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P-wave velocity structure and deep crustal reflections in the central Ontong Java Plateau

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The Ontong Java Plateau (OJP) is an elevated expanse of seafloor in the western equatorial Pacific outlined by 4000-m depth contour, and encompasses an area of 1.86 x 10^6 km^2 area (Mahoney et al., 2001), five times the size of Japan. Although thick crust has been inferred from OJP's shallow water depths and size, the feature's crustal thickness and structure have not been accurately determined. The OJP is the largest oceanic plateau on earth and is a typical large igneous province (LIPs) (Coffin and Eldholm, 1994). The formation mechanism of LIPs does not fit plate tectonic theory. No current alternative formation models can explain all of the observations. Understanding LIP formation is important not only for solid earth investigations, but also for environmental studies, because evidence suggests that LIPs may have had major environmental impacts (e.g. Tejada et al., 2009). The Japan Agency for Marine-Earth Science and Technology (JAMSTEC) conducted an active source seismic survey using R/V *Kairei* to constrain the structure in the central OJP (Miura et al., 2011). The new multi-channel seismic (MCS) data show a clear reflection boundary about 1 s below seafloor, which is thought to represent the contact between sediment and igneous basement (Mahoney et al., 2001). We observe several deep reflections below igneous basement. Two deep and strong reflections at 11-13 s and 14-15 s (two-way travel time) are thought to be significant reflections with respect to OJP's structure. Ocean bottom seismographic (OBS) data show clear first arrival refraction phases at $>$300 km offset distances and large amplitude later reflection phases. Refraction phases with an apparent velocity of 7 km/s are widely observed, indicating a thick layer. First arrival tomographic analysis reveals the velocity structure down to 40 km below sea level. We also employed a travel time mapping method that reveals deep interfaces using later reflection phases. From our analyses, we observe a continuous boundary at about 15 km depth where the P-wave velocity is 6.8-6.9 km/s, i.e., less than 7 km/s. Two continuous boundaries at about 33-35 km and 42-45 km depths are clearly imaged. Depth converted MCS data using OBS tomographic velocities show good agreement in distribution of the two deep reflections. Interpretation of the deep reflections is a subject for the future. According to Coffin et al. (2006), the crustal structure of oceanic plateaus may be divided in two types according to tectonic setting at the time of formation: off-spreading axis and on-spreading axis. The former case incorporates original oceanic crustal structure. From our data, we cannot identify original oceanic crustal structure in the central OJP; therefore, it may have formed on-axis. In this presentation, we will show further data analyses and interpretations of OJP structure including formation mechanisms.

Keywords: LIPs, OJP, MCS, OBS