

IODP Expedition 329: Subseafloor Life in the South Pacific Gyre

Site U1369 Summary

Site U1369 (Scientific Prospectus Site SPG-10A) 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 thinly sedimented region of ~58-Ma basaltic basement.

The principal objectives at Site U1369 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, 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 U1369 is located in the South Pacific Gyre at 5277 m water depth. Basement age is estimated from extrapolated magnetic models and changes in spreading rate recorded by neighboring magnetic profiles. Our best estimate of the crustal age is ~58 Ma and corresponds to magnetic polarity Chron 25r (57.2 – 58.4 Ma) (Gradstein et al., 2004). The complete sedimentary succession was recovered by the APC coring system in Holes U1369B, U1369C and U1369E. Basalt fragments were recovered from the basal cores of these holes.

Principal Results

Sediment

The sediment at Site U1369 consists of approximately 16 m of zeolitic metalliferous clay. The sediment is massive in texture and contains visible burrows throughout. The principal components of the clay are phillipsite, red-brown to yellow-brown semi-opaque oxide (RSO), and clay. Manganese nodules were recovered from the sediment/water interface and from deep in the sediment column. Micro- and nannofossils are almost completely absent. The sediment/basalt interface consists of vitric sand overlying altered basalt. Sediment thickness and composition are fairly uniform from hole to hole.

Microbial cell counts decline rapidly within 2 mbsf and remain low for the remainder of the sediment column.

Total nitrogen and total organic carbon decrease rapidly to ~3 mbsf and are then extremely low for the remainder of the sediment column.

Dissolved oxygen, dissolved nitrate, dissolved phosphate and dissolved inorganic carbon are present deep in the sediment. Dissolved hydrogen concentration is consistently low throughout the column.

A wide range of microbiology experiments was initiated shipboard. Experiments on major microbial processes and cultivations of viable microbes were initiated 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 post-cruise molecular assays and microbiological experiments.

References

Gradstein, F. M., Ogg, J., Smith, A. and 35 others, 2004, A Geologic Time Scale 2004. Cambridge University Press, ~ 500 p.