IODP Expedition 329: South Pacific Gyre Microbiology

Week 4 Report (1-7 November 2010)

OPERATIONS

Week 4 of Expedition 329, the South Pacific Gyre Microbiology, began after clearing the seafloor ending Hole U1366D. The vessel was then offset 40 m to the west and Hole U1366E was spudded at 0015 hours (UTC-10h) on 31 October. Seafloor depth was established with a mudline core at 5138.8 mbrf. APC coring consisted of a single mudline core to 4.7 mbsf, with a recovery of 4.71 m (100.2%). Core U1366E-1H was recovered with a shattered liner and was not acceptable for microbiology. After offsetting the vessel 20 m west, Hole U1366F was spudded at 0130 hours and advanced with the APC coring system for 4 cores to 30.1 mbsf with a 30.15 m recovery (100.2%). PFTs were mixed into the drilling fluid (sea water) and pumped on all cores for contamination testing. After the last core, the drill string was tripped to surface and all drilling equipment secured at 1815 hours, ending Site U1366. Subsequently, thrusters were pulled and we began a 1019 nm sea voyage to Site U1367 (Scientific Prospectus Site SPG-4A).

After a 100.75 hour transit from Site U1366, averaging 10.1 knots, the speed was reduced, and thrusters and hydrophones were lowered. Rig floor operations commenced at 2300 hours on 4 November and Hole U1367A was spudded at 0740 hours on 5 November. The PFT pump was turned on to displace the drill string with the contamination testing fluid. A wash down hole was drilled to determine depth of basement. Mudline was established as 4302.0 mbrf by tagging with the bit. After drilling down, basement was established at 21.2 mbsf. The bit was pulled clear of the seafloor at 0810 hours ending Hole U1367A.

Hole U1367B was offset 20 meters to the west and spudded at 1000 hours. Seafloor depth was established with a mudline core at 4300 mbrf. APC coring continued to 22.3 mbsf. A total of 4 cores were taken with a total recovery of 22.31 m (100 %). Hole U1367C was offset 20 meters north and spudded at 1520 hours. The hole was advanced with the APC coring system to 26.7 mbsf before encountering basement. Seafloor was established at 4299.3 mbrf. A total of 4 cores were taken with a total recovery of 27.01 m (101.2 %). The vessel was offset 20 meters east. Hole U1367D was spudded at 2205 hours and advanced with the APC system for 4 cores to 25.5 mbsf with 24.54 m of sediment recovered (96.2 %). Seafloor was established at 4299.1 mbrf. Hole U1367E was spudded at 0340 hours on 6 November. Seafloor depth was established with a mudline core at 4298.7 mbrf. Three APC cores penetrated to 24.4 mbsf and recovered a total of 23.15 meter of sediment (96.2%). The drill string was then tripped to the surface, clearing the rotary table at 1400 hours on 6 November, ending Hole U1367E. PFTs were mixed in with the drilling fluid (sea water) and pumped on all cores in Holes U1367B-E for contamination testing.

While the drill ship was offset 20 meter to the south, the Bottom Hole Assembly (BHA) was set back, the APC bit was removed and the rotary core bit and rotary coring system were assembled in preparation for running the new Rotary Core Barrel (RCB) BHA. The BHA was then run into the hole, followed by the drill pipe and then the top drive was picked up. The drill string was spaced out to spud Hole U1367F. Water depth was recorded at 4300 mbrf after tagging bottom with the RCB bit. At week's end, a drilled interval was being advanced to approximately 17 mbsf.

SCIENCE RESULTS

During Week 4 of Expedition 329, scientists processed, analyzed and described core samples and data from Sites U1366 (SPG-2A) and U1367 (SPG-4A), presented and discussed scientific results at science meetings, and worked on the site's shipboard reports.

The primary objectives at Sites U1366 and U1367 are to document the nature of subseafloor life in very slowly accumulating organic-poor sediments of great (up to ~100 Ma, Site U1366) to moderate age (up to ~33.5 Ma, Site U1367), where the surface ocean is characterized by very low mean chlorophyll content (less than 1 mg/m^3); and to determine the extent to which crustal age, thermal regime and chemical transport through the 33.5-Ma basaltic basement (Site U1367) affect microbial communities and biogeochemical processes in the overlying sediment.

The coring operations plan for Site U1367 are the same as for the previous sites: to drill a pilot hole to determine basement depth, and then core the site's sedimentary section in three or four holes: one to build the stratigraphic framework for the site, one for geochemical analyses and one for microbiological experiments. An additional hole will be drilled and cored for about 100 m into basement to sample the underlying basalt and to deploy the downhole logging tools.

Two lithostratigraphic units were identified in Cores U1366C-1H through 3H and U1366F-1H through 4H. Unit I varies from zeolitic metalliferous pelagic clay to metalliferous pelagic clay with manganese nodules at the top and middle level in the stratigraphic record. Unit II, found in the lower half of Hole U1366F is predominantly metalliferous clay.

The sedimentary record at Site U1367 consists, from the top to the sediment/basement interface, of dark brown zeolitic metalliferous pelagic clay to metalliferous pelagic clay with nannofossils to foraminiferal ooze with nannofossils. Calcareous microfossils are very well preserved in the lower half of the section. The base of Core U1367B-3H (or the base of the sedimentary interval) was estimated to be of early Oligocene/late Eocene age based on planktonic foraminifera biostratigraphy.

An ample number of core samples from Sites U1366 and U1367 are being analyzed for interstitial water chemistry and solid phase geochemistry (i.e., dissolved inorganic carbon, total organic carbon, alkalinity, pH, oxygen, nitrate, major ions, hydrogen, etc). Many more samples have been prepared and continue to be prepared for shipboard cell enumeration and cultivation studies and shore-based molecular analyses.

Expedition scientists held a science meeting to present and discuss scientific results from Site U1366 and present the scientific objectives for Site U1367. The drafts versions of the Site U1366 reports were being finalized and submitted to the Co-Chiefs and EPM for review.

By week's end, we began drilling Hole U1367F. The objective of this hole is to sample the top ~100 m of basement rocks at this site and to deploy the downhole logging tools (Triple Combo and Formation Microscanner) for in situ measuring the formation's physical properties.

TECHNICAL SUPPORT AND HSE ACTIVITIES

Technical support staff processed and curated cores from Sites U1366 and U1367, prepared thin sections, and helped expedition scientists with laboratory instruments, applications and data collection and upload. A fire and boat drill was held for the ship's crew only on Sunday November 7.