PROJECT SITUATION REPORT
DISC Drill 2012-13 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 8 **for period:** 12-30-12 **through:** 1-5-13
Prepared by: Kristina Dahnert **Date:** 1-6-13

IDDO PERSONNEL ONSITE:
Patrick Cassidy
Kristina Dahnert
Dave Ferris
Chris Gibson
Jason Goetz
Josh Goetz
Mike Jayred
Jay Johnson
Nicolai Mortensen
Elizabeth Morton
Tanner Kuhl (arrived in MCM)

ACTIVITIES DURING PERIOD

- Tanner Kuhl arrived in McMurdo on Sunday, 12/30/12.
- Broaching operations continued on the second deviation. The motor power supply in Instrument section J began cutting out several times per run due to an internal grounding issue. This section was replaced by Instrument section tube K containing the Engineering Model baseplate.
- Began broaching/milling hybrid operations. The shoes on the milling head were shimmed out .005" to reduce the cut per tooth from 1mm to 0.5mm.
- Removed the fail-safe pivot assemblies from the actuator section engineering model. These will be used as spares for the other actuator sections.
- After formation of an adequate landing pad was assumed to be completed, coring operations were again tried in the second deviation. The first core pulled up was again a crescent shape, but now displayed an acceptable increase in angle over the length of the core to continue with coring operations.
- The drill was tilted using the initial angle method and was run up and down several times between 2416.2 meters to 2416.7 meters in order to obtain the highest angle possible. Coring was then resumed and the first full diameter core of the second deviation was drilled on Monday, 12/31/12.
- A level wind fault was experienced on Monday, 12/31/12. After extensive troubleshooting, it was determined the encoder on the level wind motor had failed. The encoder was removed from the control loop, as it is not necessary for payout or critical positioning information. An order has been placed for a spare motor encoder.
- A camera run and logging tool test of the second deviation were completed after the borehole had sat undisturbed for 24 hours over the holiday. During the

logging tool test, WOB varied by only 6N in the deviation zone, thus the test was considered a success. Unfortunately, the borehole fluid was too cloudy to obtain good video footage.

- Coring operations again continued, though difficulty was experienced when trying to reenter the second deviation each run. This process often took over 45 minutes per run to enter the deviation. Offsets for the actuator arms were recalibrated. Arm E1 of the upper actuator section was found to be a bit sluggish. Ethanol was used to clean the ball nut, loosening travel of the arm. Five of six arms were within 10% of expected values, while one arm was 20 % out of range.
- Rotation of the coring head was used during descent in the deviation area in order to drill out the transition area. This expanded the entry point to the second deviation and it is now entered successfully on the first or second tries each run. Occasionally, the cutter requires a quick jog to disengage the drill from the remaining ledge at the transition, around 2418 meters.
- A new set of core dogs was installed, as the dogs were starting to slide up and gouge the exterior of the core on a regular basis. The original core dogs were resharpened and the springs were adjusted.
- A sixth screen was added to the coring drill configuration. This enables collection of a full 2 meter core per run.
- During one run on Thursday, 1/3/13, the cutter would not penetrate properly. After several attempts to initiate cutting, the drill was returned to the surface for inspection. Two cutters were found to be missing from the cutter head, the third cutter was severely chipped and the shoes were worn down. Flathead screws and cutter locating pins had also been sheared from the head.
- A square magnet commonly used for fishing small tools from the drill slot was attached to the interior lip of a barrel cuff from the old broaching mandrel in order to create a fishing tool. The magnet was recessed 5/8” to allow room for a cutter to attach to the magnet without getting pulled away during drill ascent. During the first recovery run attempt, only a few metal flakes were recovered that look to be from the cutters. The pins, screws, and two cutters were not recovered.
- A second magnet head configuration was fabricated. This configuration consisted of four magnets bonded to a metal disk. Though the piece was from a PoleNet wind generator, the diameter of the disk was a perfect match for a drill barrel and was welded to the end of a barrel cuff. Unfortunately, this configuration also failed to recover any missing hardware, as it is suspected the broken hardware had been compacted or slightly melted into the ice at the bottom of the deviation bore.
- Broaching operations were initiated for the third deviation, so as not to lose time while additional fishing and recovery tools were designed and fabricated. Broaching passes for the third deviation span from 2221 meters up to 2204 meters. The broaching stroke length for this deviation has been increased from the 13 meters used during previous deviations to 17 meters now. This will hopefully aid in our formation of an adequate notch and milling ledge.
- Good broaching continued on the third deviation accompanied by successful chip collection.

- A conical tool for the replicate bore was designed and fabricated and was deployed in the second deviation for one drill run. The idea was to counter bore the center of the bottom of the hole so that the hardware would fall into the depression and the coring drill could collect core around it.
- After the conical tool was deployed, the drill was reconfigured using the originally damaged head that had now been reworked. A one meter core was collected and all objects previously sheared from the cutter head were collected in the core barrel on top of the core, including 2 flatheads, 4 pins and 2 cutters!
- Upon inspection of the cutter head design, it was found that the back end of the cutters do not fit snuggly against the pocket in the head. This fit puts the entire cutter load on the cutter locating pins and the cutter attachment screws, which may have been a contributing factor in the loss of hardware in the borehole. The back end of six cutters was built up with weld and then machined. The cutters now have a tight fit to the cutter head and coring operations resumed in the second deviation using the second new cutter head.
- The remaining two sets of cutters have been modified for a tight fit against the cutter head and the countersink has been replaced with a counter bore for use with a larger M4 screw as a cutter attachment (M3 screws were previously in use).
- Performed maintenance on and readied the spare core dog assemblies for use.
- Drilling operations continued through Saturday night into Sunday.
- Inventoried two electrical crates on the cargo line that had been shipped to WAIS with the original DISC Drill shipment in 2007-2008. Attempts are being made to retro cargo that will not be needed for the remainder of the project.
- Two sets of spare encoders for the winch motors and sheaves were located in one of the electrical crates. One set is an exact replacement for the encoders currently in use and the second set are units rated for a higher temperature range.
- Linda Morris (IDPO) left the U.S. on Friday, 1/4/13, bound for Christchurch, NZ.

SAFETY

- Elizabeth Morton attended the weekly camp safety meeting. This week's meeting focused on back safety and prevention of repetitive stress injuries.

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- One of the Core Handlers, Brad Markle, and one of the Replicate Coring P.I.s, Jihong Cole-Dai, gave science lectures for the camp this week. Brad outlined the side project he is conducting while at WAIS Divide, which involves studying spatial variability of water isotopes in the area through the collection of firn cores and the sampling of snow pits. Jihong discussed "What is Replicate Coring and Why Are We Doing It?" Both lectures were well-attended and nicely showcased the excellent science happening at WAIS Divide this season.
- Power generation now alternates between the two 225 kW generators, and both are working well. Parts for the one generator are still in transit.

- Package mail is experiencing a severe delay in transit this season. While personal packages are not as critical, we have coordinated with Wisconsin, Christchurch and McMurdo to get some recently ordered electronics components out to WAIS as quickly as possible. The parts will be implemented in the instrument sections should the motor drivers experience additional failures.
- A delicious New Year's Eve dinner was enjoyed by everyone in camp on Monday night, followed by the dropping of the ball (an exercise ball wrapped in tin foil) at midnight. Drill operations were again suspended for 24 hours over the holiday. Camp staff enjoyed another well-deserved two days off

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