

**Week 6 Drilling and Scientific Report for IODP Expedition 313
New Jersey Shallow Shelf**



4th June – 10th June 2009

1. Operations

On the 4th of June coring from 360 mbsf became easier compared to the end of Week 5, although the core recovery was variable. Small cavings occasionally slowed progress through alternating soft and firm formations noted by the driller. Towards the end of the day, the sandy formations forced shorter core runs and caving sands required additional reaming.

Early in the day on the 5th of June, a bridge formed above the BHA which caused the drill string to become stuck. Several hours were spent trying to pull the BHA past the bridge. This was unsuccessful, and the decision was made to continue coring using the HQ drill string through the PQ drill string, effectively using the PQ string as casing set at 404 mbsf. Before the HQ string was run into the hole, a through-pipe gamma ray wireline log was taken from 390 mbsf to the surface. 10 m of infill material in the PQ pipe had to be reamed out before HQ coring could begin.

At 0330 hrs on the 6th of June, coring using the HQT (HQ Tight Tolerance) core barrel commenced. After 4 core runs, a hole collapse risked the HQ string becoming stuck and so the HQ string was pulled back to the PQ casing. On the 5th HQT core run, the drill string became stuck for an hour. Amendments were subsequently made to the mud mixture.

The first few hours of the 7th of June were spent circulating and advancing the HQ string to the base of the PQ casing. While advancing the HQ string, the driller noted little penetration and thought there was an obstruction. The HQ string was pulled back to the surface and the BHA checked. The bit was still attached but severely worn and was replaced with a similar but harder matrix impregnated bit. Upon running the HQ string down the hole, 67 m of sand was encountered inside the PQ string. The remainder of the day and the beginning of the 8th of June was spent reaming out this material.

At 0745 hrs on the 8th of June, normal coring commenced with 9 good cores collected. The improvement in coring progress continued into the 9th of June. Coring was suspended for 1 hour and 40 minutes due to an electrical storm.

Coring continued to progress well up until 1200 hrs on the 10th of June, with 8 core runs and 18.5 m penetration with a decreasing penetration per core run, reaching a depth of 533.85m. This decreasing penetration rate caused concern with the view that the inside cutting diameter of the core bit had worn out and thus the bit was cutting an oversized core. It was decided to pull the HQ string to check the bit. This decision coincided with the detection of H₂S in the last core run returned to the deck. Precautions were taken and the borehole monitored. The HQ string was pulled and the bit inspected. Although the bit showed considerable wear, it still did not account for the poor penetration. The HQ string was run back into the hole which appeared to be stable and the cavings cleared. After reaming, the core barrel was retrieved for an H₂S test (up to 2400 hrs).

2. Hole summary

Hole	M0028A
Latitude	39° 33.94279' N
Longitude	73° 29.83481' W
First core	26/05/09 at 15:15
Cores recovered	55R to 117R (63 cores)
Drilled length	186.39 m
Recovered length	136.19 m
Core recovery	73.07 %
Depth reached	533.85 mbsf

3. Science

The week began at 360 mbsf (Core 55R) in glauconitic quartz sand immediately below our preliminary correlation to seismic sequence boundary m5.3 that we placed at 356 mbsf. This correlation was supported by a small change in the through-pipe gamma ray log data collected later in the week. The sand gradually

became finer and more clay-rich, with occasional shell fragments and decreasing amounts of glauconite, down to an interval of no recovery at 382-385 mbsf that matches a major downlap surface in the seismic data. Below this depth, cores became coarser with decreased amounts of glauconite. Medium quartz sand blocking the bit at 403 mbsf marked the beginning of a struggle to maintain the previously high recoveries. Loose sand and a possible constriction led to the painful decision in the morning of June 5 to leave the PQ drill pipe at 404 mbsf, lower the HQ bottom hole assembly through this pipe-turned-casing, and continue with a slightly smaller diameter drill bit and pipe. A spectral gamma ray through-pipe log was run before rigging this changeover, and provided excellent results from 390 mbsf to the seafloor. The HQ pipe was run into the hole after that logging run, and found a significant amount of cave-in had filled the bottom of the hole up into the PQ casing, and this required many hours to clear. During this process the HQ core barrel became plugged by a thick (12 mm) bivalve wider than the diameter of the core (60 mm). We believe it may have been part of an oyster bank that together with intervals of loose sand may explain the challenging drilling conditions. Other facies recovered while clearing the hole included highly organic lagoonal mud. Coring below the bottom of the PQ pipe encountered considerable difficulty, but within the limited recovery we found a few 10s of cm of a carbonate-bearing algal mat that is consistent with the shallow-water environments implied by the overlying oyster beds and possible lagoonal facies. Challenges to drilling and recovery were not over, however. Minimal penetration forced the decision to recover the bottom hole assembly and evaluate the cause. We found the bit was completely worn out, probably due to coarse quartz sand in the fill that had been cleared getting to the start of new coring. With a fresh bit, June 8 began at 412 mbsf and marked the start of improved penetration rates. Recovery throughout the day remained close to 100% in fine quartz sand that slowly became muddier with depth and indicated that while gradually deepening, the depositional environment of these sediments was comparatively shallow. High recovery continued on June 9 in relatively uniform lithologies at the base of the early Miocene m5.4 sequence comprising hard silt with lignite and scattered shell fragments. Quiet depositional environments were indicated by our finding of fish scales and occasionally both halves of articulated bivalves. Very fine quartz sand began to appear with increasing frequency against a background of micaceous, lignitic, shelly silt, and by 482 mbsf fine sand became the dominant component. This changed abruptly at 522 mbsf with the appearance of medium to coarse quartz sand containing 20% glauconite grains. The quartz/glauconite ratio rapidly reversed downhole, cementation increased, and at 528 mbsf we encountered 6 m of hard glauconite sandstone. We need to drill deeper or collect log data to this depth to know for sure, but our preliminary interpretation places this transition as the eroded top of the m5.6 sequence. Diminished drilling success indicated a need to replace the bit, and this was done during the remainder of June 10.

4. HSE Activities

At 1100 hrs on the 10th of June, a strong smell of H₂S was detected and measured by the gas monitors to be greater than 50 ppm when the head was removed from the inner barrel (core 117R, 533.85 mbsf). The core was allowed to vent before it was curated, and the concentrations of H₂S at the top end of the core subsided quickly. At 1630, there was a discussion on how to continue drilling with the risk of H₂S arriving on deck either in the cores or in the mud as it returns to the deck. The drillers had an extended shift handover to reiterate the ESO core handling and gas monitoring procedure. Continuous gas monitoring of the core and borehole will be undertaken for the remainder of this hole.

5. Figures

On next two pages:

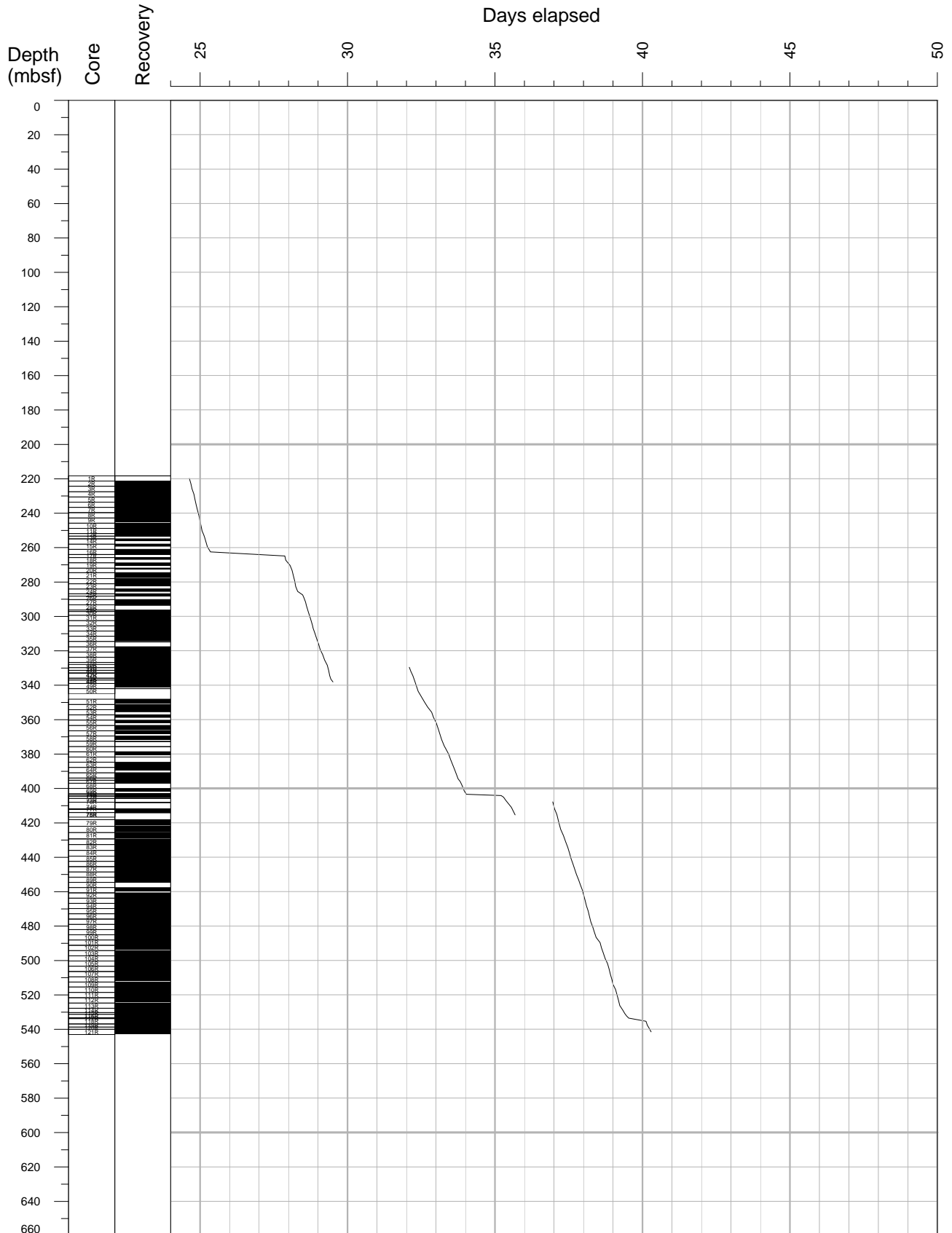
Figure 1 – Recovery and depth versus time plot at Hole M0028A, up to 2400 hrs on 10th June.

Figure 2 – Breakdown of hours up to 2400 hrs on 10th June.

IODP Expedition 313

Hole M0028A progress summary

Latitude: 39° 33.94279' N
Longitude: 73° 29.83481' W
Water depth: 35.1 m



IODP Expedition 313 - Breakdown of hours

