The Renaissance of the Oldest Oceanic Plate: Jurassic Oceanic Crust without Moho

*Yoshihiko Tamura[1], Mathieu Rospabe[1], Kentaro Kaneda[2], Alexander Nichols[3], Gou Fujie[1], Eiichi TAKAZAWA[4], Katsuyoshi Michibayashi[5], Shuichi Kodaira[1]

1. Research Institute for Marine Geodynamics, Japan Agency for Maine-Earth Science and Technology, 2. Japan Coast Guard, 3. University of Canterbury, New Zealand, 4. Niigata University, 5. Nagoya University

The western portion of the Pacific Plate, the oldest oceanic plate in the world, has been drilled several times and, based on Ocean Drilling Program (ODP) Site 801, an understanding of its layers, from pelagic clay through chert to alkali basalts and tholeiitic mid-ocean ridge basalts (MORB), has been established (e.g. Plank et al., 2000; Hauff et al., 2003). This oldest oceanic plate is experiencing a renaissance and we propose a strategy to drill the most suitable three sites to recover specific parts of the plate to continue its renaissance. The drilling sites, MM, MAT, and MINA, target (1) the most complete sedimentary sequence of pelagic clay including rare earth elements and yttrium (REY)-rich mud, (2) newly found outcrops of the Jurassic-Cretaceous boundary (JKB), and (3) MORB tholeiites without Moho, respectively.

Kaneda et al. (2010) conducted seismic surveys across the Marcus-Wake seamount chain. They found two contrasting sub-seafloor structures in the Jurassic lithosphere. The southern basin is underlain by 7.5-8.0 km thick crust with clear Moho reflections (sharp, single, flat and continuous, and of large amplitude. Beneath the northern basin, in contrast, the Moho reflections, if there at all, are extremely weak, and crust is only 6 km thick. The correlation between the strength of the Moho reflections and crustal thicknesses has been observed in other seismic profiles in the Pacific Plate (e.g. Ohira et al., 2017). We suggest that two types of oceanic crust exist; one thick with a Moho and the other thin without a Moho (Tamura et al., in prep). MORB overlying clear Moho reflections have been recovered at Site 801and thus Site MINA has been selected to represent Jurassic oceanic crust without the Moho.

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