IODP Expedition 329: South Pacific Gyre Microbiology

Week 3 Report (24-31 October 2010)

OPERATIONS

Week 3 of Expedition 329, the South Pacific Gyre Microbiology, began with the RCB bit at 51 mbsf drilling down to 71 mbsf in Hole U1365E. At 71 mbsf, the center bit was pulled by wireline and RCB coring began. Core U1365E-2R began in sediment and crossed the sediment/basement interface. The first core did not recover any of the sediment and the basement recovery was poor compared with subsequent basement cores. Coring continued with Core U1365E-3R and based on the slow penetration rates, it was decided to proceed with half cores between wireline trips. Given the delay on our operations schedule caused by the breakdown and repair to the drill string sheave and the slow penetration rates at Hole U1365E, we decided to stop RCB coring at 05:00 hours on Wednesday 27 October unless a major change in basement composition was encountered. Coring ended as planned after recovering Core U1365E-12R. A total of 11 cores were taken from a cored interval of 53.2 m and with total recovery of 39.66 m of core (74.6% overall recovery). Contamination testing was done on all cores after Core U1365E-2R with PFTs. Given the shallow penetration into basement (~53 m), potentially poor hole conditions, and time concerns over the overall expedition's operations schedule, we decided not to deploy our downhole logging tools and to terminate the hole. After the last core was recovered, the drill string was tripped to surface and the rig floor was secured at 21:15 hours on 27 October, ending Site U1365.

Thrusters were pulled and the vessel started the 494 nautical miles sea voyage to Site U1366 (Scientific Prospectus Site SPG-2A). After a 48.85 hour transit from Site U1365, averaging 10.1 knots, the speed was reduced, and thrusters and hydrophones were lowered. Speed was less than expected because 2 of the propulsion motors were offline on the starboard shaft with failed field coils. Dynamic positioning was then initiated over Site U1366 at 22:15 hours on 29 October. The position reference was a combination of GPS signals. No acoustic beacon was deployed, but a beacon remains on standby in the event of a loss of GPS satellite coverage. While automatic input into the DP system is not possible, it is possible to manually hold the vessel in position to clear the seafloor with the BHA if necessary.

Rig floor operations commenced at 22:15 hours on 29 October. The top drive was picked up and the drill string was spaced out and a wash down hole, U1366A, was drilled to determine basement depth. Mudline was established as 5146.0 mbrf by tagging with the bit. After drilling down, apparent basement was established at 17.8 mbsf. The bit was pulled back above the seafloor, clearing the seafloor at 08:45 hours ending Hole U1366A.

After clearing the seafloor, the center bit was pulled by wireline, the vessel was offset 20 m to the west and coring operations began. Hole U1366B was spudded at 10:45 hours on 30 October and the seafloor depth was established with a mudline core at 5141.8 mbrf. APC coring continued to 17.2 mbsf. A total of 2 cores were taken with a total recovery of 17.31 m (100.6%). After Core U1366A-2H, the bit was tripped back to just above the seafloor ending Hole U1366B at 13:00 hours. PFT contamination testing was done on all cores. Hole U1366C was spudded 20 m north of Hole U1366B at 13:45 hours and advanced with the APC coring system to 25 mbsf before APC refusal and after possible basement contact. Contamination testing was done on all cores with PFTs. A total of 3 cores were taken with a total recovery of 25.42 m or 101.7%. The drill string was then tripped to just above the mudline, clearing the seafloor at 17:15 hours, ending Hole U1366C. Hole U1366D was spudded 20 m east of Hole U1366C at

18:00 hours and advanced 2 cores with the APC coring system to 18.9 mbsf. The first two cores recovered 18.86 m of sediment (99.8% recovery). After APC refusal without recovery on a third core, an XCB core barrel was deployed and advanced two meters into the formation without any recovery. Total recovery for Hole U1366D was 18.86 m with 20.9 m cored and an overall recovery rate of 90.2%. Contamination testing was done on all cores with PFTs. After the last core the drill string was then tripped to just above the mudline, clearing the seafloor at 23:30 hours on 30 October, ending Hole U1366D and Week three of Expedition 329.

SCIENCE RESULTS

During Week 3 of Expedition 329, expedition scientists processed and analyzed cores from Sites U1365 and U1366. All basement cores from Hole U1365E were processed quickly on the catwalk and immediately after placed in cold storage, where they were examined by the microbiologists and preliminary described by a petrologist. Basalt samples for microbiological studies were identified and taken after approval by the Sample Allocation Committee (SAC). Examined cores then were brought up to the Core Laboratory for routine core flow processing and description. All cores were measured for physical properties using the Core Laboratory track systems, split into working and archive halves and the pieces curated, then imaged and described.

Basement rocks are light to dark gray to light yellowish brown aphyric microcrystalline to cryptocrystalline basalts, highly phyric basalts with large photcrysts, with abundant carbonate and celadonite veins, reddish brown alteration halos and occasional black calcite and chert. The wide range of basement lithologies represents different lava flows.

Expedition geochemists analyzed sediment samples for interstitial water chemistry and solid phase geochemistry (dissolved inorganic carbon, alkalinity, oxygen concentration, nitrate, ionic composition, nitrate, hydrogen, etc), while microbiologists prepared and analyzed samples for cell enumeration, cultivation and shorebased molecular analyses. Shipboard microbial cell counts from Site U1365 samples using flow cytometer and fluorescence microscopy were consistent between the two techniques and show significantly lower cell numbers in the sediments at Site U1365 than those found in organic-rich continental margin sediments previously studied.

Toward the end of the week, the JR arrived at Site U1366 (Prospectus Site SPG-2A). The plan for this site was the same as for Site U1365, to core three holes and dedicate one hole to build the site's stratigraphic framework and for sedimentological and petrophysical measurements, another one for geochemical analyses and a third hole for microbiological experiments. By week end, five holes were cored due to coring disturbance and enough adequate material was recovered to conduct all the analyses planned.

Expedition scientists held a science meeting to present and discuss scientific results from Site U1365 and present the scientific objectives for Site U1366. The drafts versions of the Site U1365 reports were finalized and submitted to the Co-Chiefs and EPM for review.

TECHNICAL SUPPORT AND HSE ACTIVITIES

Technical support staff processed and curated cores from Sites U1365 and U1366, prepared thin sections, and helped expedition scientists with laboratory instruments, applications and data collection and upload. A fire and boat drill was held for all expedition participants on Sunday October 31.