**IODP Expedition 342: Paleogene Newfoundland Sediment Drifts**
**Site U1402 Summary**

## Background and Objectives

The Motion Decoupled Hydraulic Delivery System (MDHDS) is an engineering development intended to serve as a foundation for future penetrometer and other downhole tool formation measurements. The MDHDS is designed so that downhole tools that are in the formation can be driven into the formation hydraulically and decoupled from the heave of the drill string, which negatively impacts these measurements.

The plan for the sea trial of the MDHDS was to carry out two tests of the tool set in the water column, wash to 100 m below seafloor (mbsf), test the MDHDS in situ for at least 30 minutes, turn on the pumps to clean the hole, take an APC core, test the tool in situ again, and take three more APC cores. The site chosen for the tests was a reoccupation of ODP Site 1073, New Jersey Margin.

## Principal results

After a 582 nmi transit from Bermuda to Site U1402 (ODP Site 1073), the vessel arrived at the first expedition location to perform engineering qualification tests on the MDHDS. The vessel was on Site U1402 at 1542 h (UTC-3h) on 6 June 2012. Two holes ended up being drilled at IODP Site U1402. Hole U1403A was drilled without coring to 96.4 m to perform MDHDS testing. Hole U1403B was drilled to 15.03 m CSF to obtain two cores, test laboratory equipment and provide experience for the science staff.

The drill pipe was lowered to 608 m below rigfloor (mbrf) and the MDHDS with the Temperature and Pressure (T2P) tool were made up for deployment using the developmental electronic release system (ERS) tool on the Schlumberger wireline. After running the tools through the blocks, a surface test was performed to check all components prior to deployment. A communication problem with the tool was fixed and the Schlumberger wireline was run into the drill pipe to ~250 mbrf, where the ERS released prematurely, allowing the MDHDS and T2P to fall 400 m to the landing seat in the Bottom Hole Assembly (BHA). An attempt was made to re-latch the ERS

tool to the MDHDS without success and the Schlumberger wireline was pulled from the drill pipe. An MDHDS mechanical latch assembly with sinker bars was assembled and deployed on the coring line in an attempt to fish the MDHDS tool, but this did not work. Upon retrieval of the coring line, the sinker bars were observed to have parted from the retrieval sub (RS) overshot, leaving a configuration that was impossible to fish. The decision was made to pull the drill string out of the hole to retrieve the test equipment inside the BHA.

After tripping out of the hole, the test equipment was removed from the BHA, and inspected for damage. It was found that the ERS was in the unlatched position. This may have caused the tool to drop in the first place and may have been the reason the MDHDS could not be retrieved with the ERS. The drill string was again deployed and Hole U1402A was spudded at 1405 h on 7 June, with the seafloor recorded at 650 mbrf. Hole U1402A was washed down to 96.4 m (746.4 mbrf) and the MDHDS, T2P and ERS were assembled and deployed for a second test. The MDHDS was lowered by the ERS to the BHA at 96.4 mbsf. The ERS was unlatched with the tether system and raised two meters above the BHA. The drill string pressure was raised and the T2P penetrometer was successfully deployed into the formation. Temperature and pressure signals were successfully transmitted to the rig floor for 30 minutes and recorded downhole. When circulation was re-established to clear the BHA of settled sediment, telemetry was lost. The ERS was then lowered and re-latched into the MDHDS. However, it was found that the MDHDS could not be retrieved with the wireline system. The wireline tension was increased to ~8,000 lbs. It was interpreted that the MDHDS had jammed in the BHA. The ERS was released and the Schlumberger wireline was pulled from the hole, the top drive was set back and the drill string was tripped from the hole. The bit cleared the rotary table at 0110 h ending Hole U1402A. It was found that the tether within the MDHDS had been worked between the tool and the inside of the BHA aperture, jamming the tool in place and preventing recovery. There was also significant sediment within the BHA. This concluded the MDHDS sea trial.

The ERS and the MDHDS worked well in this second deployment. The in-situ pressure was successfully measured and equal to 7.536 MPa, just slightly above hydrostatic pressure. The MDHDS was successfully delivered to the BHA and

released with the ERS. In addition, the inner MDHDS subassembly was successfully unlatched from the outer subassembly and the T2P was driven into the formation with no damage to the penetrometer tip. Analysis of accelerometer and pressure data showed no coupling with the drill string. While real-time data were acquired through the tethered system, problems with the tether associated with drill string pressurization suggest that this component (real time telemetry with a tether) is not ready for regular shipboard use.

When the MDHDS tests were concluded, several hours remained until a helicopter would arrive to exchange departing engineers with arriving science support technicians. The science party requested that a few cores be obtained from Site U1402 to test lab equipment and provide experience for the science staff. The vessel was offset 20 m to the east, the drill string was deployed a third time, and Hole U1402B was spudded at 0625 h on 8 June. Two cores were taken from 0-15 mbsf, with 100% recovery. Core U1402-1H was a 7-m long mudline core, and Core U1402B-2H was an 8-m long partial stroke core that suffered significant core liner damage.

While working on retrieving the second core a scheduled helicopter arrived at 0932 h with four USIO staff. The helicopter refueled, took on five MDHDS scientists/engineers and luggage and departed the *JOIDES Resolution* at 1020 h. The rig floor was secured at 1330 h on 8 June, ending Hole U1402B, and the vessel was underway at full speed to Site 1403 (proposed site JA-1A).

Analysis of Cores U1402-1H and 2H showed the sediment to be unconsolidated, sticky, grey to dark grey-brown Pleistocene-Holocene silty mudstone. The mud contains abundant woody organic matter and patches of sulfides as well as mollusk shell fragments. The sediment is similar to pro-glacial muds elsewhere along the continental margin. The microfossil assemblage consists of sponge and diatom fragments, a foraminifer assemblage dominated by benthic species, and a late Pleistocene calcareous nannoplankton assemblage. Both the benthic foraminifer and calcareous nannoplankton assemblages include, in addition to Pleistocene species, a mixed reworked assemblage. For example, reworked calcareous nannoplankton includes markers for the lower Oligocene, the upper Eocene, and the Cretaceous. Planktonic foraminifers are dominated by cold water Pleistocene species. Benthic

foraminifers are typical of slope water depths of 400-600 m. Section U1402B-1H-1 has normal magnetic polarity and a short reversed interval was detected in Section U1402B-1H-3. A similar reversal event was reported at 14.8-15.7 mbsf at Site 1073 and was provisionally identified as the Laschamp or Blake excursion. Nannofossil biostratigraphy indicates that the base of Hole U1402B cannot be older than 70 ky, so we interpret the reversal at 6.15-6.20 m to be the ~38-40 ky Laschamp excursion.