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海洋地殻・マントル・モホの地震学的特徴 －IODP Mohole projectに向けて－

Understanding seismological nature of oceanic crust, mantle and Moho toward IODP Mohole project

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An ultimate goal of the IODP Mohole project is to understand nature of oceanic crust, mantle and Moho. Previous ocean drilling studies (e.g., IODP Expedition 304/305 and 309/312) provided significant improvement for understanding of structures and formation processes of fast- and slow-spreading oceanic crust, but we still far from the ultimate goal. Since drilling into the mantle requires intensive geophysical studies for, 1) selecting the best area where drilling into the mantle is feasible, 2) clarifying scientific hypothesis to be tested, and 3) making further integration with coring/logging, we have been proposing a plan and strategy of geophysical studies toward deep drilling into the mantle. Those consist of the following three phases Phase 1; Seismic imaging of typical oceanic crust in the northwestern Pacific, Phase 2 Integrated geophysical study at possible Mohole sites, and Phase 3 Geophysical studies pre-, with- and post-drilling. As a part of the Phase 1, we have started a five-year seismic project in the northwestern Pacific since 2009. In the first year we acquired data from the two 500 km-long profile off Hokkaido and Sanriku on the incoming plate to the Kuril and Japan trench. A preliminary result of the reflection seismic data shows clearly imaged Moho from the abyssal basin to the outer rise, and becomes obscure toward the trench. The seismic refraction data indicate decreasing the seismic velocity of the uppermost mantle from the outer rise to the trench. Those observations may indicate an effect of serpentinization due to a normal fault system forming by bending the crust. We also conducted numerical modeling of Moho reflections using a realistic oceanic crust model, which is created on the basis of crust/mantle transitions observed in ophiolites. A result of the numerical modeling shows that a model having thin layered wehrlite intruded between gabbro and harzuburgite creates layered Moho reflections with the first peak of the reflection from top of the wehrlite. In this presentation, we propose a strategy of seismic studies toward the IODP Mohole project, and summarized a most recent result of the active-soruce seismic survey in the Northwestern Pacific as well as the numerical modeling of Moho reflection calculated from field observation of ophiolite.