

Study for Deep Biosphere and Subseafloor Aquifers in IODP: Report from Domestic Workshop for INVEST

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Domestic Workshop for Deep Biosphere and Subseafloor Aquifers has been opened during 12 to 13 December of 2008 in Kashiwa campus, University of Tokyo. The workshop participants discussed the present situation and perspectives of drilling science to investigate the subseafloor biosphere.

The data obtained from studies of drilling expeditions have a power to change the conceptual model of the biosphere. During the past decade, studies of the subseafloor microbial community have been advanced using the archived ODP core samples and the sub-samples collected from several IODP expeditions. The initial evidences for subseafloor microbial residence have reported in the final stage of ODP era (Parks et al 1994, Wellsbury et al 1997, Fisk et al 1998). Subseafloor microbial community has recently been detected in a core sample collected from 1,626 m below of sedimentary layer (Roussel et al 2008). Other recent report reveals the specific distribution profile of dominant occupation of Archaea in deep subseafloor habitats, and estimation of the cellular carbon storage reached to 90 Pg in the world ocean (Lipp et al 2008). The next IODP expedition targeted to Deep Biosphere will be started in 2010.

The workshop participants recognized the following issues to investigate and determine through the IODP expeditions. 1) The limits of subseafloor life, ecosystem and biosphere are not yet fully understood to define the boundary conditions. Marginal zone between biotic and abiotic process may be a unique environment to understand the biogeochemical process and production of natural resources. 2) Plate tectonics create various geological structures (sediment, igneous rock, subduction etc.) and fluid flow systems (geo pressured fluid, seepages, hydrothermal system, etc). Transportation of energy resources and nutrients supply are crucial factors to sustain a physiological activity of the subseafloor microbes. Collaboration with geology and sedimentology will be needed to understand the situation of habitats. 3) Natural resources such as methane gas hydrate, petroleum, sulfide deposits, are products of biogenic and thermogenic processes in the deep subseafloor region but the mechanism of accumulation and decomposition process is unknown. 4) To investigate the linkages between chemical fluxes and microbial metabolisms, systematic research using drilling expeditions, in situ experiments, and borehole-based long-term monitoring will be needed.

This workshop provided the good opportunity to discuss the many issues and the initiative to make an interdisciplinary research network of Deep Biosphere and Subseafloor Aquifers. The convenors really appreciate the contributions from all participants and workshop organizers.