IODP Expedition 341: Southern Alaska Margin

Week 7 Report (7–13 July 2013)

Operations

Week 7 of Expedition 341 (Southern Alaska Margin) began while RCB coring in Hole U1418F. Coring continued through Core U1418F-72R (948.7 m drillers depth below seafloor [DSF]). Total depth was reached at 0600 h on 7 July. A total of 71 cores were taken over a 688.7 m interval and recovered 495.20 m (72%) at Hole U1418F. The upper 260.0 m were drilled without coring.

After laying out the final core, the drill string was tripped back to 821.7 mbsf. The drill string was run into the hole (RIH) without rotation and pumping. The bit was then worked down with rotation and circulation until hard fill was tagged at 945.0 m DSF. The hole was circulated clean with another 50-barrel high viscosity mud sweep. The sinker bars were installed and the Rotary Shifting Tool (RST) tool was RIH to release the bit in the hole. The end of the drill pipe was set at 98.6 m DSF for logging.

The triple combo logging tool string was then rigged up and RIH reaching a total depth of 599 m wireline depth below seafloor (WSF) at 2333 h on 7 July. The Schlumberger wireline winch experienced a transmission problem during the logging run and had to be repaired. The hole was then logged up, and the tools were pulled to surface and rigged down. After rigging down the triple combo tool string, the Vertical Seismic Imager (VSI) tool was then rigged up and RIH. Protective Species Observation (PSO) watches began at 0900 h on 8 July. No protected species were observed during this period within the 940 m-diameter exclusion zone, so the G-gun source was ramped up starting 1 h after the PSO watches commenced. PSO watches continued throughout the VSI run with the sound source triggered manually while running into the hole. Despite the hole cleaning preparation the VSI tool was unable to pass below ~217 m WSF. Once the VSI was near an identified station, the control of the sound source was passed to the Schlumberger logger. Several attempts were made to collect data, but the tool had problems securing itself in the hole. The tool was pulled out of the hole and back to the surface and rigged down. The sound source was secured and the Protective Species Watch ceased at 1500 h. The FMS-Sonic tool string was then rigged up and deployed to a total depth of 581 m WSF. Only a single pass was made with the tool string and the tool string became stuck when re-entering the bottom hole assembly (BHA). After trying unsuccessfully to free the tool string, the Kinley crimper was rigged up and deployed to crimp the logging cable inside the BHA before severing the cable. While this was being done, the logging tools became unstuck and they were then pulled to the surface and rigged down. All logging equipment was rigged down by 0845 h on 9 July. The drill string was then pulled from the hole and the BHA set back and secured for transit at 1630 h on 9 July, ending Site U1418.

After a 4.75 hour, 47 nm transit the vessel arrived on location at Site U1419 (proposed site KB-2A). The vessel stabilized over Site U1419 at 2118 h on 9 July and the positioning beacon was deployed at 2135 h.

Hole U1419A was spudded at 0200 h on 10 July. Non-magnetic core barrels were used for APC coring from Core U1419A-1H through -12H. Coring with the half-length APC system continued

through Core U1419A-20H. Partial APC strokes were recorded on Cores U1419A-5H, -8H, -9H, -11H–13H, -15H, and -17H–20H. APC core recovery was affected by frequent rock clasts. The XCB coring system was deployed with a soft formation-cutting shoe from Core U1419A-21X to -29X to 193.0 m DSF. The total depth was reached at 0235 h on 11 July. Hole U1419A was terminated after Core U1419A-29X (193.0 m DSF). At the conclusion of coring the hole was plugged and abandoned with 85 barrels of 10.5 ppg mud. A total of 20 piston cores were taken over a 118.6 m interval with a total recovery of 96.38 m (81%). A total of 9 XCB cores were cut over a 74.4 m interval with a recovery of 14.86 m of core (20%). The overall core recovery for Hole U1419A was 58%.

Hole U1419B was spudded at 0530 h on 11 July. Non-magnetic core barrels were used and FlexIt Orientation was performed from Core U1419B-1H through -10H. After Core U1419B-10H, the half-length APC system was deployed. The hole was advanced from Core U1419B-11H through -19H to 114.0 m DSF. A 1 meter interval was drilled without coring from 109.6–110.6 m DSF. Partial strokes of the coring systems occurred on Cores U1419B-6H, -8H–10H, -13H, -17H, and -19H. APC core recovery was affected by frequent rock clasts. Coring on Hole U1419B was terminated at 114.0 m DSF at 1740 h on 11 July. The hole was displaced with 48 barrels of 10.5 ppg mud and the drill string was tripped from the hole with the top drive installed. The seafloor was cleared at 1940 h on 11 July, ending Hole U1419B. A total of 18 cores were taken over a 113.0 m interval and recovered 99.05 m (88%).

Hole U1419C was spudded at 2100 h on 11 July. After spudding Hole U1419C, the hole was washed down to 2.0 m DSF and Cores U1419C-2H to -11H were recovered from 2.0 to 78.7 m DSF. Partial strokes were recorded on Cores U1419C-5H, -7H, -9H, -10H, -14H–17H, and -19H. After Core U1419C-11H, the half-length APC coring system was deployed and coring continued to Core U1419C-20H to 109.1 m DSF. Coring on Hole U1419C was terminated at 1230 h on 12 July. The hole was displaced with 43 barrels of 10.5 ppg mud and the drill string was tripped from the hole with the top drive installed. The seafloor was cleared at 1425 h on 12 July ending Hole U1419C. A total of 19 cores were taken over a 107.1 m interval and recovered 100.37 m of core (94%).

Hole U1419D was spudded at 1720 h on 12 July and the hole was washed down to 5.5 m DSF. Cores U1419D-2H to -14H were recovered from 5.5 to 80.1 m DSF. Partial strokes were recorded on Cores U1419D-6H, -8H, -9H, -11H, -12H, -14H, -17H, -21H, -23H, and -24H. After Core U1419D-14H, the half-length APC coring system was deployed and coring continued to Core U1419D-24H to 114.2 m DSF. Coring on Hole U1419D was terminated at 0715 h on 13 July. The hole was displaced with 40 barrels of 10.5 ppg mud and the drill string was tripped from the hole with the top drive installed. The seafloor was cleared at 0810 h on 13 July ending Hole U1419D. A total of 20 cores were taken over a 103.7 m interval and recovered 105.10 m of core (101%). There were three intervals drilled without coring, which added up to 10.5 m.

Hole U1419E was spudded at 0900 h on 13 July and washed down to 9.0 m DSF. Cores U1419E-2H to -12H were recovered from 9.0 to 69.0 m DSF. Partial strokes were recorded on Cores U1419E-4H, -6H, -8H, -9H, -11H, -12H, -18H, and -19H. After Core U1419E-12H, the half-length APC coring system was deployed and coring continued to Core U1419E-19H to 98.7 m DSF. Coring on Hole U1419E was terminated at 1900 h on 13 July. The hole was displaced with 38 barrels of 10.5 ppg mud and the drill string was tripped from the hole. The drill bit cleared the rotary table at 2315 h on 13 July. A total of 15 cores were taken over a 75.5 m

interval and recovered 72.1 m of core (96%) on Hole U1419E. There were four intervals drilled without coring with a combined length of 23.2 m. At week's end the vessel was being secured for the transit to Site U1420 (proposed site GOAL-15C).

Science Results

This week we present some initial results from Sites U1418 and U1419.

At Site U1419, Cores U1418F-70R to -72R contain very dark greenish gray (10Y 3/1) mud mixed with a very dark gray (N 3) clast-rich muddy diamict. Both lithologies are characterized by normal faulting, soft sediment deformation, and intrastratal contortions suggesting that they are part of the mass transport deposit that we intended to core.

At Site U1419, the lithology described thus far from 0–190 m cored interval below seafloor (CSF-A) is based on Holes U1419A and U1419B. The uppermost 6 m CSF-A is an olive gray (5Y 4/2) diatom ooze with foraminifera. Lonestones occur immediately below this interval in dark gray (N4) mud and continue throughout. Below 6 m CSF-A, intervals dominated by mud, interbedded sand and mud, interbedded mud and diamict, and clast-rich diamict are interpreted to record glacial influence at the site whereas those with diatom or biosiliceous ooze and diatom-bearing mud likely record interglacial or interstadial periods.

Diatoms and radiolarians were studied in samples from Holes U1419A-U1419D. Diatoms and radiolarians are well-preserved in the upper 100 m CSF-A, but diatom abundances are generally lower than radiolarian abundances. Deeper than 100 m CSF-A, siliceous microfossils are almost barren. We also recognize an abundance peak in *Chaetoceros* resting spores that can be correlated across holes.

Foraminiferal analyses have focused on core-catcher samples from Hole U1419A. Foraminifera are well-preserved and abundant in Cores U1419A-1H to -15H and then decline in abundance downcore to Cores U1419A-25H and -26H where abundances again increase. Benthic foraminifera typical of low-oxygen and/or highly productive environments are dominant in some core catcher samples and seem to be most abundant when sand and lithic clasts are absent.

Paleomagnetic data was measured and processed for Site U1418 and measurements on Site U1419 began. Measurements from the superconducting rock magnetometer (SRM) to study the remanent magnetization of Holes U1418A–U1418E were all dominant normal polarity, consistent with the biostratigraphic ages. However, the deeper sediments of Hole U1418F revealed an exceptionally well-resolved and apparently high-quality paleomagnetic record of polarity extending through the Jaramillo subchron. Measurements on Site U1419 are ongoing with only a normal polarity interval observed for Hole U1419A.

For the coring and drilling of Holes U1419A–U1419D, we used stratigraphic correlation in real time, primarily using physical properties data collected on the special task multi-sensor logger (STMSL) This assisted in guiding the drilling operations by working directly with the chief scientists, the Operations Superintendent, the drillers, and the tool pushers, as needed to recover a complete sequence. Coring and drilling of Hole U1419D and the initial construction of the composite splice are ongoing.

Physical property measurements were performed on whole-round core sections from Holes U1418E–U1418F and U1419A–U1419D, 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 U1418E–U1418F and U1419A. Due to failure of one of the *P*-wave gantry systems, *P*-wave measurements were collected only on discrete samples for U1419A and only on the whole round multi-sensor logger (WRMSL) track for U1419C–U1419D, with the quality of data compromised by methane-gas expansion of the core sections. Methane gas expansion resulted in core expansion of up to 40 cm in individual cores, and produced variable depth offsets of up to 8 cm within sections between physical properties measurements collected on whole rounds versus the archived split sections. Variations in measured values of bulk density, track *P*-wave velocity, natural gamma radiation, porosity, and shear strength show cyclic variability downcore.

Ion chromotography (IC) analysis for cations and anions, and photometric analysis for ammonium and phosphate, were completed for Hole U1418F. ICP-AES analysis was completed on interstitial water (IW) samples from Holes U1418D and U1418F. Discrete samples from Hole U1418F were prepared and analyzed for total carbon, nitrogen, carbonate, and TOC contents. In Holes U1418D and U1418F, continuous down-core profiles of dissolved chemical concentrations and solid-phase chemistry were obtained, overlapping with Hole U1418A. The low TOC and TN contents at Site U1418 are comparable to those at Site U1417. Below 500 m corrected core composite depth below seafloor (CCSF-B), the down-core profiles of lithium, barium, and boron showed similar variations. At Site U1419, twenty-two IW samples were obtained from Hole U1419A and were immediately analyzed for alkalinity/pH and chlorinity. Headspace gas samples from Hole U1419A were also immediately analyzed. In Hole U1419A, an alkalinity maximum occurred at 60 m CSF-A. Methane showed variable concentrations through Hole U1419A, ranging from 3–40,000 ppmv.

Downhole logging operations in Hole U1418F were completed at 0830 h on 9 July. Three tool strings were deployed in the following order: the Triple Combo, the VSI tool string and the FMS-Sonic. The caliper log from the Triple Combo run showed that the borehole size varied from 10 inches to greater than the calipers maximum of 18 inches. The logging data were particularly affected in the upper 220 m of the hole because of large variability in borehole diameter and numerous areas with washouts. The logs, originally recorded in wireline meters below rigfloor (m WRF), were shifted to wireline meters below seafloor (m WSF), which is identified by a step increase in gamma radiation log. The data from all logging passes were depth-matched to the main pass of the Triple Combo, which is considered as the reference log, and logs were displayed in matched depth below seafloor (m WMSF). Despite numerous areas close to bit diameter, no adequate travel times were recorded during the vertical seismic profile with the VSI tool due to the softness of the sediments and the inability of the tool to be securely coupled to the borehole wall. Good quality gamma ray, density, magnetic susceptibility, resistivity and velocity data were recorded where the borehole was not washed out. Based on the logs recorded, one logging unit has been identified. Within this unit, variations in spectral gamma ray, magnetic susceptibility, and resistivity that likely correspond to lithologic changes described in cores.

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. Participants were summer school groups from College Station, Texas and Lincoln, Nebraska; a homeschool group from Providence, Rhode Island, and a Texas State Aquarium Sea Camp. In total, E&O connected with 60 children and 24 adult participants via live video broadcasting. Other duties performed include Skype 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 cryogenic magnetometer tracking system has been stalling with heavy core sections. A misalignment in the gearbox-to-drive pulley caused by the set bolt was found to be the problem. The temporary solution is to let the gearbox/motor float on loosened bolts.
- A stuck core section in the cyrogenic magnetometer resulted in a problem with the tracking system. After much trouble shooting, the cyrogenic magnetometer is once again functional.
- Issues with the NGR are ongoing, but the scientists involved have tested the machine and decided on a set of operating procedures, which meet their needs.
- The Protected Species Watch and seismic source worked successfully for the VSI logging run at Hole U1418F.

The following HSE activities took place:

- A fire and boat drill was held on Thursday, 11 July.
- The eye wash stations were tested on 12 July.