

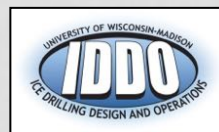
SAB MEETING

ARLINGTON, VA
APRIL 16-17, 2015

IDDO UPDATES

KRISTINA SLAWNY – PROGRAM DIRECTOR MARK MULLIGAN – PI

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IDDO – BIG CHANGES IN 2014



Don Lebar retired from SSEC/IDDO on July 3, 2014

- ICDS/IDDO Program Director from 2001-2014 and PI from 2013-2014
- Oversaw and directed numerous large-scale equipment development projects
- Supported over 60 field projects in the polar regions

Kristina Slawny (nee Dahnert) assumed IDDO Program Director position

- Responsible for the IDDO Program which includes small and large-scale drill development projects, field programs, day-to-day operations, management of staff and reporting to IDPO and the NSF



Mark Mulligan assumed role of IDDO Principal Investigator

- Position previously held by Charlie Bentley and Don Lebar
- Responsible for IDDO's sub award from Dartmouth under a Cooperative Agreement with the National Science Foundation (NSF)

Apr 16-17, 2015

IDDO STAFFING CHANGES

Project Management Additions:

- **Chris Gibson** – Mechanical Engineer and Project Manager for the Agile Sub-Ice Geological Drill Development project
- **Rory Holland** – Assumed management role for all IDDO Field Projects in June 2014

New Mechanical Engineer Hired:

- **Grant Boeckmann** – Grant worked with IDDO as a student employee from May 2011 - Jan 2014 and as a Mechanical Engineering Research Intern from Jan 2014 – April 2015. He will now join the full-time UW Academic Staff as of May 2015.
 - Grant recently deployed with both the Greenland field test of the Intermediate Depth Drill (IDD) as well as to the South Pole for the first production year of SPICE Core.

New Electrical Engineering Intern:

- **Zack Meulemans** – A recent UW-Madison graduate, Zack joined the IDDO team in June 2014 as an Electrical Engineering Research Intern
 - Zack has already been instrumental in remotely troubleshooting IDD issues experienced at the South Pole and is also working on new designs for several IDDO drill control boxes.

DEVELOPMENT PROJECTS

IDDO

DEVELOPMENT PROJECTS

AGILE SUB-ICE GEOLOGICAL DRILL (ASIG) DRILL



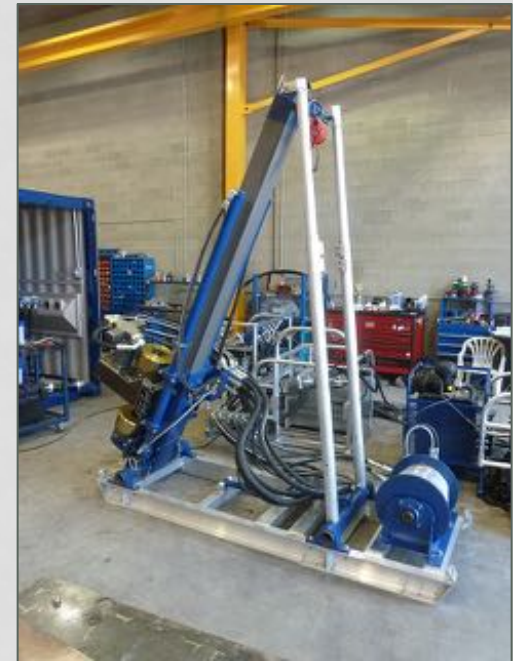
- **Sub-set of Scientific Requirements:**

- Produce 700 m borehole to base of ice with drilling and retrieval of 10 m of bedrock core and / or unconsolidated frozen sediment core.
- Ice drilling will be to dry, frozen-bed conditions, and will not be done in areas where there is subglacial water.
- Retrieve several short ice cores (~50 cm long) at up to 700 m depth.
- Retrieve 10 m of bedrock cores of maximum 33 mm (1.3") diameter beneath the ice sheet.
- Maximum time at a site, including set up and core retrieval, should be 6 days.
- Stand-alone capability is needed for operation at small field camps at remote sites.
- Minimal staff (4) for drilling operations in the field; other field camp staff in support of drilling operations to be provided separately.
- Drilling fluid should not be a boron-rich fluid.
- Drill system must be transportable by Twin Otter, or helicopter with sling load.

AGILE SUB-ICE GEOLOGICAL (ASIG) DRILL DEVELOPMENT

ASIG DRILL

- IDDO purchased an off-the-shelf minerals exploration rig from Multi-Power Products Ltd. Located in Kelowna, BC Canada
- Rig arriving at IDDO in mid-April
- IDDO engineers designing and fabricating ice augering/ drilling attachments, fluid handling and chips handling equipment, and casing setting and inflatable packer equipment
- First field use expected in west Antarctica in 2016-2017



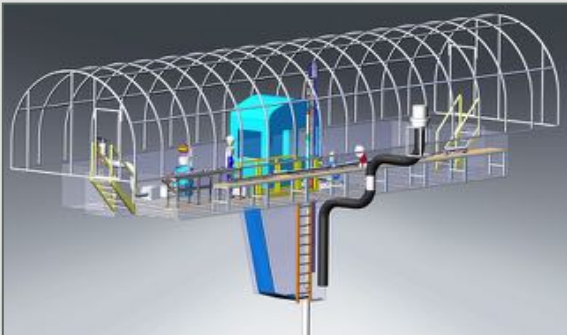
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INTERMEDIATE DEPTH DRILL (IDD) DEVELOPMENT

IDD

- **Greenland Test (2014)**

- Full-scale system test near Summit Station, Greenland from early May to mid-June 2014
- Crew of six IDDO drillers and engineers participated
- All equipment fully tested for both dry and wet drilling applications; final depth 285 m
- Equipment returned to Madison in late June for minor modifications and repairs
- System shipped to Antarctica in mid-September 2014 for first production drilling season

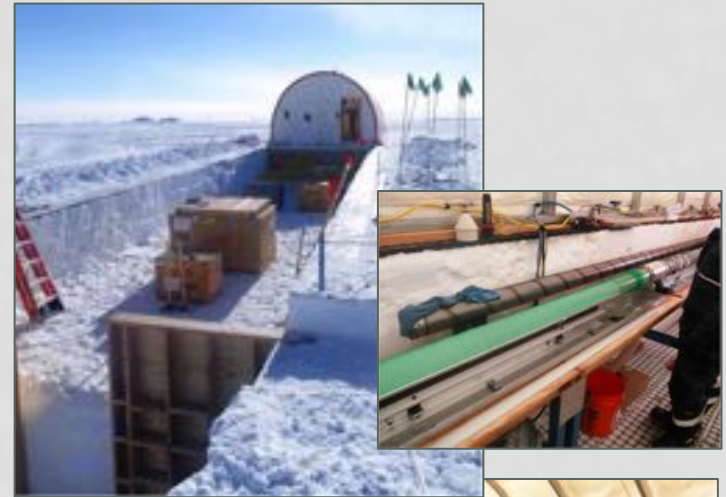


INTERMEDIATE DEPTH DRILL (IDD) DEVELOPMENT

IDD

- **SPICE Core (2014-2015)**

- Ultimate depth goal is 1,500 meter, though drilling deeper is currently under discussion
- First production season completed in Antarctica in 2014-2015
- Crew of seven IDDO drillers and engineers participated
 - Lead Driller Tanner Kuhl
- Season plagued by start-up delays, aircraft availability and equipment issues
- Despite challenges, team managed to collect 736 meters of core, surpassing the original goal of 700 meters
- Small subset of components returned to Madison in late March 2015 for minor modifications and repairs
- Repaired/modified components will be shipped back to Antarctica in mid-September 2015 for second and likely final production drilling season



MAINTENANCE & UPGRADE PROJECTS

IDDO

SMALL HOT WATER DRILL (SHWD) UPGRADES

SHWD



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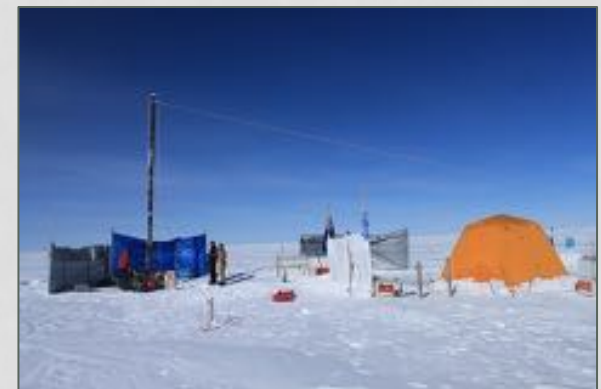
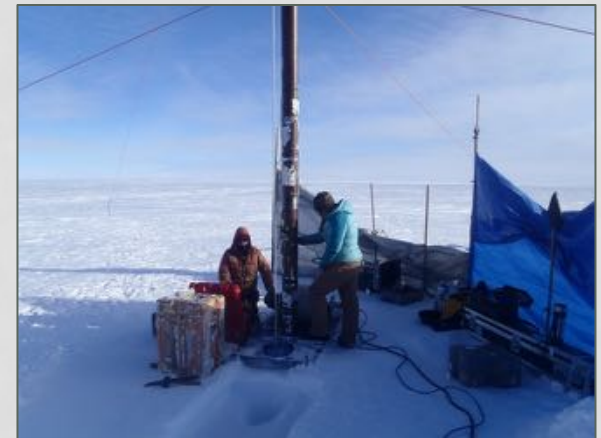
- IDDO making user-identified and much-needed modifications to aging SHWD equipment
- Systems typically used by science teams with no IDDO driller support
- Upgrade goals:
 - Perform at least as well and be at least as mobile as existing systems
 - Improved safety and reliability
 - 60 m depth capability (current capability ~30 m depth)
 - Aim to compliment Scalable Hot Water Drill (SchWD) system
 - (SHWD 0-60m; SchWD 60-1000m)
- 2015 Objectives:
 - Refurbish heaters
 - Evaluate hose
 - New nozzle kit
 - Develop more user-friendly pickling system
 - Test and verify
- 2016
 - New sleds
 - New heaters



4-INCH DRILL UPGRADES NEW 'FORO' DESIGN

FORO DRILL

- 'Foro' Latin for "to bore, make a hole"
- New sonde, winch and tower designs reflect beneficial aspects of the IDD design
- Upgrade goals:
 - Redesign tower and winch to be lighter/smaller
 - 5.7 mm diameter steel electromechanical winch cable, same as used on the IDD Drill (current 4-inch Drill cable is 13mm in diameter)
 - New cable weight is 13.1kg/100 m (current 4-inch Drill cable weight is 17.1kg/100 m)
 - Upgrades for wet conditions
 - New sealed motor section - submersible in drilling fluid or water (current 4-inch Drill is not submersible)
 - Upgraded control system
 - Drill and winch motors will be able to be run simultaneously
 - Off-the-shelf motor controllers
 - Reduced weight, compared to the existing 4-inch Drill control boxes



CONTINUED MODIFICATION/UPGRADE PROJECTS

BLUE ICE DRILL – DEEP (BID-DEEP)

- Continued mods/upgrades to extend system depth capability from 30 m to 200 m
 - Fabricating new step cutters for better core quality at depth



BADGER-ECLIPSE DRILLS

- Designing several upgrades to control box; similar to 4-Inch/Foro upgrades
- Engraving parts for ease in identifying component compatibility
- Purchased new Mountain Hardware Space Station tent for use with drill



KOCI DRILL

- Drill requested for a 2016-2017 Antarctic project needing 20 cm long rock cores below 5-30 m of potentially dirty ice
- Maintenance of the Koci Drill not identified as a priority in the Long Range Science Plan
- IDDO exploring other options for meeting the field projects goals
 - Promising option of using a Winkie Drill with ice auger attachments



FIELD PROJECTS

IDDO

FIELD PROJECTS

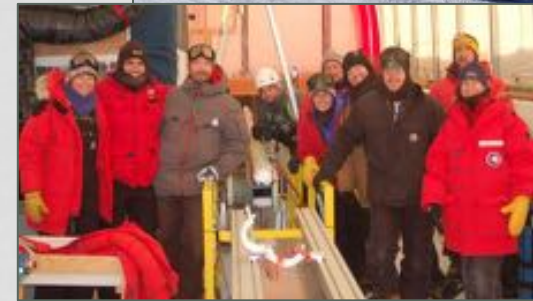
ARCTIC/U.S. 2014

- **IDD Test near Summit Station, Greenland**
- **Cosmogenic C-14 Cores** - PIs Petrenko, Brook and Severinghaus, White
 - IDDO Drillers/Engineers Josh Goetz, Grant Boeckmann and Driller Mike Jayred
 - Drilled and recovered cores for in-field gas analysis
 - Tested deep winch capability to 200 m
 - Tested upgrades to the slide hammer motor section
 - All samples collected ahead of schedule and new BID-Deep components tested
 - Core quality deteriorated after 140 m
- **(4) Hand Auger Projects**
 - Disko Bay Ice Cores – PI Sarah Das
 - Disko Bay, Greenland
 - Used new IDDO hand auger to collect shallow cores to 10 m depth
 - Summit Shallow Core Array – PI David Noone
 - Summit Station, Greenland
 - Used new IDDO hand auger to collect shallow firn cores for isotopic analysis
 - NW Greenland Holocene Climate Change – PI Erich Osterberg
 - Thule Air Base, Greenland
 - Used new IDDO hand auger and Sidewinder to collect one 20 m core
 - Midwest US Ice Cores – PI Mike McKay
 - Midwestern U.S.
 - Used new IDDO hand auger to collect shallow river/lake ice cores

FIELD PROJECTS

ANTARCTIC 2014-2015

- **SPICE CORE** – PIs Aydin, Neumann, Saltzman, Souney, Steig, Twickler
 - Installed all equipment at drill site near South Pole Station
 - Drilled to 736 m depth
 - Shipped 600 m of ice cores to NICL in Denver



- **Taylor Glacier Blue Ice Cores** - PIs Petrenko, Brook and Severinghaus

- IDDO Driller Mike Jayred
- Total of 52 holes drilled over 34 days of drilling
- 936 m of core drilled in a total of 1018 drill runs
- Tested deep system capability to 125 m; core quality deteriorated after 70 m

FIELD PROJECTS

ANTARCTIC 2014-2015

- **WAIS Divide**

- Borehole Logging – Pls Bay, Clow, Pettit, Riverman, Talghader
 - Used USGS (now IDDO) Deep Logging Winch for temperature, optical, fabric, texture and seismic logging in the DISC Drill borehole
 - Season plagued by severe delays due to weather and aircraft availability
 - IDDO extended personnel time onsite and trained a new winch operator
- DISC Drill Disassembly and Packing
 - Majority of work completed
 - Remaining tasks include disassembly of yellow gantry crane, removal of crane rails and cable chains, palletizing of control room and extension of borehole casing



FIELD PROJECTS

ARCTIC/U.S. 2015

- **Midwest U.S. Ice Cores**
 - Continued hand auger support for PI Mike McKay in the U.S. and Canada
- **Cosmogenic C-14 Cores**
 - Continued Blue Ice Drill support for near Summit Station
 - IDDO drillers Mike Jayred and Don Kirkpatrick to deploy in mid-May
- **Disko Bay Ice Core**
 - Eclipse Drill support for PI Sarah Das in the Disko Bay region
 - IDDO Driller Mike Waszkiewicz to deploy in late April
- **Greenland Firn Aquifer Investigation**
 - Thermal Drill support for PI Rick Forster in SE Greenland
 - IDDO engineer Josh Goetz deployed in late March and is drilling now



ANNALS OF GLACIOLOGY

- IDDO recently published 8 papers in Annals volume 55(68)

2015 TAB MEETING

- Meeting to be held in Madison, WI on September 10-11, 2015

NEW DRILLERS!

- In 2014, IDDO successfully recruited, trained and deployed 4 new drillers

IN OTHER NEWS

IDDO HAPPENINGS

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RAID & IDDO COLLABORATION

- Beneficial and synergistic opportunities explored between RAID development team/PIs and IDDO, with the two groups sharing ideas and with Chris Gibson and Jay Johnson participating in viewing the RAID North American Test (NAT)