

IODP Expedition 329: Subseafloor Life in the South Pacific Gyre

Site U1365 Summary

The scientific objectives at Site U1365 are (1) to document the nature of subseafloor life in very old (>100 Ma) and slowly accumulating organic-poor sediments; (2) to test how oceanographic factors (such as surface ocean productivity, sedimentation rate and distance from shore) control variation in sedimentary habitats, activities and communities from gyre center to gyre margin; (3) to quantify the extent to which subseafloor communities in organic-poor sediment are sustained by H₂ from radiolysis of water; and (4) to determine how basement habitats, potential activities and, if measurable, communities vary with basalt age and hydrologic regime (from ridge crest to abyssal plain).

Site U1365, at 5708 m water depth, is centrally located in ocean crust formed during the Cretaceous Normal Superchron (CNS). The tectonic history of this Australia-sized area is poorly constrained because correlatable magnetic seafloor anomalies are not present. Consequently, radiometric dating of the recovered basalt will provide important constraints on the tectonic and volcanic history of this region.

The complete sedimentary succession was recovered by APC in Hole A. Excluding a drilled-over chert interval in the lower sediment column, complete successions were also recovered from Holes B and C. Core recovery in the underlying basalt was unusually high (75%). However, slow penetration (<1 m/hour) allowed us to drill only about 50 m of basalt, preventing us from reaching sufficient hole depth to deploy downhole logging tools.

Principal Results

The sedimentary succession at Site U1365 is composed of three units. Unit I consists of medium brown zeolitic metalliferous pelagic clay (0-44 mbsf); Unit II of porcellanite and chert (44-65 mbsf); and Unit III of dark brown metalliferous clay (65-75 mbsf).

Cell counts are much lower than at the same sediment depths in all sites previously cored by scientific ocean drilling. Total organic carbon and total nitrogen disappear in the lower portion of Unit I. Dissolved oxygen and dissolved nitrate are present to great depth.

The drilled sequence of basement rock is a series of massive basalt flows. Secondary mineralization and wall-rock interaction is primarily restricted to regions between lava flows.

Downhole temperature was measured using the APCT-3 (Advanced Piston Coring Temperature tool). The result closely agrees with the thermal gradient observed by

the site survey expedition. The heat flow is typical for this age crust. Sediment temperatures are within the range inhabited by psychrophilic microbes.

A wide range of microbiology experiments was initiated shipboard. 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 nearly 50 m into the basaltic basement. Subsamples for postcruise biomolecular assays and microbiological experiments were routinely taken from all of the distinct lithologic units.