IODP Expedition 329: Subseafloor Life in the South Pacific Gyre

Site U1367 Summary

Site U1367 was selected as a drilling target because (1) its microbial activities and cell counts were expected to be characteristic of a setting midway between the western gyre edge and the gyre center, and (2) its basement age renders it a reasonable location for testing the extent of basalt alteration and openness to flow in a thinly sedimented region of ~33.5 Ma basaltic basement.

The principal objectives at Site U1367 are (1) to document the habitats, metabolic activities, genetic composition and biomass of microbial communities in subseafloor sediment with very low total activity, (2) to test how oceanographic factors control variation in sedimentary habitats, activities and communities from gyre center to gyre margin, (3) to quantify the extent to which these sedimentary communities may be supplied with electron donors by water radiolysis, (4) to determine how habitats, potential activities and, if measurable, communities in subseafloor basalt vary with crust age and hydrologic regime (from ridge crest to abyssal plain).

Site U1367, at 4285 m water depth, is located in ocean crust formed during magnetic polarity Chron 13n [33.3 – 33.7 Ma]. The complete sedimentary succession, from seafloor to underlying basalt, was recovered by APC in Holes U1367B through U1367E. The sediment/basalt contact varies by a few meters from hole to hole. The lowermost sediment and fragments of the underlying basalt were recovered by RCB in Hole U1367F. Core recovery of the basalt was unusually low (11%). Continuous infall of basaltic debris forced us to terminate the hole early, preventing us from reaching sufficient depth below seafloor to deploy downhole logging tools.

Principal Results

The sediment at Site U1367 is composed of ~6 meters of pelagic clay (Unit I) overlying ~16 meters of Oligocene carbonate ooze (Unit II). The principal components of the clay are smectite and mica-group members, phillipsite (a zeolite), and red-brown to yellow-brown semi-opaque oxide (RSO). The ooze is composed mainly of coccolithophores and RSO, accompanied by foraminifera. The clay and the ooze differ significantly in several physical properties, including porosity, bulk density, electrical conductivity, magnetic susceptibility and natural gamma radiation. Although unit thickness and composition vary from hole to hole, the general composition is very similar in each hole.

Manual cell counts are much lower than at the same sediment depths cored by all previous scientific ocean drilling expeditions. They decline rapidly with initial depth below the seafloor. Dissolved oxygen, nitrate and phosphate are present deep in the column.

The recovered sequence of basement rock is composed of pillow basalt fragments with prominent chill margins. Secondary mineralization and wall-rock interaction is limited in the recovered basalt. However, it is likely that the most altered portions of the basalt were not recovered.

A wide range of microbiology experiments was initiated on board the *JOIDES Resolution*. Experiments on major microbial processes and experiments for enumeration of viable microbes were initiated at selected depths ranging from near the sediment/water interface to ~30 m into the basaltic basement. Subsamples were routinely taken from all of the distinct lithologic units for postcruise molecular assays and microbiological experiments.