

IODP Expedition 351: Izu Bonin Mariana Arc Origins

Week 8 Report (13–19 July 2014)

Operations

Rotary core barrel (RCB) coring, exclusively with non-magnetic core barrels, continued this week with 30 ft knobby drilling joints positioned at the top of the string. At 1300 h on 13 July, the drill string was short tripped to remove the knobby drilling joints in the string and replace them with 5.5 inch drill pipe. No overpull was experienced coming out of the hole; however, while running back in the hole, excessive top drive torque (75–100 A) was encountered at 1404.9 mbsf. An RCB core barrel was deployed and Core U1438E-60R was recovered although tight hole conditions continued. Remedial hole conditioning took place between 1500–1530 h; a mud sweep (50-barrel high viscosity sepiolite) was circulated and all drilling parameters returned to normal. Coring resumed through Core U1438E-68R (1460.9 mbsf), the base of which was identified as the sediment-basement contact. Another incident of poor hole conditions occurred at this depth in spite of pumping 50-barrel high viscosity mud sweeps after every core and hole conditioning operations were required. Coring resumed at midnight on 15 July and continued through Core U1438E-71R (1474.7 mbsf), when once again the driller identified tight hole conditions which required 6.25 h of remedial work. The pipe was raised to 1165.8 mbsf and then the top drive was used to lower the bit back to 1369.6 mbsf; a wash barrel was deployed at that point and the bit was washed to 1450.0 mbsf. This area of the hole was worked an additional 45 min before continuing to bottom at 1474.7 mbsf. Two meters of fill were circulated out of the hole with a 75-barrel high viscosity sepiolite mud sweep and the sinker bars were deployed to recover the wash barrel. At 1830 h on 15 July, a core barrel was deployed and RCB coring resumed. Coring continued without incident through Core U1438E-74R to 1503.8 mbsf. Between 1345–1730 h on 16 July, while cutting Core U1438E-75R (1506.8 mbsf), the driller noted a very slow rate of penetration coupled with a strong drill string vibration. All attempts to reduce or eliminate the drill string vibration failed, so coring was halted and the barrel was recovered early after only a 3.0 m total advance. By 1900 h, RCB coring resumed without any noticeable drill string vibration. Coring continued through Core U1438E-82R to 1561.4 mbsf. At 1315 h on 18 July, the drill bit was raised up to 1387.7 mbsf as a preventative measure to allow any suspended cuttings to fall to the bottom of the hole so they could be flushed out. Everything went well until reaching the sediment/basement contact at 1460.9 mbsf. Nearly six hours were spent working through the interval from 1451–1496 mbsf, followed by circulating a 50-barrel mud sweep. While circulating the mud sweep there was another occurrence of the mysterious drill string vibration experienced two days earlier. However, once the ship's trim was adjusted, the vibration went away. The remainder of the wiper trip from 1496.1–1561.4 mbsf was without incident and once the bit was back on the bottom all drilling parameters were normal. After sweeping the hole once more with 50 barrels of high viscosity sepiolite mud, the wash barrel was recovered and a new RCB core barrel was deployed. RCB coring resumed at 0130 h on 19 July

with the cutting of Core U1438E-83R. Coring continued through basement through Core U1438E-85R to 1584.9 mbsf. Coring operations are anticipated to conclude on the evening of 20 July. We will then conduct wireline logging of Hole U1438E using the triple-combo, FMS-sonic, Versatile Seismic Imager (VSI), and Goettingen tri-axial borehole magnetometer (GBM) tool strings.

Science Results

This week the core description team described Cores U1438E-55R through 83R. The most important findings were the first igneous rocks, two basaltic cobbles in Core U1438E-61R and basaltic rocks in Cores U1438E-69R through 83R. For the basaltic rocks, the group determined that relatively coarse upper intervals were flows rather than a sill, thus establishing that basement had indeed been encountered. The basement is generally gray basalt that contains patchy chlorite and oxide alterations. In each of the basement cores, serpentine, calcite, and sulfide veins are present. The group also finalized their Methods section for the *Proceedings* volume. They continued work on the description of lithostratigraphic Unit III and the definition of lithostratigraphic Unit IV, as well as the correlation of Holes U1438D and U1438E. DESClogik entries were made consistent to produce clear and useful VCDs.

The micropaleontology team analyzed the fossil content of all remaining core catcher samples, and several selected additional samples, to the bottom of the sedimentary lithostratigraphic Unit IV (Sample U1438E-68R-CC). The foraminifer and nannofossil content is extremely low. Radiolarian occurrences are low to medium in the majority of core catcher samples. Moreover, the skeletons of most recovered radiolarians from Hole U1438E are recrystallized as quartz, clay minerals, or zeolites, and filled by matrix or cement. Therefore, they could not be examined using standard transmitted-light techniques. These residues were sieved, dried, and examined using reflected-light methods as for previous holes. If the assemblage yielded acceptable specimens, an attempt was made to identify them using a scanning electron microscope (SEM). This technique requires more time and thus the processing of the selected additional samples is still in progress.

Inductively coupled plasma–atomic emission spectroscopic (ICP-AES) analyses were performed for major elements in sediment samples of Holes U1348B, U1348D, and U1348E. The analyses led to a significant drift increase, which decreased the quality of the data. Therefore, further analyses of sediments were abandoned to focus on analyzing basement samples. The group calibrated the method for trace elements analysis on the ICP-AES while the basement rock samples were being prepared. The Methods section for the *Proceedings* volume has been significantly improved and will be finalized shortly.

The paleomagnetic team continued measuring and demagnetizing archive half core sections from Hole U1438E. They thermally demagnetized another set (50 specimens) of discrete cubic

samples from the sedimentary sequence of Hole U1438E and calculated their remanence directions. In addition to paleomagnetic analyses, they measured the anisotropy of low field magnetic susceptibility on igneous discrete samples from Hole U1438E to calculate the magnetic fabric. These data show consistent shallow plunges of maximum anisotropy axes that may possibly provide constraints on the flow direction of the magma during emplacement (once reoriented using remanence directions).

The physical properties team continued to measure *P*-wave sonic velocities, moisture and density (MAD), and thermal conductivity of the igneous rocks recovered from basement. In order to increase the number of cubic discrete samples for the *P*-wave velocity, they used samples taken for paleomagnetic analysis in addition to the designated samples for MAD analyses. All cubic samples, including those for paleomagnetic analysis, were saturated with seawater for 24 h using vacuum system. While measuring the physical properties of recovered cores, they finalized the Physical Properties Methods chapter and Site U1438 report.

Education and Outreach

Work began to focus on the completion of ship-based projects. Some final interviews were conducted with scientists, and filming of scientific work continued. Edits of summary videos for various expedition activities were started, as well as other scientist interviews. Poster development continued and ideas for curriculum to be developed off ship are being discussed with scientists.

Social media outlets were maintained, including posts to Facebook (<https://www.facebook.com/joidesresolution>), Twitter (<https://twitter.com/TheJR>), and Instagram (http://instagram.com/joides_resolution). Facebook growth continued to be strong; reach increased to an expedition high of 8,100 persons and over 1,800 people were engaged on the page this week. Broadcasts have continued with positive feedback from host institutions. Additionally, feedback surveys were sent to those who participated in educational broadcasts.

Technical Support and HSE Activities

This week was spent handling and processing cores, both sediment and hard rock, recovered during continuous RCB coring of Hole U1438E:

Core Laboratory

- Curation switched to hard rock procedures from Core U1438E-71R.

Thin Section Laboratory

- Requests are essentially the maximum able to be produced.

Paleomagnetism Laboratory

- The D-tech AF demagnetizer is having problems with the software not finishing its cycle; the issue is being diagnosed by IT and Marine Instrumentation Specialists.

Application Developers and Information Technology

- Continued development on LIMS Reports III.
- Worked on a number of LIME developments:
 - Add DESClogik data management.
 - Add a summary analysis display to provide more information to the sample data management process.
 - Address data management for RGB & LSIMG taken on sections. Data from whole round surface line-scans still requires better separation from the similar split-section image scans.

Underway Geophysics Laboratory

- Seismic sources being prepared for the Versatile Seismic Imager (VSI) scheduled next week.

Miscellaneous

- Off-going shipments are being assembled and shipping papers drawn up.
- Inventory has been updated.

Health and Safety Activities

- The eyewash and safety showers were tested.
- A man overboard drill was conducted on 14 July.
- A boat and fire drill was completed on 16 July.