PROJECT SITUATION REPORT
DISC Drill 2012-13 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 6 **for period:** 12-16-12 **through:** 12-22-12
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ACTIVITIES DURING PERIOD

- Performed a cleaning run using the original DISC Drill screen barrel and 10 screens. Only 1.75 screens were filled. It appears as though the bottom 7 meters of the parent borehole is full of chips through which the DISC Drill screen barrel cannot penetrate. A full cleaning run with the conical tool attached to the end of the DISC Drill screen barrel will be completed at the end of the season. The conical tool, combined with barrel rotation, will loosen the chips so they can be collected.
- After additional broaching runs last week, the drill was reconfigured for milling operations. One run was performed, completing 50 passes while milling between 2995 meters and 3002.2 meters depth. A ledge was established at 3000.2 meters!
- Completed a second milling run, adding axial shoes to the milling head. The head cut as expected with the cutter torque increasing as the ledge was made wider. Adequate width and stability of the notch were verified by retracting the actuators and witnessing an increase in inclination with a constant hold on weight-on-bit (WOB).
- The drill was reconfigured with a 1 meter core barrel and 3 screens. The actuators were rotated in line. 218” rear shoes were added for a 1mm pitch per tooth.

***** FIRST REPLICATE CORE RECOVERED on Monday, December 17, 2012! *****

- Coring operations showed chatter in the cutter torque, but penetration was good. While no core break was witnessed with regard to rise in cable tension, a

beautiful 1 meter core was recovered with a moon shaped cutout as was expected.

- After drilling a second 1 meter core, the drill was reconfigured with a 2 meter core barrel and five screens. With this setup, 1.75m could be drilled per run.
- Rollers on the tower were adjusted to accommodate both broaching and coring configurations of the drill.
- An issue was experienced with the cutter motor disabling during coring operations. This was attributed to either stick-slip or too aggressive of a cut. Cutter pitch was reduced from 1mm per tooth to .75mm per tooth.
- A 141mm diameter ring was installed on the upper actuator section to help support the upper sonde.
- Once the entire drill is in the deviation hole for coring operations, only the upper actuator arms are utilized during coring. The knife blade configuration on the upper arms provides anti-torque while coring.
- High core break tension was experienced this week, ranging from 23 kN to 35 kN. This was also experienced while drilling the parent borehole.
- A sixth screen was added to the screen barrel, allowing for the collection of full two meter cores.
- Fabricated a segmented broaching ring that mounts in place of the axial shoes on the milling head. This will be used starting with the next deviation.
- A scheduled power outage for generator maintenance occurred on Wednesday, 12/19/12.
- LVDT counts began creeping on the actuator arms throughout the week, with a couple of the arms remaining in the 20's after being commanded to retract (a 0 count signifies full retraction). Three shear pins have been changed this week due to either preventive maintenance or failure.
- 32 new shear pins were fabricated.
- Upper bulkhead pressure of the instrument section, as read between the two seals of the instrument section end cap, began reading borehole pressure during several runs this the week. On three occasions, the SAE plug was removed and 1-2 cups of fluid were drained from the instrument section each time. Instrument section K which is currently in use will likely be replaced along with leaking upper actuator section E after the first deviation is completed.
- A very visible ash layer was drilled at 3035.56 meters. This depth correlates well to the ash layer drilled in the parent borehole.
- The previous issue experienced with WOB and data rate transmission was repaired on Instrument section J. This section was reassembled and is ready for service. It will likely replace section K.
- Completed design of a trigger system for use with the drop ring and started fabrication. The trigger system will hopefully eliminate the need for strings to secure the drop ring during broaching operations.
- Drilled the second deepest U.S. ice core ever drilled, once again surpassing GISP 2 at a depth of 3056 meters.
- Added stabilizer pads to the top of the core barrel (147mm effective diameter) and relocated the 141mm diameter upper ring to the top of the upper actuator

section. These corrections were made to encourage the drill to continue away from the parent borehole, though no issues have been witnessed.
- Total number of drill runs this week: 46
- Total meters drilled this week: 86.067 meters
- Current drill depth: 3087.62 meters

SAFETY

- High winds and blowing snow greatly restricted visibility for much of Thursday and Friday this week. The heavy equipment operators are going a good job of cleaning snow away from the Arch doors as weather permits. While the drilling end of the Arch and the side entrance sustained heavy drifting, the core processing end of the Arch remained relatively drift free.
- After each power outage this week, the Arch ventilation system was restarted and proper operation was verified.
- Jessy Jenkins, our POC in McMurdo, is continuing her search for a backup handheld O_2 monitor.

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- The replacement breaker arrived for the second 225 kW generator and was installed. The second generator was repaired and started up. One of the cores is not the correct part, but the mechanics believe it will suffice and should allow the unit to function until the correct part arrives in several weeks.
- An unscheduled power outage occurred when the second 225 kW generator overheated. This was most likely caused by the windy conditions late this week. Operations resumed on the other 225 kW generator.
- Happy Holidays from everyone at WAIS Divide!