Cultivable microbial populations in deep marine sediments

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During the past 15 years, investigations on deep marine sediments have shown abundant microorganisms in deeply buried oceanic sediments. Bacterial diversity in Nankai Trough was estimated trough cultivation in media specifically designed to enrich various metabolic types of bacteria including methanogens, sulphate-reducer, heterotroph and autotroph sulphur-reducer and by sequencing 16S rDNA genes from enrichment cultures.

Results indicated that cultivable bacteria represents a very small proportion of the direct cell counts. Nevertheless, description of new species adapted to their deep-sediment environment remains necessary to understand biogeochemical processes in subseafloor sediments. Isolates were obtained at 5, 300 and 400 meters below the seafloor from Nankai Trough. Pures cultures of fermentative anaerobic heterotroph were isolated at 25, 50 and 70°C.

DNA fragments encoding bacterial ribosomal RNA small-subunit sequences (16S rDNA) were amplified by polymerase chain reaction method using DNA extracted directly from enrichment cultures. Sequences analysis revealed 6 differents groups of bacteria 16S rDNAs related mostly to the low G+C gram-positive phylum (48% of the total clone library) and *Proteobacteria gamma*, *delta* and *epsilon* subdivision (45%) and a few were identified as *Cytophaga-Flexibacter-Bacteroides* (5%) and *Spirochaetales* (2%). These results indicated that cultivable bacterial community in the Nankai Trough sediment mainly consists of mesophilic heterotroph bacteria belonging to the low G+C gram-positive phylum. Metabolism and growth characteristics of isolates are under progress.

Geochemical evolution of magmas in Fuji Volcano, Japan

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The Fuji volcano, the East Japan arc, is still active. Seismic tomography study detected a low velocity area in the depth range from 20 to 32 km (Lees and Ukawa 1992) beneath source area of deep low frequency earthquakes observed between the 10 and 20 km depth (Ukawa 1997).

Analyses of boulders from debris flows of older stages, scoria from fall deposits and sequential samples in boreholes have revealed the whole evolution of magmas (eg. Takahashi et al. 1991; Miyaji et al. 2001; Togashi and Terashima 1997).

Major and trace element concentrations and Nd-Sr isotopes of island arc tholeiites from Fuji Volcano show compositional change of magmas with time for the last 100,000 years. Rocks from the Shin-Fuji-type magma (14ka-0 ka) have two or three times higher concentrations in Cs, Rb, K, Ba, Zr, Ti, P, Y, Cu and Au at the same SiO_2 level than those from the Ko-Fuji-type magma (100-3 ka). While the ratios of Zr/Y and Rb/Y of the magmas mostly increase with time, the Nd -Sr isotopes are restricted in the small range of depleted arc basalts.

The concentrations of Cu and V decrease with increase of fractionation in the older stages and conversely in the younger stages, from less-fractionated magmas with the same levels of concentrations. The timing of the formation of titanomagnetite relates to the behaviour of Cu and V under the different fO_2 conditions of magma chambers.

Fresh less-fractionated basaltic magmas have been repeatedly supplied in all stages of Fuji Volcano. The observed general temporal change of incompatible elements in magmas inherits the original difference in parental magmas. This would be heritage of a slightly heterogeneous mantle source in incompatible elements including HFS elements.

References

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