

27th September 2013 – 3rd October 2013

1. Hole summary

Hole	M0060A	M0060B
Latitude	56° 37.211' N	56° 37.204' N
Longitude	11° 40.243' E	11° 40.229' E
First core	23/09/2013	29/09/2013
Last core	28/09/2013	01/10/2013
Cores recovered	30	28
Drilled length (Coring)	23.31m	85.7m
Drilled Length (Open Hole)	28.89m	N/A
Recovered length	19.0 m	87.54 m
Core recovery	81.5 %	102.15 %
Final depth	229.6 m	85.7 m
Hole recovery	68.74 %	102.15 %

2. Science

At the start of week 3, drilling had reached a depth of 169 mbsf in Hole M0060A of Station BSB-1 south of the Kattegat island, Anholt. We were drilling through hard deposits of mixed clay and sand with variable composition, ranging from almost pure sand to silty clay. The occurrence of shell fragments of marine bivalves, snails and foraminifera, together with the grain size succession, indicated that the depositional environment changed several times from shallow water to deeper water and then back again to more shallow water. Bits of charcoal were abundant at several horizons. We also recovered 5-10 mm large, thin sheets of amorphous black plant material with fibrous imprints of cellular plant structure and with indications of initial pyritization. A number of such pieces were collected and frozen at -80°C for later DNA analysis. Such a material also constitutes excellent samples for 14C dating and the possibility to achieve an accurate timescale is thus very promising.

As drilling passed 200 mbsf the sediment became increasingly hard and sandy. Shell fragments were typical of shallow-water marine bivalves such as *Cardium* and *Chameleastriatula*. Foraminifera were scarce and their diversity was low. Sampling for OSL dating started at 128 mbsf and continued at regular intervals down to the bottom of the hole. Coring could now only be done by push corer and by hammer sampling. At 233 mbsf, only 10 m short of the targeted drilling depth, further coring was prevented due to a strong artesian flow of formation water that carried large amounts of sand up into and around the drill string and locked the bottom hole assembly, causing the hole to be abandoned.

The next Hole, M0060B at Station BSB-1, was drilled by piston coring for microbiology and (bio) geochemistry studies. The stratigraphy was very similar to Hole M0060A, with 6-8 m of well sorted sand at the top, followed by a deep sequence of clay, at some depths mixed with small portions of silt and sand. Starting from 10 mbsf the quality of the cores was very good and well suited for microbiological sampling. Due to the difficulties and risk of drilling down through the deep layers of pure sand, which started at around 85-90 mbsf, it was decided in advance not to go deeper than 100 mbsf. The depth intervals of microbiology sampling, which had been pre-planned for a 243 m deep hole, were therefore shifted to a higher frequency in these upper 100 m.

The overall impression of the cored sediment sequence is that it has recorded significant shifts in the sedimentary environment. Judging from the grain size, colour, compaction and fossil content of the sediments the environment has undergone several shifts from a deepwater marine regime to a glacially influenced less marine setting and back. The degree of consolidation of the clays from c. 40 mbsf and down core may indicate that this sequence has been compacted by the load of glacial ice. Black stains, spots and banding also occur fairly frequently down core from this level. The findings of abundant organic material such as mollusc shells and plant remnants will together with analyses of the pollen and diatom content make it possible to determine how and when these environmental regime shifts occurred.

As this was the second microbiology hole of the expedition, the science teams were fully prepared and well organized and sampling went very well. PFC tracer was pumped constantly during the drilling of Hole M60B, where drilling mud was used in the upper 30 mbsf and seawater below that depth. Samples for PFC contamination tests were taken frequently from cores and from drilling fluid down through the hole and will be analyzed in a land-based laboratory within the coming days. The PFC contamination data will then be available for those microbiologists who are working with live sediment samples.

As coring reached 85 mbsf we again hit a highly permeable sand layer. The water flow carried large amounts of sand into the bottom of the hole and the last piston core was recovered only with difficulty. The hole was therefore terminated at 87 mbsf and prepared for subsequent logging.

Pore water was drawn from all cores in both holes. Recovery was high, 10-30 mL, in the sandy clay down to about 25 mbsf below which it dropped to <1-5 mL. Recovery by Rhizon sampling was also high in the pure sand at 100-150 mbsf. The interstitial water chemistry from the two holes at Station BSB-1 showed that the salinity decreased gradually with depth, from seawater values of 30-32‰ at the sediment surface. Salinity was distinctly lower in the very sandy interval from 85 to 150 mbsf where a minimum of 9‰ was reached at 125 mbsf. Since this is the layer with overpressure and artesian water flow it is possible that this sand layer is an aquaduct originating from a terrestrial catchment area, e.g. on Anholt, and that the fresh water is mixed with seawater during its flow. Below the sandy interval salinity increased again to around 20‰. Alkalinity and ammonium showed surprisingly sharp peaks in the marine clay at 10-15 mbsf while their concentrations remained moderate below 40 mbsf with ca. 10 mM alkalinity and 0.5 mM ammonium. There was no detectable free sulfide at any depth. Methane was at trace levels down to the pure sand at 100 mbsf and below 170 mbsf but showed a broad peak approaching 1 bar partial pressure in the middle of the sand layer.

3. HSE and Environmental Activities

N/A

4. Figures

Figure 1 – Recovery and depth versus time plot at Hole M0060A

Figure 2– Recovery and depth versus time plot at Hole M0060B

Figure 3. Breakdown of hours, up to 24:00 hrs on 3rd October.

Photos of the week.

IODP Expedition 347

Latitude: 56° 37.211 N
Longitude: 11° 40.257 W
Water depth: 31.2 m

Hole 60A progress summary

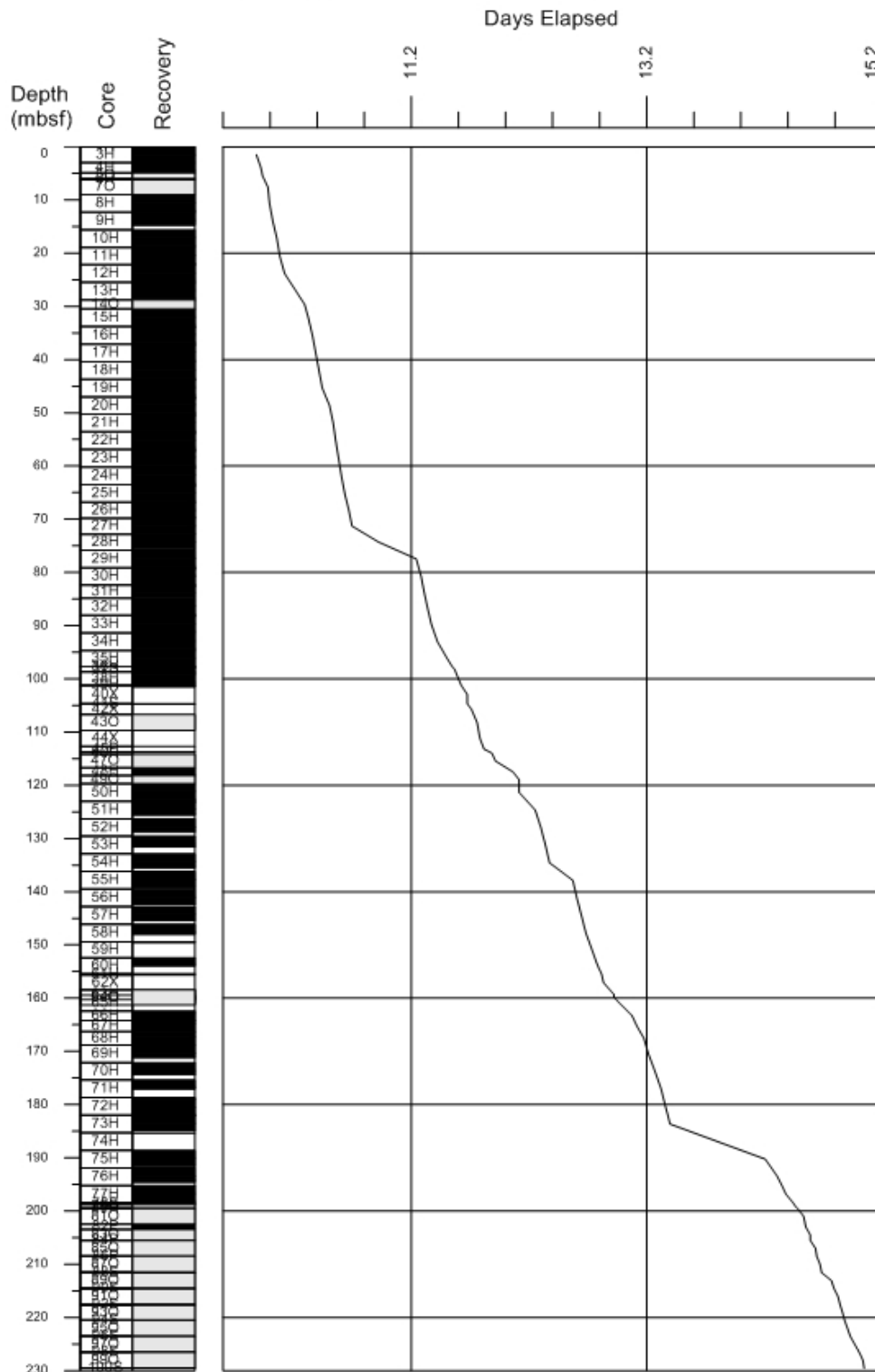


Figure 1 Recovery and depth versus time plot at Hole M0060A

IODP Expedition 347

Latitude: 56° 37.211 N
Longitude: 11° 40.257 W
Water depth: 31.2 m

Hole 60B progress summary

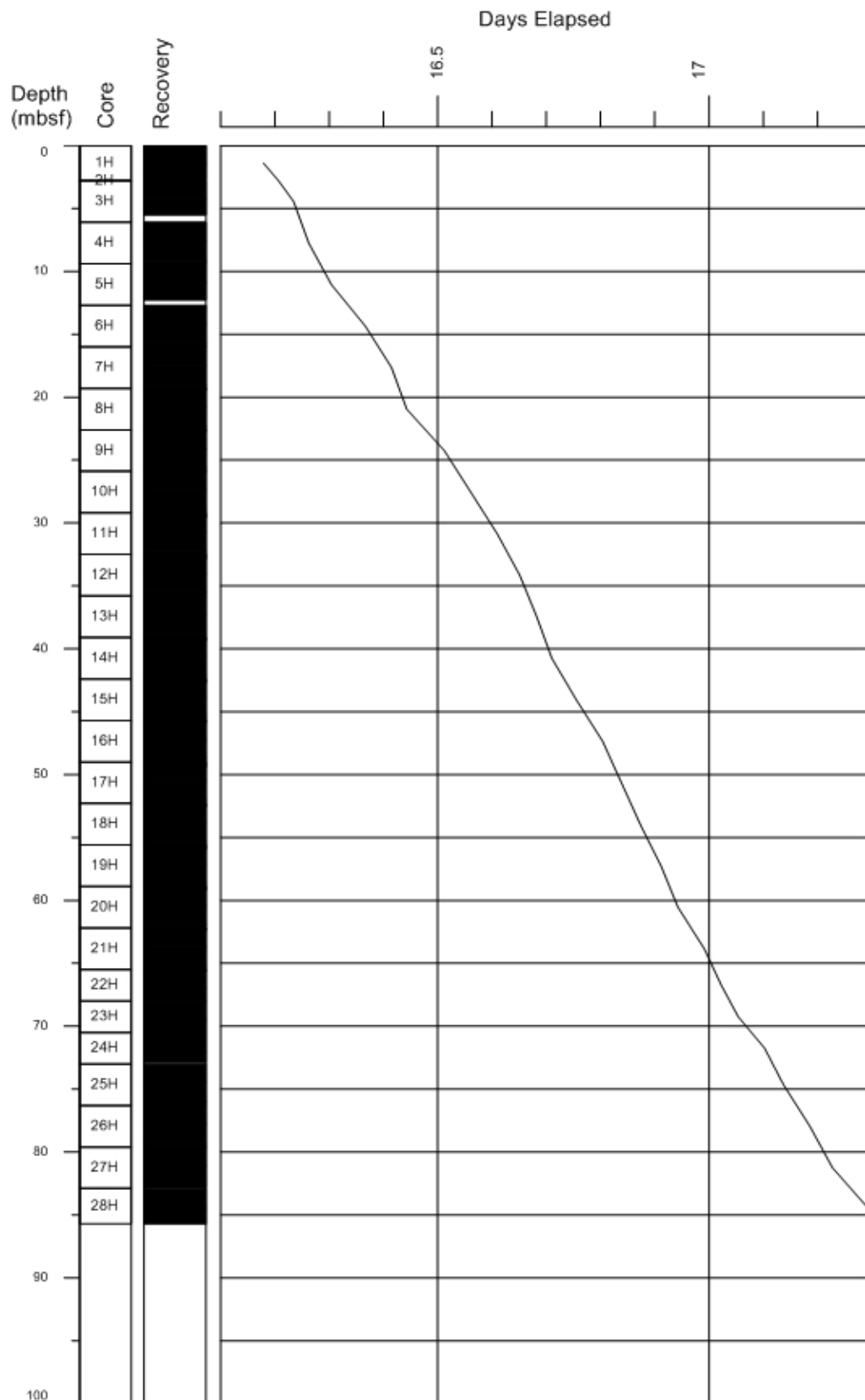


Figure 2 Recovery and depth versus time plot at Hole M0060B

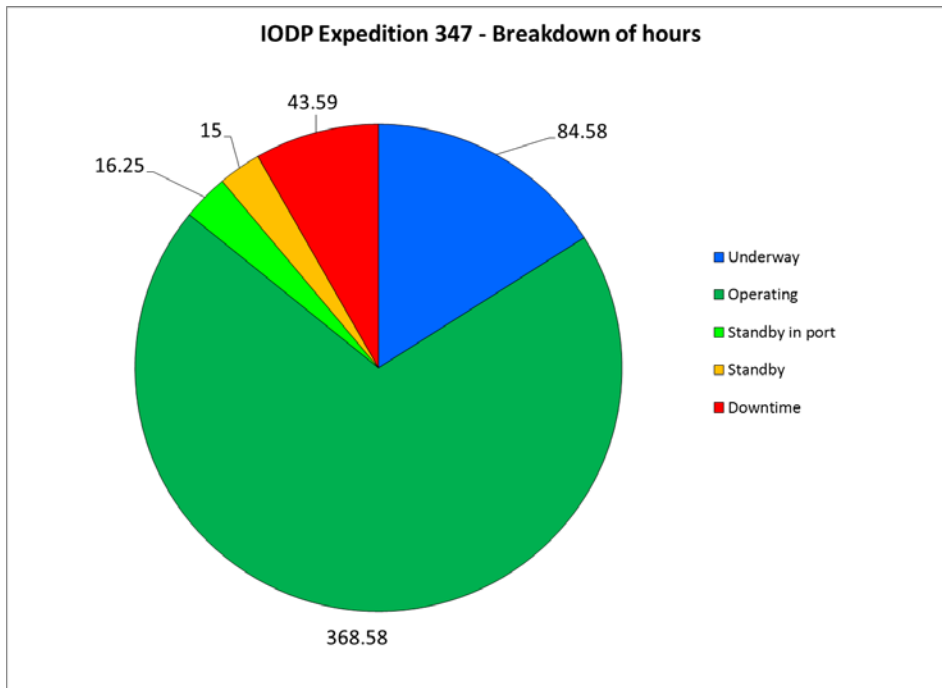


Figure 3 Breakdown of hours, up to 24:00 hrs on 3rd October.



NadineQuintanaKrupinski©ECORD_IODP



CarolCotterill©ECORD_IODP



BoBarkerJorgensen©ECORD_IODP



BoBarkerJorgensen©ECORD_IODP