**IODP Expedition 329: Subseafloor life in the South Pacific Gyre**

## Site U1370 Summary

Site U1370 (Site SPG-11A in the site survey cruise) was selected as a drilling target because (1) its microbial activities and cell counts were expected to be characteristic of midway between gyre center and the southern gyre edge, and (2) its basement age renders it a reasonable location for testing the extent of sediment/basement interaction in a moderately sedimented region of 74 to 80-Ma basaltic basement.

The principal objectives at Site U1370 are (1) to document the habitats, metabolic activities, genetic composition and biomass of microbial communities in subseafloor sediment with 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 communities may be supplied with electron donors by water radiolysis, and (4) to determine how sediment-basement exchange and potential activities in the basaltic basement vary with basement age and hydrologic regime (from ridge crest to abyssal plain).

Site U1370 is located in the South Pacific Gyre at 5074 m water depth. The coring site is located within magnetic polarity Chron 33n, so the crustal age may range from 73.6 – 79.5 Ma. The sedimentary succession was recovered by APC coring in Holes U1370D, U1370E and U1370F. Altered basaltic fragments were recovered from the basal cores of Holes U1370D and U1370F.

## Principal Results

*Sediment*

The sediment at Site U1370 is approximately 70-m thick. The dominant lithology is dark brown zeolitic metalliferous pelagic clay. The principal components of the clay are red-brown to yellow-brown semi-opaque oxide (RSO), phillipsite, and smectite. Unit I lies between the sediment/water interface and the top of a nannofossil ooze (Unit II), at approximately 61 mbsf. Unit II is a relatively short (30 to 290 cm) pale yellow interval predominantly composed of coccolithophores, with trace phillipsite and clay. Unit III is a thin clay interval, containing 88% RSO and 12% clay; it directly overlays the basaltic basement. Although volcanic glass is locally abundant (~43%) in Unit I, its overall abundance is only 7% and it is completely absent in Units II and III. A large, fragmented manganese nodule was recovered in Hole U1370D at 10 mbsf and fragments of a manganese-encrusted hardground were recovered in Hole U1370F at 52 mbsf.

Overall sediment structure at Site U1370 is massive, although occasional laminations and thin beds are visible in the lower half of Unit I. *Planolites* (horizontal) burrows are faintly visible in most of the clay and *Trichichnus* (vertical)

burrows blend the upper and lower contacts of the nannofossil ooze and the overlying and underlying clay. Sediment thickness and composition are uniform from hole to hole.

The nannofossil ooze was deposited during early Paleocene foraminiferal zone P1. Its occurrence in this deep-sea clay sequence is attributed to deepening of the calcite compensation depth and lysocline during the interval of decreased planktic carbonate precipitation that followed the end-Cretaceous mass extinction.

Microbial cell counts were above the minimum detection limit throughout much of the sediment column.

The dissolved oxygen and nitrate profiles at Site U1370 are strikingly different from the profiles at previous sites. Dissolved oxygen concentration decreases sharply in the first several meters below seafloor and then more gradually with depth. The rate of increase in dissolved nitrate concentration is higher than at previous sites, suggesting that organic nitrogen oxidation in the sediment is greater here than at those sites. The changes in dissolved oxygen and nitrate throughout the upper sediment column are attributed to oxygen consuming organic oxidation by sedimentary microbes.

*Basalt*

Dissolved potassium concentration declines nearly linearly with depth in the sediment, indicating a sink for dissolved potassium in the underlying basaltic basement. This sink is inferred to be basalt alteration (clay formation).

A wide range of microbiology experiments was initiated shipboard. Experiments on major microbial processes and cultivations of viable microbes were initiated with samples taken at selected depths ranging from near the sediment/water interface to the sediment/basalt interface. Subsamples were routinely taken from all of the distinct lithologic units for postcruise molecular assays and microbiological experiments.