IODP Expedition 341: Southern Alaska Margin

Week 2 Report (3–8 June 2013)

Operations

Week 2 of Expedition 341 (Southern Alaska Margin) began while still underway to Site U1417 (GOA18-2A). After a 1038 nmi transit from Victoria, BC averaging 10.8 kt, the vessel arrived at the first expedition site. The local vessel time was advanced 1 h during the transit, placing the vessel in the time zone for the Gulf of Alaska. The vessel stabilized over Site U1417 at 1101 h (UTC – 8 h) on 4 June.

The BHA was picked up and assembled, then RIH with drill pipe to 4165.25 mbrf. All drill pipe was strapped and drifted during the pipe trip. The top drive was then picked up and the drill string was circulated out to remove any debris that might have accumulated in the string. The calculated PDR for the site was 4199.2 mbrf and after some consideration 4194.5 mbrf was selected as the shoot depth for the first core. The bit was spaced out to 4194.5 mbrf and the APC barrel was RIH with wireline and landed. Hole U1417A was spudded at 0315 h on 5 June. The mudline core recovered 5.4 m of sediment and seafloor was calculated to be 4198.6 mbrf. Non-magnetic core barrels were used for APC coring from Core U1417A-1H through Core U1417A-20H. Temperature measurements were taken with the APCT-3 temperature shoe on Cores U1417A-4H, 10H and 13H with good results. APC coring with wireline continued through Core U1417A-22H with the new ½ APC coring system using steel core barrels. Partial APC strokes were recorded on Cores U1417A-6H, -8H, -18H, -19H, -20H, and -21H, which were likely caused by large clasts. Hole U1417A was terminated after Core U1417A-22H at a final depth of 4366.6 mbrf (168.0 mbsf). At the conclusion of coring the top drive was set back and the drill string was pulled from the hole. The seafloor was cleared at 0935 h on 6 June, ending Hole U1417A. A total of 22 piston cores were taken over a 168.0 m interval with a total recovery of 167.74 m of core (99.8%).

After clearing the seafloor, the vessel was offset 20 m to the east. The top drive was then picked up and the bit was spaced out to 4196.5 mbrf in an attempt to recover approximately 8.5 m on the mud line core. The 5.35 m core recovery was unexpected but could have been attributed to the vessel heave. The seafloor depth was calculated to be 4200.7 mbrf (4185.2 mbsf). Hole U1417B was spudded at 1225 h on 6 June. Core orientation was planned and the FlexIt tool was deployed. High heave conditions and mechanical shearing forced abandonment of orientation on Hole U1417B. Non-magnetic core barrels were used for APC coring from Core U1417B-1H through Core U1417B-20H at a depth of 176.3 mbsf. APC coring with wireline was extended by 47.1 m to a depth of 223.4 mbsf from Core U1417B-21H through Core U1417B-33H using the ½ APC coring system. The XCB system was deployed from Core U1417B-34X through Core U1417B-41X to a depth of 300.6 mbsf. A total of 33 piston cores were taken over a 223.4 m interval on Hole U1417B with a total recovery of 211.97 m of core. A total of 8 XCB cores were cut over a 77.2 m interval with a recovery of 32.51 m of core. At the end of the week, the overall core recovery for Hole U1417B was 81.3%.

At week's end the vessel was still XCB coring in Hole U1417B at a depth of 300.6 mbsf.

Science Results

Site U1417 (proposed Site GOA-18-2A) is located in the distal Surveyor Fan in the Gulf of Alaska. Primary goals for Site U1417 are to establish the baseline erosion conditions in the St. Elias orogen prior to Pliocene–Pleistocene climate perturbations by integrating the results of the Surveyor Fan seismic reflection data sets and sediment mass fluxes and provenance records. Another goal is to link glacial activity and regional oceanographic changes with variation in submarine fan deposition patterns and rates. This site also has the potential to establish tephra records of southern Alaska volcanism and to characterize Aleutian subduction zone inputs.

Once core from Hole U1417A came on deck, core description began with visual core description, smear slides, and core imaging. The lithology of Hole U1417A is mostly biogenic-barren dark gray mud with clasts (up to pebble size), alternating with diatom ooze, suggesting repeated cycles between periods of high sediment accumulation, potentially glacial periods, and intervals of increased primary productivity. Several ash beds, turbidites, and debris flow deposits were also observed. Initial interpretation suggests a deep-water depositional environment that records environmental change from glacial to interglacial sedimentation and evidence of regional volcanism and slope failures.

Although the major lithology of Hole U1417A is dark gray mud with terrigenous material, several intervals of diatomaceous oozes were identified. Based upon diatom and radiolarian biostratigraphy, Hole U1417A covers the last ~1.5 Ma. Diatoms are, in general, abundant to rare in their abundance and are well to poorly preserved. Radiolarian abundance closely matches that of the diatoms. Radiolarian species diversity is high at the top of Hole U1417A and decreases to the base of the hole. Occurrence of planktic and benthic foraminifers is largely affected by the lithology of the sediments. Their abundance was quite limited in recovered sediment that contains large amounts of sand-sized grains, suggesting their original signal was diluted by the terrigenous input. Their preservation was high at the top of Hole U1417A and becomes poor with depth.

The archive half of Hole U1417A has been processed through the superconducting rock magnetometer (SRM) to study the remanent magnetization. The core halves were measured and alternating field demagnetized at peak fields of 5, 10, 15 and 20 mT and then re-measured. The viscous component is removed by 10 to 20 mT, revealing consistently strong and apparently stable and well-preserved magnetization. Inclinations are consistent with geocentric axial dipole (GAD) values for the site location and declination is serially correlated. Three polarity reversals have so far been recognized tentatively correlated with the Matuyama/Brunhes (Core U1417A-14H), upper Jaramillo (Core U1417A-17H) and the lower Jaramillo polarity transitions (Core U1417A-18H). Measurements and data analysis continue.

Over 375 m of core has been logged from Holes U1417A and U1417B. We collected initial low-resolution dataset of gamma-ray attenuation density and magnetic susceptibility at (2.5 cm intervals with 2 s measurements) on the special task multisensor logger (“fast track”) to facilitate rapid decisions on the coring strategy. After warming to room temperature, sections were logged at higher resolution (2.5 cm intervals with 5 s measurements) for gamma-ray attenuation density, magnetic susceptibility, and *P*-wave velocity on the whole round multi-sensor logger. Core lengths of over 50 cm were also analyzed for natural gamma radiation. All the aforementioned properties showed cyclic variability downcore. Punctuating events of anomalously high

density/magnetic susceptibility are associated with volcanic ash beds, discrete clasts, and/or turbidites. Episodes of low density/magnetic susceptibility are associated with episodes of biogenic (frequently diatomaceous) sedimentation. Natural gamma radiation primarily co-varies with density, and seems to be a proxy for terrigenous sediment input at this site. *P*-wave velocities recorded on 47 discrete samples using the gantry *P*-wave calipers range from 1510–1640 m/s and are well within range of velocities measured on whole-round cores by the multisensor tracks. There is not a strong correlation of sonic velocity with increasing depth. The 42 shear strength measurements recorded via the automated vane shear system indicate shear strength increases with depth. Moisture and density samples were collected and are awaiting measurement after drying.

During coring and drilling of Hole U1417A, we acquired data from all tracks and translated them into *Correlator* format. For the coring and drilling of Hole U1417B, we developed correlations to Hole U1417A in real time and assisted in guiding the drilling operations, working directly with the co-chiefs, the operations superintendent, the drillers, and the tool pushers, as needed. The correlators provided a preliminary "affine" table of depth offsets for the APC cores of Holes U1417A and U1417B, to assist the biostratigraphy group in assembling their core catcher samples from multiple holes into proper stratigraphic order. Some correlations at this site proved difficult, as core quality was compromised to some extent by ship heave during heavy weather. Nevertheless, the initial composite depth section appears viable, and is expected to be completed and verified during the drilling and coring of Holes U1417C and U1417D.

The sampling strategies for geochemical shipboard analyses were planned, covering headspace (HS) gas analysis, interstitial water (IW) chemistry, and bulk sediment geochemistry. A sampling strategy to meet the needs of some shore-based requests was also devised. The geochemistry group has analyzed around 20 HS samples, and collected around 30 IW samples from Hole U1417A. The amounts of interstitial water in all samples were sufficient to cover all shipboard analyses, shipboard and shorebased IW requests. Samples were analyzed for alkalinity, pH, chlorinity and salinity. Further shipboard analyses are pending.

The downhole logging group spent much of the week discussing logging plans with the science party and preparing the Methods chapter for the expedition report. The possibility of running the full Magnetic Susceptibility Sonde (MSS) at Site U1417, with both a high-resolution and a deep-reading sensor, has been discussed in the case that hole conditions are suitable and time allows. The logging tools that will be deployed during this expedition are currently being tested by the Schlumberger Engineer and Logging Staff Scientists in preparation for logging next week.

In preparation for core-log-seismic integration (CLSI) that will take place following logging at Site U1417, we identified key seismic facies boundaries and truncation surfaces that will be targets for correlation. These boundaries were then imported into the GeoFRAME interpretation package. Facies boundaries define the upper and lower sequence of the Surveyor Fan as well as subdivisions within these sequences; these seismic units will be correlated with lithologic and logging units.

Education and Outreach

The education and outreach (E&O) team posted educational, informative and social material to various media every day to inform the public about the JR's mission and goals. Blogs were written for the *JOIDES Resolution* website, daily updates were posted on Facebook and Twitter, and videos were posted on Ocean Leadership's YouTube site. Three videoconferences were conducted via Skype to two school groups from the Ann Richards School in Austin, Texas and one with the Texas State Aquarium's Sea Camp in Corpus Christi. In total, E&O connected with 187 participants via live video broadcasting. Other duties performed include Skype and Zoom test calls for upcoming video broadcasts, video broadcast scheduling, and assisting scientists in labs.

Technical Support and HSE Activities

The following technical support activities took place:

- The Metrohm IC is currently being worked on to fix a problem associated with cation measurements.
- The physical properties tracks were operational with some lingering problems with the section half multisensor logger (SHMSL).
- The VSP guns were readied for deployment.
- A pre-seismic operations planning meeting was held to discuss procedures associated with the VSP.

The following HSE activities took place:

- A lifeboat and fire drill was held on 9 June.
- The laboratory safety showers and eyewash stations were tested.