

Collaborative Research: Climate, Ice Dynamics and Biology Using a Deep Ice Core from the West Antarctic Ice Sheet Ice Divide (I-477)

PI: Ken Taylor (Desert Research Institute) [NSF-OPP supported](#)

PI: Mark Twickler (University of New Hampshire) [NSF-OPP supported](#)

Field Team:

Don Voigt and Peter Burkett (Penn State University)

Field Season Objective:

The purpose of I-477's field season was to complete the retrograde of science/equipment cargo from the core handling arch.

Field Season Summary:

- Voigt and Burkett arrived at WAIS Divide (WSD) on 12/11/2014.
- The arch was already dug out by the time of Voigt and Burkett's arrival.
- The Carpenter Crew has been working since arriving on 12/11. The Arch is in rough shape.
- The Processing-Side gantry was removed by the Carpenter Crew.
- I-477 prepared pallets for retro including Core Trays (two pallets, 95 trays), the AFP rollers, and the O2 monitor.
- Several items were requested for use at the SPICE Core project, these were located and sent via Guard Mail.
- Two snowmobiles retrieved from Byrd Surface Camp were put into service to be used by Science at WSD. This brings the science snowmobile pool to 4 machines. This should be adequate for the needs of the six events using them.
- Camp celebrated Christmas with dinner on 12/24. Staff had the 25th and 26th off, then worked Saturday and Sunday.
- Work continues to box up all the loose items left from ice core processing. Dismantling of the "buffer table" is complete. Crating of the 4-meter core trays and longer parts from the MK table are next.
- Work in the Arch was not possible for several days during the storm. Lack of lighting in the Arch and not being able to open the Processing Side doors made it too dark to work.
- Several items were requested for use at the SPICE Core project, these were located and sent via Guard Mail. The last, a replacement blower for the FED is on its way to Pole.
- Crates for the 4-meter core trays and the MK table have been built and are being packed.
- I-477 completed the dismantling and pack up of the Processing side of the Arch. Voigt and Burkett flew back to McMurdo Station on 1/15/2015.
- Camp is in the process of closing. Scheduled LC-130 flights have been cut and all science is scheduled to pull out on 1/22, including T-350. Flight delays and weather have combined to reduce the number of flights on continent, and Pole needs fuel flights.
- While in McMurdo, Voigt completed the process of assigning TCNs to cargo that had already arrived from WSD. Since Voigt's return to McMurdo no further cargo was returned (from WSD to McMurdo) and Voigt suspects that the remaining three crates will winter at WSD. They contain (and are labeled) the MK Table, MK Motor and 4 Meter Trays. In addition, 12 Arctic Oven tents belonging to the SCO remained at WSD camp and will be packed in 50 cube MW boxes for storage on the cargo lines.



View of the arch. Photo: Don Voigt.



View of the remaining items inside the core handling arch. Photo: Don Voigt.



Heavy drifting on the warming Jamesway. Photo: Don Voigt.



Heavy drifting at the doors to the drilling side of the arch. Photo: Don Voigt.

WAIS Divide Borehole Logging 2014-15 Field Season

Field Team:

I-475: Gary Clow

I-172: Ryan Bay, Joseph Talghader, Merlin Mah

I-161: Kiya Wilson, Don Voigt, Nicholas Holschuh, Atsu Muto

I-166: Erin Pettit, Rachel Obbard, Christina Carr, Yasmini Balassoubramaniane (PolarTREC)

IDDO: Mike Waskiewicz, Jim Koehler

19 DEC:

- Setup the logging winch including the level-wind system.
- Setup the sheave-wheels in the arch.
- Tested winch power.

20 DEC:

- Conducted communication tests through the logging winch with the temperature logging system (I-475), Ryan Bay's optical logger (I-172), and the downhole seismometer (I-161).
- All three logging systems passed their communication tests and appear to be working.
- Setup and calibrated the temperature logging system.

21 DEC:

- Ran the temperature logging system all day. No problems were encountered. Temperature tool went past the depth of the deviation ice cores just fine. This log also told us where the bottom of the hole is.

22 DEC:

- Brought the temperature logger back to the surface and recharged system batteries in preparation for the next log.

23 DEC:

- Ran the second temperature log. No problems were encountered. This concluded the temperature logging experiments.

24 DEC:

- Ran the downward leg of Ryan Bay's first optical log. Went past all 5 hole deviations without a problem.

25 DEC:

- Finished Ryan's first optical log and brought the system back to the surface.
- Attempted to do a seismic log but the seismometer did not appear to be picking up a signal.

26 DEC:

- Ran Ryan's second optical log down to 1600 m and back to the surface. This log focused on conditions in the bubbly ice zone. No problems encountered. This concluded Ryan Bay's optical experiments.
- Started the first set of seismic experiments in the evening, beginning at the bottom of the hole.

27 DEC:

- Left the seismometer hanging in the hole at 2500 m during the day. Resumed seismic shots in the evening, incrementally moving the seismometer uphole.

28 DEC:

- Left the seismometer hanging in the hole at 750 m during the day. There was too much wind to conduct any further seismic experiments that evening (wind noise obscures the seismic signal).

29 DEC:

- I-161 decided they had a sufficient amount of seismic data to declare their experiments finished. The seismometer was brought back to the surface. At this point, the temperature, Ryan Bay's optical, and the seismic experiments were done.

30 DEC - 4 JAN:

- No logging was done during this time period while we waited for the other logging teams (Pettit/Obbard I-166, Talghader I-172) to arrive from McMurdo. I-166 and I-172 arrived in camp on 4 JAN.

5 JAN:

- Setup and tested the acoustic televiwer (I-166) on the logging winch.

6 JAN:

- Began acoustic televiwer log #1. The logging speed was 5 cm/s so this log took quite a while.

7 JAN:

- Continued acoustic televiwer log #1. The logger entered one of the deviation holes. We didn't realize this until we got to the bottom of the deviation. We backed out and managed to get past the deviation on the second attempt.

8 JAN:

- Finished acoustic televiwer log #1 at 4am. At 42 hours in duration, this may be the longest geophysical log ever conducted!
- Notified I-172 (Joey Talghader/Merlin Mah) by 8am that the winch and borehole were ready for them to begin logging with their optical tool. They indicated they were having problems with the optical logger. Waited until 3pm at which point they indicated it wouldn't be ready until the next day.
- Erin Pettit was ready to begin her second acoustic televiwer log, we began that about 5pm to minimize the amount of time the borehole was sitting idle.

9 JAN:

- Continued acoustic televiwer log #2. The televiwer again entered one of the deviation holes. It took a couple of tries to get past this deviation.

10 JAN:

- Finished acoustic televiwer log #2. This completed the acoustic televiwer logs.
- Notified Merlin Mah (I-172) that the winch and borehole were again ready for him to log.
- Unfortunately, the logging instrument still wasn't working

10-15 JAN:

- The winch and borehole remained available for optical logging by I-172. The instrument continued to have problems on the bench and so never made it into the borehole.

Ice Drilling Design and Operations (IDDO) Activities at WAIS Divide 2014-2015 (T-350)

PI: Mary Albert (Dartmouth College) NSF-OPP supported

Field Crew:

- Jim Koehler
- Don Kirkpatrick
- Mike Waszkiewicz
- Jeffrey Donenfeld

Summary of Field Season Objectives:

- Retrograde any IDDO equipment currently in MCM
- Ship to Pole spare chip blower and gloves
- Get both cranes operational
- Remove drip pans and ventilation from slot
- Disassemble DISC drill and prep for shipping
- Extend bore hole casing
- Work with ASC to backfill slot and compact snow per Chief Scientist Kendrick Taylor's instructions
- Assist Gary Clow with operation of USGS (now IDDO) logging winch (Waszkiewicz)

Summary of Field Season Results:

- Retrograded all IDDO equipment already in MCM
- Delayed in MCM; Don Voigt shipped blower and gloves to South Pole
- Once at WAIS Divide, disassembled and palletized the majority of the drill components and the blue gantry crane
- Field season extended due to delays in getting to WAIS Divide
- Remaining equipment to disassemble consists of the yellow gantry crane, crane tracks, crane cable trays, and palletize control room
- Still need to extend bore hole casing and backfill slot per instructions
- Pack-up remaining tools and crate for shipping
- Supported borehole logging operations; trained a second IDDO winch operator (Jim Koehler), after Gary Clow had to depart as originally scheduled on January 7.

Project Execution:

- Dec 5 – Koehler, Donenfeld, Kirkpatrick and Waszkiewicz flew from CONUS to CHC
- Dec 6 – Collect clothing at CDC
- Dec 7 – Koehler, Donenfeld, Kirkpatrick and Waszkiewicz flew from CHC to MCM
- Originally scheduled for five days in MCM for training and shipping cargo, but due to extreme weather and aircraft delays, 3 of 4 IDDO personnel ended up spending four weeks in MCM.
- Dec 10 – Waszkiewicz and Gary Clow fly from MCM to WAIS
- IDDO notified by NSF on 1/4/15 that the season could be extended until 01/28/15
- Koehler arrived at WAIS on 1/5/15
- Kirkpatrick and Donenfeld arrived at WAIS on 1/6/15
- During the week of 1/5/15, the blue crane VFD was installed and disassembly was completed for the mixing tank and centrifuge. The level-wind and winch were also safely disconnected, lifted out of the winch pit and were removed from the Arch.

- Koehler was trained as a second logging winch operator to allow for the continuation of borehole logging after Gary Clow had to depart as originally scheduled on 1/7/15
- The level-wind, winch, and tower were palletized and prepared for shipment during the week of 01/12/15
- The shipping container was organized as items were being packed. The winch pit matting was also removed and readied for shipment.
- The IDDO team was notified their departure date had been moved up from 1/28/15 to 1/22/15.
- Cargo was staged, the slot was cleaned, and equipment prep occurred during the final three days on site at WAIS.
- Koehler, Donenfeld, Kirkpatrick and Waszkiewicz flew from WAIS to MCM on 1/21/15
- Koehler, Donenfeld, Kirkpatrick and Waszkiewicz flew from MCM to CHC on 1/28/15
- Koehler, Donenfeld, Kirkpatrick and Waszkiewicz flew from CHC to CONUS on 1/31/15

Problems Encountered:

- Primary problem encountered was lack of flights which kept us in MCM for four weeks
- Building deformation didn't allow for full travel for either crane
- Rigid drip pans deeply imbedded in slot, especially behind the ladder, were very difficult to remove and required heavy equipment to force them out
- Arch floor heaving made walking and moving equipment difficult as well
- Worn heavy equipment was maxed out while lifting the blue crane and when pulling the DISC Drill winch drum out of the winch pit

Successes:

- The crew worked very well together given this was the first time they had met and only one individual was familiar with the DISC drill.
- Despite the extremely shortened field season, we finished many of the disassembly tasks.

Recommendations:

- Recommend IDDO send 1-2 people back to WAIS Divide during the 2015-2016 field season to finish the remaining tasks that were not completed due to the much abbreviated 2014-2015 season. IDDO should be the ones to complete disassembly of the DISC Drill equipment, owned by NSF, of which IDDO is the custodian.
 - IDDO has discussed the borehole casing extension with both Matthew Kippenhan from ASC as well as WAIS Divide Chief Scientist Kendrick Taylor. Extending the casing correctly and backfilling snow around the casing correctly is critical. ASC, like IDDO, is also faced with add-on seasons at WAIS Divide in light of the 2013 government shutdown and the abbreviated 2014-2015 season due to weather and aircraft availability. ASC does not have unlimited manpower and requests that IDDO direct and assist with borehole casing extension in 2015-2016 and possibly again in 2016-2017 when IDDO plans to assist borehole logging scientists at WAIS Divide.



Lifting the DISC Drill's winch drum out of the winch pit. Photo: Don Voigt.



The DISC Drill's winch drum successfully removed from the drilling arch. Photo: Don Voigt.



View of what's remaining inside of the core handling arch. Photo: Don Voigt.



View of the inside of the drilling arch showing the uneven deformation/buckling of the floor. Photo: Don Voigt.



View of the inside of the drilling side of the arch showing the buckling of the railings due to the uneven buckling/deformation of the floor. Photo: Don Voigt.



View of the inside of the borehole logging tent and the USGS (now IDDO) Deep Logging Winch. Photo: Don Voigt.