

Sediment Laden Lake Ice Drill

IDDO initiated a detailed conceptual design late in the quarter for this new, very portable hot water drilling system. Design activities are expected to ramp up early in the second quarter.

IDPO Involved in Multiple Education and Outreach Events

Education Outreach Event at the Montshire Museum

Four Dartmouth graduate students and one undergraduate student worked with Louise Huffman, IDPO Director of Education & Public Outreach, to plan a community outreach event at the Montshire Museum in Norwich, VT, held on November 5, 2016. Approximately 560 elementary students and their parents from local school districts were invited to spend a Saturday engaging in hands-on ice core activities and interacting with early career Dartmouth scientists. Students tried on Extreme Cold Weather (ECW) gear, "swam" in the Southern Ocean wearing blubber gloves, operated a model of an ice core drill, and touched a real Greenland ice core. Several new IDPO educational videos were field tested with museum visitors. Mary Albert spoke to a mixed audience of elementary students, their parents and grandparents about working in Greenland and Antarctica and how ice cores inform us about climate change.

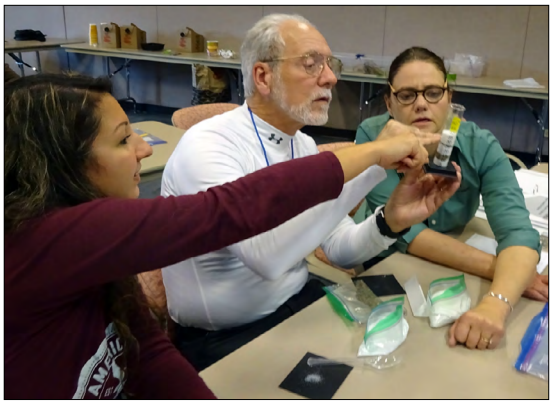
A Dartmouth graduate student, left, teaches about Greenland ice cores during the Montshire Museum outreach event.

School of Ice

Planning for the 2017 *School of Ice* (SOI) is well underway. SOI will host 12 faculty members at Dartmouth in June. Applications were solicited and received from across the country representing colleges in 20 states, and the selection committee is working to choose this year's class.

Checking Out Your Team (COYT)

Educators are invited through the www.climate-expeditions.org website to take part in an activity titled "*Checking Out Your Team*" which brings IDPO scientists to classrooms through a teleconference. Planning for a COYT teleconference is underway with a teacher in North Carolina and SPICECORE scientist Mindy Nicewonger which will take place in March.



The 2017 School of Ice will have hands-on activities similar to this lab from last year's workshop. Credit: Louise Huffman.

New Education Outreach Website

Work is underway to update and re-organize the education and outreach website (www.climate-expeditions.org). The new website will be unveiled this spring.

IDPO Hosts Successful Town Hall at AGU Fall Meeting

IDPO planned and convened the AGU Town Hall on *Scientific Drilling in the Polar Regions* (December 13, 2016). The session included National Science Foundation remarks by Mike Jackson, IDPO-IDDO updates by Mary Albert, an update on International Partnerships in Ice Core Sciences by Ed Brook, and an update on and the U.S. Rapid Access Ice Drill (RAID) by Bob Hawley (on behalf of John Goodge). As discussed during the Town Hall, U.S. scientists are encouraged to get involved in planning for the IDPO Long Range Science Plan and engage with the IDPO Science Advisory Board working groups.

Requesting Ice Drilling Support

If you are preparing a proposal that includes any kind of support from IDPO-IDDO, you must include a Letter of Support/Scope of Work (LOS/SOW) document from IDPO-IDDO in the proposal. Researchers are asked to provide IDPO-IDDO with a detailed support request six weeks prior to the date the Letter of Support/Scope of Work document is required. Early submissions are strongly encouraged.

For further information on requesting IDPO-IDDO support, visit our website at http://www.icedrill.org/scientists/scientists.shtml or contact us at IceDrill@Dartmouth.edu .

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