

## **IODP Expedition 341: Southern Alaska Margin**

### **Week 5 Report (23–29 June 2013)**

#### **Operations**

Week 5 of Expedition 341, Southern Alaska Margin, began while pulling out of the hole (POOH) at Hole U1417E. The bottom hole assembly (BHA) was set back and secured for transit at 0145 h (UTC – 8 h) on 23 June, ending Site U1417. After a 13.25 h, 137 nmi transit the vessel arrived on location at Site U1418 (GOA16-1A). The vessel stabilized over Site U1418 at 1101 h on 23 June and the positioning beacon was deployed at 1515 h.

Hole U1418A was spudded at 0015 h, 24 June. The mud line core recovered 4.87 m of sediment and the seafloor was calculated to be 3668.2 mbsl. Non-magnetic core barrels were used for APC coring from Core U1418A-1H through -13H. Temperature measurements were taken with the APCT-3 temperature shoe on Cores U1418A-4H, -7H, -10H and -13H. APC coring with wireline continued through Core U1418A-33H with the half-length APC coring system using steel core barrels. Partial APC strokes were recorded on Cores U1418A-11H, -12H, -13H, -32H, and -33H. Hole U1418A was terminated after Core U1418A-33H (209.9 mbsf). The drill string cleared the sea floor at 1155 h on 25 June, ending Hole U1418A. A total of 33 piston cores were taken over a 209.9 m interval with a total recovery of 216.85 m of core (103%).

After clearing the sea floor, the vessel was offset 20 m to the east. Hole U1418B was spudded at 1355 h on 25 June. The mud line core recovered 7.57 m of sediment and the seafloor was calculated to be 3667.5 mbsl. Non-magnetic core barrels were used for APC coring from Core U1418B-1H through -2H. Hole U1418B was terminated after two cores. These cores were to cover the sediment section that was disturbed in the first two cores from Hole U1418A. At the conclusion of coring, the bit was pulled clear of the seafloor ending Hole U1418B at 1525 h on 25 June. A total of 17.03 m of core was recovered (100% recovery).

After clearing the seafloor, the vessel was offset 20 m south of Hole U1418B. Hole U1418C was spudded at 2030 h on 25 June. The mud line core recovered 8.67 m of sediment and seafloor was calculated to be 3666.0 mbsl. Non-magnetic core barrels were used and FlexIt Orientation was performed from Core U1418C-1H through -7H. The liner from Core U1418C-7H had to be pumped from the core barrel and the decision was made to drill ahead 2.5 m and change to the half-length APC coring system. The hole was advanced from Core U1418C-9H through -19H to 118.2 mbsf. The core barrels were then switched back to the full stroke, non-magnetic core barrels and the hole was further advanced through Core U1418-33H to 230.7 mbsf. Partial strokes of the coring system occurred on every core after Core U1418C-18H, but recovery was adequate until Core U1418C-33H. Coring on Hole U1418C was terminated at 230.7 mbsf. The seafloor was cleared at 0710 h on 27 June ending Hole U1418C. A total of 32 piston cores were taken over a 228.2 m interval with a total recovery of 229.48 m of core (101%).

After clearing the seafloor, the vessel was offset 20 m to the west of Hole U1418C. Hole U1418D was spudded at 0855 h on 27 June. After spudding Hole U1418D, the hole was washed down to 3 mbsf and coring began with Core U1418D-2H and continued with non-magnetic core barrels through Core U1418D-26H to 230.0 mbsf. Partial strokes were recorded on Cores U1418D-12H, -13H, -16H, and -19H to -26H. After Core U1418D-26H, the half-length APC

coring system was deployed and coring continued to Core U1418D-32H (257.3 mbsf). The XCB coring system was deployed from Core U1418D-33X to -37X to 305.8 mbsf. The total depth was reached at 0725 h on 29 June. The drill string was then pulled from the hole and the seafloor was cleared at 0900 h ending Hole U1418D. A total of 31 piston cores were taken over a 254.3 m interval with a total recovery of 256.97 m of core (101%). There was a single 3 m interval that was drilled without coring. A total of five XCB cores were cut over a 48.5 m interval with a recovery of 22.8 m of core (47%). Overall core recovery for Hole U1418D was 279.77 m for the 302.8 m cored interval (92%).

After clearing the sea floor, the vessel was offset 20 m to the south of Hole U1418D. While servicing the rig, a broken strand of wire was detected on the drilling line. Rather than risk a more severe problem, the decision was taken to slip and cut the drilling line to remove the damaged section of line. Hole U1418D was spudded at 1755 h on 29 June. The hole was advanced to 78.0 mbsf and the wash barrel was pulled. APC coring continued from Core U1418E-2H through -4H to 96.8 mbsf.

At week's end the vessel was still APC coring in Hole U1418E.

## Science Results

The lithostratigraphy at Site U1418 has been described from 0–210 m CSF-A based on Holes U1418A, U1418B, and U1418C. The major lithologic units are dark gray (N 4) mud and interbedded mud and silt, suggesting continuous but variable terrigenous sediment supply over the entire interval. Silt laminae are up to 1 cm-thick and have sharp, irregular boundaries. There are relatively few sand beds, which range up to 6 cm-thick and have sharp contacts. A few thin beds of glass-rich volcanic ash are present. The biosiliceous component is minor except for three notable intervals where diatom ooze occurs. Lonestones are scattered throughout the unit confirming the presence of tidewater glaciers during the deposition of this sequence. Common clast types in the lonestones are metasiltstone and argillite. Less common clast types are mafic plutonic and quartzite.

The micropaleontology lab analyzed samples from Holes U1418A, U1418B, and U1418C. These holes have high abundances of benthic and planktic foraminifera, while the abundances in siliceous microfossils vary from low to high between Cores U1418A-21H and -31H. The preservation of each microfossil group is good when they are present. Diatom biostratigraphy indicates that the cored sediment is within the biostratigraphic zone NPD12 (<0.3 Ma).

Radiolarian biostratigraphy indicates that the LO datum of *L. sakaii* (0.03 Ma) is found in sample U1418A-10H-CC (89.54 m CSF-A). Planktic foraminifera are also restricted to the youngest biostratigraphic zone, CM1. Benthic foraminiferal faunas vary in the relative abundances of taxa, which may indicate fluctuations in the bottom water oxygenation or organic carbon fluxes.

The processing of Site U1417 paleomagnetic data and measurements on Site U1418 took place in this week. Measurements from the superconducting rock magnetometer (SRM) to study the remanent magnetization of Holes U1418A and U1418B are completed; measurements from Hole U1418C are ongoing. These core halves were measured before and after alternating field demagnetized at peak fields of 10 and 20 mT. A steeply positive viscous component was mostly

or completely removed by AF fields 10 to 20 mT in all samples not affected by drilling disturbance. A consistently strong, apparently stable and well-preserved magnetization is revealed; however, sediment complexity influences the record and inclinations are slightly shallower than expected for the site location. So far, only normal polarity has been observed.

We performed physical property measurements on whole-round core sections from Holes U1418A, U1418B, U1418C, and U1418D including low- and high-resolution magnetic susceptibility and gamma-ray attenuation bulk density, *P*-wave velocity and natural gamma radiation. Discrete moisture and density, *P*-wave velocity and shear strength measurements from working halves were completed on Holes U1418A and U1418C. Discrete *P*-wave velocity measurements were collected at higher frequency to compensate for our inability to collect *P*-wave velocity measurements on whole-round cores below 120 m on Hole U1418C, due to methane gas expansion of the sediment. Variations in measured values of bulk density, track *P*-wave velocity, natural gamma radiation, porosity and shear strength show cyclic variability downcore, although discrete *P*-wave velocity values collected by discrete measurements produce a relatively scattered profile.

Real-time stratigraphic correlation for coring Holes U1418A, U1418B, U1418C, and U1418D used primarily “fast-track” data (STMSL) to guide the drilling operations to recover a complete sequence. Detailed analysis of the correlations among the four holes suggests the presence of a few gaps in the composite sedimentary sequence and an optimized coring plan was drafted to recover these gaps in Hole U1418E.

Analyses of the remaining interstitial water samples from Site U1417 were finalized. ICP-AES data for minor elements showed high Fe and Mn concentrations only in the uppermost part of the record, while Li strongly increased downcore. At Site U1418, sampling of interstitial water (39 samples) and headspace gas (35 samples) was done for Holes U1418A and U1418B. Interstitial waters from Holes U1418A and U1418B have been analyzed for alkalinity/pH, chlorinity, calcium, magnesium, sodium, potassium, sulfate, bromide, phosphate and ammonium. Also, the minor elements from Holes U1418A and U1418B were analyzed. A large increase in methane (2–3 orders of magnitude) occurred between 80 and 95 m (CSF-A), i.e. values increase from 6 to 1,267 ppmv. The highest methane concentration was found at 135.5 m (CSF-A) with a value of 39,032 ppmv. At 100 m (CSF-A), a sulfate-methane transition was observed, with an increase in methane and depletion of sulfate. Increased alkalinity was found at this site with a maximum value of 32 mM in Hole U1418A. Sediments for Hole U1418A have been prepared for total carbon, total nitrogen, and inorganic carbon analyses.

Downhole logging operations in Hole U1417E were completed at 1605 h on 22 June. Four tool strings were deployed in the following order: the Triple Combo, the FMS-Sonic, the MSS tool string, and the VSI tool string. The borehole was variable in diameter, ranging from the maximum extent of the logging tool calipers (18 inches) to as small as <5 inches. The logging data were affected by the rugosity of the borehole wall, particularly in the interval between 87 and 305 mbsf. The logs, originally recorded in meters below rig floor, were shifted to meters below seafloor, which is identified by a step increase in gamma radiation. The data from all logging passes were depth-matched to a reference log, the main pass of the Triple Combo. Despite the rugose borehole, adequate travel times were recorded at one depth station during the VSP. Based on hole condition and characteristic trends and features in the data, two distinct

logging units were identified for Hole U1417E. Logging Unit 1 (base of drill pipe to 305 mbsf) is defined primarily by highly variable borehole diameter. Within this unit, gamma ray, magnetic susceptibility, and compressional wave velocity ( $V_p$ ) logs are the least affected by the borehole conditions. Logging Unit 2 (305 to 624 mbsf) is characterized by improved borehole conditions and the quality of the logging data is higher throughout this unit. It can be subdivided into two subunits. Subunit 2A (305 to 476 mbsf) shows elevated gamma ray, density, and velocity values relative to the unit above. Magnetic susceptibility shows higher amplitude variability and co-varies with gamma ray. Subunit 2B (476 to 624 mbsf) is distinguished by an initial, rapid decrease in density, resistivity, and velocity with depth, followed by general increases. Magnetic susceptibility displays lower signal in this subunit. Together, these data indicate that downhole logs appear to reflect lithologic variations.

## **Education and Outreach**

In addition to routine updates on the *JOIDES Resolution* website (<http://joidesresolution.org/>), Facebook (<https://www.facebook.com/joidesresolution>), and Twitter (<https://twitter.com/TheJR>), videoconferences were conducted via Skype and Zoom. Participants were school groups from Girl Start in Austin, Texas; the National Museum of Natural History in Washington, D.C.; Havelock North High School and St. John's College in New Zealand; IODP US Science Advisory Committee; University of Southern California Wrigley Institute for Environmental Studies. We were also a featured session at the Texas Regional Collaborative Annual Conference. In total, E&O connected with 163 children and 119 adult participants via live video broadcasting. Other duties performed include Skype and Zoom test calls for upcoming video broadcasts; video broadcast scheduling, curriculum development and assisting scientists in labs.

## **Technical Support and HSE Activities**

The following technical support activities took place:

- The labs are processing cores and core samples from Site U1418.

The following HSE activities took place:

- A fire and boat drill was held on Tuesday, 25 June.
- All of the eye wash stations and safety showers were tested on 29 June.