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Composition of the subducted slab beneath Izu collision zone, Japan

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The Philippine Sea plate subducts northwesteward under the Honshu arc, Japan. The presence of the Izu-Bonin arc within the Philippine Sea plate causes a complex tectonic environment. In eastern Kanto area, an accretionary wedge composed of late Cenozoic sediments overlies the downgoing Philippine Sea plate. In western Kanto area, the Izu-Bonin arc has collided with the Honshu crust; remnant pieces of the Izu-Bonin arc such as the Tanzawa block were accreted to the Honshu crust. A megathrust separates the Philippine Sea slab from the Honshu crust. According to seismic servey (Sato et al., 2005), the megathrust fault separates the upper/middle crust from the Izu-Bonin arc beneath the Izu collision zone. Devastating M8-class earthquakes occur on the megathrust fault, and the epicenter of the Kanto earthquake of 1923 (M7.9) is located in the Izu collision zone. To evaluate seismic hazard in the Greater Tokyo Area of Japan we need to clarify the lithological properties of Izu collision zone.

This study presents an interpretation of the crustal structure of the Izu collision zone. This study infers that amphibole is a main constituent mineral of the subducted lower crust of the Izu-Bonin arc. Dehydration embrittlement process resulting from the dehydration of hydrous minerals (e.g. amphibole) in the subducting lower crust is expected, and it may have induced the microearthquakes by enhancing pore pressures along the pre-existing faults/fractures in the subducting lower crust beneath the Izu collision zone. Stability filed of amphibole within the gabbroic composition from the Tanzawa plutonic complex was calculated by Theriak-Domino software, and the phase diagram shows hot subduction can account for seismicity of the microearthquakes beneath the Tanzawa Mountains and the resulting dehydrated dry slab may therefore account for the observed absence of seismicity below the northern part of Tanzawa Mountains and Kanto Mountains.

Keywords: collision zone, slab