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Phase changes and temperature of the subducted crust of Philippine Sea slab beneath Kanto, Japan

ISHIKAWA, Masahiro[1*] ; NAKAGAWA, Shigeki[2] ; SAKAI, Shin'ichi[2] ; HIRATA, Naoshi[2] ; SATO, Hiroshi[2] ; KASAHARA, Keiji[3]

[1]Graduate School of Environment Information Sciences, Yokohama National University, [2]Earthquake Research Institute, The University of Tokyo, [3]Association for the Development of Earthquake Prediction

The Philippine Sea plate subducts beneath the Greater Tokyo Area of Japan. Devastating M8-class earthquakes occurred on the upper surface of the Philippine Sea plate, examples of which are the Genroku earthquake of 1703 (magnitude M8.0) and the Kanto earthquake of 1923 (M7.9). A M7 or greater (M7) earthquake in this region may occur either on the upper surface or intra slab of Philippine Sea plate. To evaluate seismic hazard in the Greater Tokyo Area of Japan we need to clarify the lithological properties of Philippine Sea slab. This study presents an interpretation of the crustal and mantle structure of the Philippine Sea slab beneath Kanto based on recent MeSO-net seismic tomography data. The seismic tomography reveals that P wave velocity of the subducted crust of the Philippine Sea slab increases stepwise at 30 km and 40 km depths beneath the Kanto area. The cause of these two stepwise increases in P wave velocity of subducted crust is expected to correspond to metamorphic phase changes. Mineralogical assemblages of forearc basalt composition of the Izu arc was calculated by Theriak-Domino software, and the phase diagram shows that phase changes to garnet amphibolite and eclogite can account for these two stepwise increase in P wave velocity of the subducted crust of the Philippine Sea slab.

Keywords: slab, phase change, slab temperature, Kanto, Philippine Sea Plate, crust