IODP Expedition 355: Arabian Sea Monsoon

Week 6 Report (3–9 May 2015)

Operations

Hole U1456D (IND-03C)

While pulling the Schlumberger wireline severing tools, the Schlumberger engineer indicated that a weak link on the Schlumberger cable head had failed and the severing tool assembly was lost in the hole. With the top drive in, the drill string was pulled back to 756.6 m below seafloor (mbsf). Overpull was 10–15 klb. The top drive was set back and the drill string pulled clear of the seafloor at 0425 h on 3 May. When the drill string reached 753.9 m below rigfloor (mbrf) it became apparent why the core barrel deployed earlier via wireline would not pass the seafloor depth. Several joints of 5 inch drill pipe that had extended from just below the seafloor and deeper into the hole were recovered severely bent. The next 13 h were spent removing the joints from the drill string and laying them out via the pipe racker to the portside inboard bay of the riser hold. In total, there were 39 joints (~377 m) of bent 5 inch drill pipe. The four-stand rotary core barrel (RCB) bottom-hole assembly (BHA) that was lost in the hole included 11 control length drill collars (CLDC), one tapered drill collar (TDC), a new CC-4 RCB core bit, a complete mechanical bit release assembly (MBR), two modified head subs, and one modified top sub. A detailed list of lost hardware was prepared along with an incident report. The remainder of the drill string was intact and the severed end of the last joint of 5 inch drill pipe cleared the rig floor at 2200 h on 3 May. This officially ended Hole U1456D and began Hole U1456E.

Hole U1456E (IND-03C)

The drill crew cleared the rig floor of all remnants of the bent pipe recovery (cut-off tool joints, etc.) and serviced the rig. At 2245 h on 3 May the drill crew began picking-up the eleven additional CLDCs and TDC required to make up the BHA for drilling operations in Hole U1456E. The drill collars were made up into stands and racked back in the derrick. The upper guide horn was laid out to the forward main deck pipe rack and the casing running tools, subs, and equipment picked up. At 0700 h on 4 May, we began to assemble the drilling stinger. This included a Hughes 9⅞ inch R2 tri-cone drill bit, a bit sub with float valve, an underreamer with the mill tooth arms/cutters set to 12¾ inch diameter, and a positive displacement mud motor. This assembly was deck tested with the motor beginning rotation at ~25 spm of the mud pumps, with the underreamer arms fully opening at 30–35 spm. After testing, the assembly was laid out on the pipe racker. The Hole U1456E reentry cone was moved over the center of the moonpool doors and a 16 inch casing hanger with pup joint was lowered and latched into the reentry cone using the 16 inch casing running tool. A 10¾ inch casing hanger assembly was made up with the 10¾ inch casing running tool and the power tongs and casing running equipment rigged-up. At 1430 h on 4 May we began making up the 10¾ inch casing string. The first five joints were

welded together and the casing hanger was also welded to the last casing collar. Including the shoe joint, a total of 55 joints of casing were made-up in 8.5 h and by 2400 h on 4 May, the 10¾ inch casing hanger was landed and latched into the reentry cone assembly. The drilling stinger assembly was then picked up, along with 23 stands and one single of 5 inch drill pipe, run inside the casing string, and the casing running tool was attached to the 10¾ inch casing hanger. Three hours were spent working on the 5½ inch pipe racker jacking assembly before beginning the pipe trip toward the seafloor.

At 0700 h on 5 May, with the drilling stinger assembly (bit) extending 4.82 m ahead of the casing shoe, the reentry cone, casing, and drilling stinger assembly were deployed. This space out placed the underreamer arms 2.61 m below the 10¾ inch casing shoe. While lower the casing toward the seafloor, the pipe was filled with seawater every 15 stands, the drilling line was slip and cut, and the subsea camera deployed for reentry. The drilling assembly reached the seafloor by 2045 h on 5 May. We then picked up the top drive and the drill string was spaced out. At 2130 h, Hole U1456E was spudded. We spent the next day drilling in the casing to 743.4 mbsf. The reentry cone landed at the seafloor (3648 mbrf) at 0100 h on 7 May. We then released the casing string and retracted the underreamer assembly back up inside the casing. After setting back the top drive, the subsea camera and drill string were recovered back to the ship. After the drilling assembly cleared the seafloor at 0410 h on 7 May, the vessel was offset 50 m east of the reentry installation as a precaution. After spending an hour repairing a ruptured hose on the iron roughneck, the pipe trip was completed by 1415 h. We then washed and laid out the mud motor/underreamer assembly.

At 1615 h on 7 May, we began making up the new RCB drilling/coring BHA. The drill string was once again tripped to the seafloor and the subsea camera deployed. After maneuvering the ship for 36 min, we reentered Hole U1456E. The subsea camera was recovered, the pipe advanced to 706.1 mbsf (still inside the casing string), the top drive picked up, and then an RCB core barrel dressed with a center bit was deployed. The bit was advanced to 748.2 mbsf before tagging the bottom of the hole. This was the depth the drilling "stinger" assembly reached when drilling in the 10¾ inch casing shoe, indicating that there was no fill at the bottom of the hole. We pumped a 30-barrel high viscosity mud sweep and at 0830 h on 8 May, we began drilling with the RCB center bit. A total of 26.5 h were required to advance the 9⅞ inch diameter hole to 970.0 mbsf and at 1100 h on 9 May, the drill ahead was completed. The overall average rate of penetration for the 221.8 m interval drilled was 10.9 m/h. We pumped a 40-barrel mud sweep and recovered the RCB center bit; however, before a core barrel could be dropped the driller noted that he had 4 m of fill on bottom. Therefore, instead of dropping an RCB core barrel, we deployed a wash barrel and pumped two 50-barrel high viscosity mud sweeps out of the hole at a circulating rate of 130 spm. Once the hole was considered to be clean, the wash barrel was recovered and at 1545 h on 9 May, we deployed a core barrel and coring initiated in Hole U1456E from a depth of 970.0 mbsf. For reference, it required 5.6 d to drill-in a new reentry cone and 10¾ inch casing assembly to 743.4 mbsf, and then drill a 9⅞ inch hole to 970.0 mbsf. Prior to that, another 1.8 d had been spent severing the drill string and recovering the bent string

of drill pipe. Total lost time due to the loss of Hole U1456D was 7.4 d. At the end of the week, Core U1456E-4R had advanced to 978.0 mbsf.

Science Results

The sedimentologists described and refined the lithologic units for Site U1456. Unit I is described from Holes U1456A, U1456B, and U1456C, and is primarily composed of nannofossil ooze and nannofossil ooze with clay, with thin graded beds of silt and sand. Unit II is found in Holes U1456A and U1456C and is dominated by sand, with lesser amounts of light brownish to gray nannofossil-rich clay and clay with nannofossils. Unit III is described from Holes U1456A, U1456C, and U1456D, and consists of light brown to dark green clay/claystone, light brown to dark gray sand/sandstone, light greenish nannofossil chalk, and light to dark greenish gray nannofossil-rich claystone. The finer grained lithologies are heavily burrowed, with *Planolites, Chondrites,* and *Zoophycos* traces, typical of deep-water sedimentation. Unit IV is found in Hole U1456D and primarily consists of dark gray claystone and light greenish calcarenite and calcilutite. Conglomerate and breccia are present in lesser amounts.

The biostratigraphers re-analyzed some samples from Hole U1456D to refine bioevents and worked in collaboration with the paleomagnetists to produce a shipboard age model for Site U1456. The final age model supports the presence of several hiatuses through the recovered section.

The stratigraphic correlators continued to refine the correlation between cores from Holes U1456C and U1456A and the logging data from Hole U1456C. The gamma ray log taken through the pipe in the upper 80 mbsf of Hole U1456C can be correlated to patterns in the magnetic susceptibility and gamma ray attenuation from the cores. Core U1456E-3R was run on the Special Task Multisensor Logger (STMSL) for correlation to Hole U1456D. Initial analysis indicates that the cored interval is similar to that of Core U1456D-56R.

The geochemists completed CHNS analysis of sediment samples from Hole U1456D. Coulometer measurements were also made on 10 core catcher samples from Hole U1456D. The geochemists started sample preparation for onboard organic extractions from interstitial water sediment residues (squeeze cakes) and core catcher samples. Thus far, 72 samples have been extracted using organic solvents, and the total lipid extract (TLE) was combined, concentrated, and stored in 2 mL vials. TLE samples were weighted for organic extractability measurements.

Paleomagnetic activities revolved around fine-tuning the magnetostratigraphic constraints for Holes U1456A, U1456C, and U1456D, as well as performing some exploratory rock magnetic tests addressing overall reliability of the paleomagnetic signal and the possibility of contributing to discussions of weathering on the continent.

Core U1456E-3R was first scanned on the STMSL. The core was then allowed to equilibrate to room temperature before being run on the Whole-Round Multisensor Logger (WRMSL). Magnetic susceptibility and bulk density show very little variation through the core.

Education and Outreach

We conducted five ship-to-shore events with audiences in India, Italy, and the USA. We connected with more than 200 university students at the University of Milano-Bicocca in Italy, as well as 25 PhD students and researchers at the CSIR National Institute of Oceanography in Goa, India. We spoke to about 50 marine science students in two separate events with a high school in Washington, D.C. We also held an event with the Ministry of Earth Sciences (MoES) in New Delhi, India. Finally, the Co-Chiefs participated in a 2 h "Ask Me Anything" event with Reddit. These events allow people from around the world to connect with scientists via chat over a 2 h period. This inaugural event for the *JOIDES Resolution* was quite successful!

Technical Support and HSE Activities

The following technical support activities took place during Week 6.

Laboratory

- Amplifier on superconducting rock magnetometer (SRM) is not able to ramp up to higher amperage. Contacted vendor and the diagnosis is to restrict usage to lower amps until a service call can be arranged or the new SRM is installed.
- All archive sections are now being scanned with the Minolta spectraphotometer. Paleomagnetists are investigating whether these data can be used to detect iron sulfides, which they want to avoid when selecting discrete samples.
- Conducted a comparison of the hematite and goethite peaks between the Minolta and the Section Half Multisensor Logger (SHMSL) spectrophotometer and concluded that the SHMSL spectrophotometer is not set up to detect these peaks.
- Power supply on SHMSL stopped working just as we were ready to scan the first core from Hole U1456E and was fixed after some troubleshooting.

HSE Activities

- Tested safety shower and eye wash stations.
- An abandon ship drill was held on 8 May.