

## **IODP Expedition 366: Mariana Convergent Margin**

### **Site U1495 Summary**

#### **Background and Objectives**

International Ocean Discovery Program (IODP) Site U1495 (proposed Site MAF-12B) is located at the edge of the summit in the upper slope region of Asùt Tesoru Seamount (informally called Big Blue Seamount in the Expedition 366 *Scientific Prospectus* and previous publications) at 18°5.67'N, 147°6.00'E, in 1405 m of water. The site lies on multichannel seismic (MCS) reflection profile EW0202 42-44.

At Site U1495, the cores are expected to penetrate the edge of a serpentinite mudflow that overlies the larger mudflow that was targeted at Site U1494. The mudflow at this location is about 7 km wide at its widest extent. The flow fans out from the summit for a distance of about 6 km to the southwest. Its upper surface has concentric ridges and arcuate semiradiating grooves that are evident in the bathymetry data. The expectation at this site, as it was for Site U1494, was that it would be possible to date the eruptive sequences on the flank of the seamount near the summit by paleontologic dating of sediments between flow units. Samples of any sediment encountered were to be taken for microfossil identification and establishment of age ranges.

Because of difficulties with drilling the deep flank site of both Yinazau Seamount at Site U1491 and the flank of Asùt Tesoru Seamount at Sites U1493 and U1494, it was decided again to core only one 50 m hole at this locality if possible. The objectives in detail were to: 1) intersect sediments and serpentinite mudflows on the upper-slope region of the southern flank; 2) potentially date discrete mud flows paleontologically, should there be sediment layers between them; 3) determine variability of mudflow compositions and thicknesses; 4) investigate potential systematic variability in degree of serpentinitization; 5) examine transport characteristics; 6) provide an assessment of pore fluid composition; and 7) collect samples for microbiological analysis.

#### **Operations**

The ship arrived at Site U1495 at 0115 h on 7 January. It quickly became apparent that the hole was unstable for drilling, and after each half-length advanced piston corer (HLAPC) core, an extended core barrel (XCB) was deployed and the bit drilled down to the depth of the previous HLAPC core. These XCB hole-cleaning runs recovered two “ghost cores” containing mostly rock clasts. Elevated levels of hydrogen were found in Core U1495A-2F, so we decided to core a second hole at this site to increase the number of microbiological and interstitial water samples across this interval. Hole U1495A penetrated 10.7 m and recovered 5.3 m (76%).

The vessel was offset 25 m to the northwest and Hole U1495B was started at 1320 h. The water depth here was 1403 mbsl, 3 m shallower than at Hole U1495A. Coring continued with the HLAPC coring system to a total depth of 10.8 mbsf. Once again hole cleaning and slow rate of penetration drilling out the HLAPC rat hole led us to stop coring in this hole. Hole U1495B penetrated 10.8 m and recovered 10.8 m (100%). The transit to Site U1496 in dynamic positioning (DP) mode began at 2100 h.

## Principal Results

Sediments recovered at Site U1495 include pelagic clays and highly consolidated serpentinite mud flows. At the top of the Hole U1495B, 0.4 m of greyish-brown mud with fine sand overlies light green to grayish-brown serpentinite mud with serpentinitized ultramafic rock clasts and acicular needles of aragonite. Below are dark bluish-gray to dark greenish-gray serpentinite mud, with clasts of pebble-size serpentinitized ultramafic rock making up 5%–10% of the core.

The physical property data show that there is a rapid increase in consolidation with depth, far greater than observed in other seafloor sediments (Bekins and Dreiss, 1992). Porosity decreases to 30% in just 4 m at Site U1495. Processes other than compaction must be the main driver of this low porosity, perhaps ongoing serpentinitization. Natural gamma radiation has values of about 6 counts/s down to 1.5 m at Site U1495, before dropping to <1 counts/s with depth, suggesting that ash and/or pelagic clay is a component in the upper serpentinite muds.

Site U1495 is close to the summit of Asùt Tesoru, and indications of upwelling serpentinite pore fluids are an elevated Na/Cl ratio of ~1.0 (compared to seawater, 0.86), along with high pH values reaching 10.8 in Hole U1495B, enrichments in B, Li, and K, and depletions in Ca and Sr. One sample from Core U1495A-2F has extremely high H<sub>2</sub>, at 2 mM.

Paleomagnetic measurements of section halves and discrete samples from the flank holes were affected by coring disturbance and a pervasive vertical overprint, likely imparted from the drill string, and no clear normal or reversed polarity could be obtained from shipboard measurements.

Sampling efforts for postcruise microbiological analysis focused on representative sequences of both near surface and deeper whole-round cores with evidence of transitions across gradients of microbiologically affecting compounds and gases, e.g., hydrogen, methane, hydrogen sulfide, and sulfate.

## References

- Bekins, B.A. and Dreiss, S.J. (1992) A Simplified Analysis of Parameters Controlling Dewatering in Accretionary Prisms. *Earth and Planetary Science Letters*, 109(3-4), 275-287.