

# ICE BITS NEWSLETTER

SUMMER 2012

## 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*

### Replicate Coring System Characterization Testing Underway

After review of data collected during the previous Antarctic field season and in preparation for the 2012-2013 WAIS Divide field season, IDDO has designed and fabricated a sophisticated test set-up to determine the root causes of shortcomings experienced by the Replicate Coring system. During the third quarter, IDDO was able to complete a major portion of a “sonde-in-the-borehole” test of the Replicate Coring System to determine drill sonde deflection, to verify the mechanical system analyses and to measure force at cutter head for given set points. This will assist IDDO engineers in making system modifications necessary to successfully collect replicate core during the next field season. The root cause of the intermittent instrument section faults witnessed in the field and during the system test in Madison was identified; the fix is designed and is currently being implemented.

Troubleshooting of actuator motors, pressure testing of motor sections and modifications of instrument section circuit boards and LabVIEW software modifications were all successfully completed. System testing and modifications will continue into the Fourth Quarter. The large DISC Drill winch motor was also successfully repaired, rebuilt and returned to IDDO.



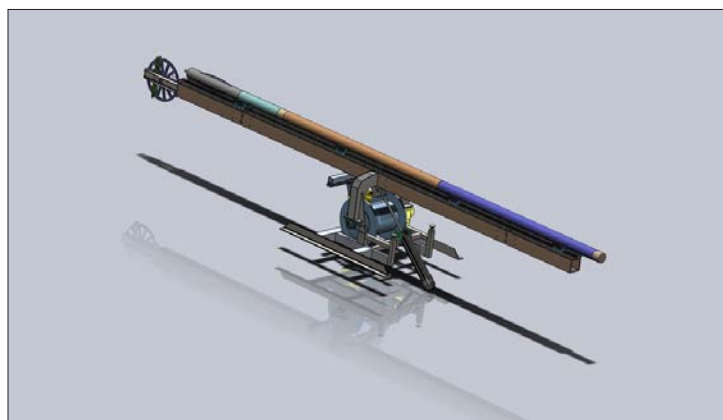
*Replicate coring system testing in Madison, WI.*



*Cooling jacket for replicate instrument section.*

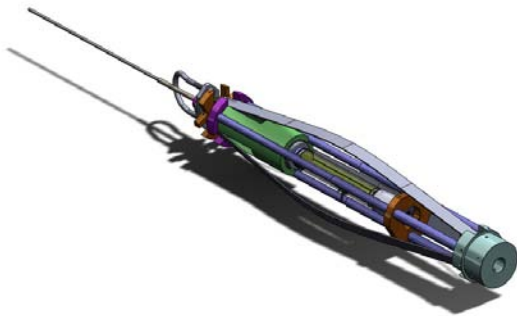
### Intermediate Depth Drill Starts Taking Shape

IDDO made progress in design and systems procurement of the new Intermediate Depth Drill, based on the Danish Hans Tausen drill. In cooperation with Centre for Ice and Climate in Copenhagen, Denmark, several component designs are being modified and upgraded. With the help of a contract engineer and a new IDDO mechanical engineering research intern, the design work shows good progress. The winch, tower and anti-torque designs have been completed. Several components of the system, including a winch drum with Lebus groove and a Teflon coated cable, have been procured. The first system design review is scheduled for July 26th. IDDO expects to complete detailed design of the entire drill system by the end of calendar year 2012, with an aim to have an operational, tested drill by the end of



*New Intermediate Depth Drill winch and tower design.*

FFY2014, in time for deployment to Antarctica for the 2014-15 field season.



*New Intermediate Depth Drill anti-torque design.*

## Intermediate Depth Logging Winch in Fabrication

In collaboration with IDPO and the borehole logging community, IDDO has completed design and specification of an Intermediate Depth Logging Winch and has procured the winch as well as the associated Teflon-coated logging cable. This system is expected to be ready for use by the end of the calendar year 2012.



*IDDO Intermediate Depth Logging Winch. Credit: Mount Sopris*

## Rapid Access Ice Drill

After completing revisions to the drill design and Prospectus document, IDDO sent one engineer and one contract engineer/driller to Indianapolis to visit Laibe Corporation. There they were able to view several mineral exploration rigs and discuss applications for Antarctic drilling with company management. With support from IDPO/IDDO, a proposal was submitted by P.I. John Goodge for development of the drill.

## Technical Advisory Board Meeting

IDDO held its annual Technical Advisory Board (TAB) Meeting in Madison, WI on April 24-25, with drilling experts from a wide variety

of fields. The meeting was well attended by all TAB members but one, IDDO staff, an IDPO representative, two distinguished guests from the Polar Research Center at Jilin University in China and others, including NSF Program Manager Julie Palais via phone. IDDO presented on the current status of IDDO field projects and current equipment status and gained valuable feedback from board members on equipment development projects. Notes from the meeting will be available at <http://icedrill.org/about/tab.shtml>



*Technical Advisory Board meeting in Madison, WI. Photo courtesy of Dr. Pavel Talalay.*

## GISP2 Borehole Casing

IDDO worked with CH2MHill Polar Services to extend the GISP2 borehole casing at Summit Station, Greenland. IDDO prepared and shipped a 20-foot long section of 10-inch pipe to be installed by the science techs at Summit. This casing extension will ensure that the borehole entry does not become buried, providing surface access to the borehole for years to come.

## New Drilling Fluid

IDPO worked on investigation of drill fluids identified by other nations, most notably the Danes and Russian/Chinese. A new drill fluid was tested in Greenland this summer (Estisol 140) that appears to be an environmentally friendly drilling fluid that will be useful in extremely cold conditions. Samples of the fluid were obtained from the manufacturer and will be distributed to US ice core laboratories for testing.

## Change Management Policy

IDPO led the development of a new IDPO/IDDO Change Management policy that formalizes the IDPO/IDDO change process. This policy is intended to provide authorization and accompanying visibility for necessary changes from the IDPO-IDDO Annual Plan and component project plans and associated baselines. The intent of this policy is to define the change processes for IDPO's oversight of IDDO and also to define at what level IDPO/IDDO need to seek NSF approval. IDDO may, in addition, have their own internal change processes with a finer level of detail that are not managed by IDPO.



## New Outreach Effort

Showcase your research through the "In the News" section of IDPO's Climate Expeditions web site. To make ice core discoveries more readily available to the public, your peer-reviewed research paper will be distilled into key points summarizing its importance. Please check the examples at:

<http://climate-expeditions.org/public/links.html> (first two bullets, In the News)

Send your documents to Education Program Manager Linda Morris at [linda.m.morris@dartmouth.edu](mailto:linda.m.morris@dartmouth.edu) for translation today!



The screenshot shows the homepage of the Climate Expeditions ICE website. The header features a navigation bar with links: HOME, EDUCATORS, STUDENTS, PUBLIC (highlighted), COOL STUFF, and CONTACT US. Below the navigation bar is a main heading: "Connections Between Monsoons, Plant Systems, And Rapid Climate Change". The content is organized into sections: "Key Discovery", "Research Results", "What Does It Mean?", and "Scientist Background".

**Key Discovery**

Rapid climate changes that cause glaciers to melt are linked to stronger monsoons, which causes changes to major plant systems in these monsoon regions.

**Research Results**

Dr. Jeffrey Severinghaus and his colleagues were able to use old air in ice cores from Antarctica to look at the changes in oxygen **isotopes** in our atmosphere over the past hundred thousand years. Plants breathe out oxygen, and the type of oxygen they give off depends on the kind of water they are receiving and how they are interacting with the air around them. Changes in plant systems can help cause the oxygen in the atmosphere to be composed of either predominately "heavy" or "light" isotopes.

By comparing these oxygen measurements to records of monsoon strength, it was seen that monsoons tended to be stronger when the oxygen isotopes were lighter. The relationship is especially obvious during periods of abrupt climate change. For example, rapid warming after cooler periods is shown to correlate with lighter oxygen isotopes and stronger monsoons. Monsoons affect and are affected by a large area of the earth's plant-growing regions.

**What Does It Mean?**

This discovery shows that tropical rainfall (the monsoon in particular) changed dramatically, in a few decades or less, during past abrupt climate change. Rapid changes in climate are accompanied by shifts in the land-based water cycle and its interactions with plant life, particularly at lower latitudes. Specifically, events of large glacier meltdowns caused by rapid warming in the past were shown to correlate with patterns of increased monsoon strength in Asia and Northern Africa.

Changing climate can cause a variety of locally and globally scaled impacts on environmental systems. When these large changes happen on short timescales, the effects can be even more dramatic. Not only does this discovery help us understand how climate change has affected hydrological systems in the past, but it may help us to predict what changes in global rainfall patterns might occur in the future and

**Scientist Background**



2011-2012 WAIS Chief Scientist Severinghaus (on left) celebrates US record 3,405.77 m coring depth

Jeff is currently a Professor of Geosciences and Director of the Climate-Ocean-Atmosphere Program (COAP) at Scripps Institution of Oceanography, La Jolla, California. Throughout his life he has enjoyed backpacking and mountain climbing, and early on became intrigued by the glaciers he saw, which he coined "fascinating beasts." This lifelong love of the outdoors and a desire to pursue a science where precision was key led him into his current field during his Post Doctoral studies. A self-professed "absent minded professor," Jeff has since given up the mountain climbing for fear he'll forget to clip himself in some day and instead explores the deserts of southern California while camping!

In speaking of his career, Jeff expresses satisfaction about following his dream

*Screen shot of one of the research summaries translated by IDPO Education Program Manager Linda Morris.*

## Educational Outreach

On April 11th, two classroom presentations were made to AP environmental science students in Washington state by UW graduate researchers, using IDPO's Checking Out Your Team activity. Spruce Schoenemann, who previously participated in the videoconference format of this activity, acted as a mentor for Bradley Markle during the in-person delivery.

During the IPY 2012 conference in Montreal, April 21-26, the following events facilitated by Linda Morris of IDPO occurred.



*Dr. James White addressing educators at the IPY 2012 conference in Montreal.*  
Credit: PolarHorizons.com

Dr. James White delivered a keynote address at the PolarEDUCATORS conference, participated in a hands-on workshop conducted by Morris and colleagues, and was interviewed by Canadian radio on a panel of experts. Morris independently conducted an APECS K-12 Career Development session on "School Children and Teachers" for early career scientists, an exhibit hall stage show

and poster session on "Hands-on Hooks for Scientists" and an oral session on "Keys to Communicating Your Science: Simple Strategies for Scientists". Networking during this conference led to the development of an ongoing Polar Educators International network, subscribed to by colleagues from around the world interested in sustaining and growing polar education initiatives.

On May 2, Dr. Joe McConnell partnered with Morris to deliver an NSTA Web Seminar entitled, "Natural and Anthropogenic Climate Impacts as Evidenced in Ice Cores", with supporting educational lessons and IDPO resource information provided by Morris. The 49 participants rated the web seminar content as valuable, interactive, and relevant, with 100% expressing interest in more online professional development offerings. The materials are archived at: [http://learningcenter.nsta.org/products/symposia\\_seminars/NSF/webseminar3.aspx](http://learningcenter.nsta.org/products/symposia_seminars/NSF/webseminar3.aspx)

An important new collaboration Morris created with the American Meteorological Society (AMS) led to a dual presentation by Drs. Julie Palais, in-person, and Richard Alley, via Skype to community college professors during the AMS's Climate Studies Diversity Project's faculty conference in DC.

Dr. Murat Aydin conducted a Checking Out Your Team videoconference with Morris on May 23rd, for high school students in Houston, TX. This followed up his participation in a teacher workshop with Morris last fall that prepared him for this role.

## Ice Drilling Technology Workshop Proceedings

IDPO finished its effort to make all of the proceedings from the six international workshops on ice drilling technology held to date available online at:

<http://www.icedrill.org/library/index.shtml>

There are a total of 160 papers from the workshops, bringing the total number of ice drilling technical documents now available to the community via the web site to 287.



## REQUESTING ICE DRILLING SUPPORT

If you are preparing a proposal that includes any kind of ice drilling or ice coring support from IDPO/IDDO, you must complete a Field Project Requirement Form ([www.icedrill.org/scientists/scientists.shtml](http://www.icedrill.org/scientists/scientists.shtml)) and submit it to IDPO/IDDO via [icedrill@dartmouth.edu](mailto:icedrill@dartmouth.edu) at least six weeks before your proposal deadline.

Once IDPO/IDDO receives your Field Project Requirement Form we will provide you with a cost estimate and a letter of support that **MUST** be included with your proposal. If you are submitting a proposal to NSF the cost estimate and letter of support should be included as Supplemental Information in your proposal, and it is recommended that you also notify your relevant NSF Program Manager that your proposal requires support from the IDPO/IDDO.

If you are preparing a non-NSF proposal, it is recommended that you familiarize yourself with the Policy for Ice Drilling for Organizations other than NSF available at [www.icedrill.org/scientists/scientists.shtml#otheragencies](http://www.icedrill.org/scientists/scientists.shtml#otheragencies).