Lower limit of Shimanto belt: constraints from elastic wave velocities of rocks from the Kanto Mountains and the Tanzawa Mountains

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The lithological interpretation of crust beneath the Kanto area is important for understanding the crustal dynamics of the Knato area. The oceanic island arc (Izu-Bonin-Mariana arc) is developed along the eastern margin of the Philippine Sea Plate. The forearc part is subducting as the Philippine Sea slab beneath the Kanto area, whereas the Izu peninsular is colliding with the Honshu arc. In recent geophysical studies (Arai et al., 2009, 2013, 2014), seismic structure models have been constructed by refraction/wide-angle reflection seismic profiling across the Izu collision zone and the Kanto Mountains. The Kanto Mountains is located at the northern side of the Tanzawa Mountains Izu collision zone, and mainly composed of the accretionary complex represented by the Chichibu belt and the Shimanto belt.
In this study, we collected sandstone and mudstone samples from the Shimanto and Chichibu belts and greenstones from the Tanzawa group, and then measured compressional wave velocities (Vp) and shear (Vs) wave velocities. Ultrasonic measurements on these rock samples were conducted up to 1.0 GPa at 25℃ in a piston cylinder apparatus. At pressure up to 0.35GPa, Vp and Vs of the sandstone and mudstone samples from the Shimanto and Chichibu belts are 5.9-6.0km/s and 3.6-3.7km/s, respectively. The low Vp/Vs ratio (1.6-1.65) reflects the high content of quartz in the sandstone and mudstone samples. In contrast, Vp/Vs ratio of the greenstone sample from the Tanzawa group shows higher value. We then compared the rock velocities with the seismic velocity profiles (Arai et al., 2009, 2013, 2014), and inferred that the Shimanto and Chichibu belts are not distributed at depths deeper than 10km.

Keywords: Izu collision zone, Shimanto Belt, Kanto Mountains, Tanzania Mountains