On the geometry and evolution history of the subducted Philippine sea plate slab beneath the Tokyo metropolitan area

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We, in this study, discuss the detailed geometry of the subducted Philippine sea plate slab (PH slab) beneath the Tokyo metropolitan area, and possible tectonic history of PH slab for recent several million years. We modified the original 'slab SG' model by Eguchi and Hori (2006) beneath the metropolitan area, as outlined by the broad and thick seismic zone over the Pacific plate slab (PC slab), to some extent. Horizontal dimension of slab SG covers approximately the Kanto plains lowland, except the middle valley areas of large rivers such as the Tone River and Kinu River.

Considering the possible tectonic influence of drastic directional change in absolute plate motion vector of the Philippine sea plate from NE or NNE to NW near the Sagami trough in ~5Ma, we proposed five fundamental models of the internal structure and evolutional origin(s) of slab SG confined within the limited wedge mantle layer, i.e., a horizontal triangular prism-like space, over PC slab as follows. Basic internal structure models of slab SG, in the N-S direction, inferred in this study are (1) two layered slabs with the shallower PH slab and the lower different slab (named 'slab SL'), (2) bookshelf-like configuration of northwardly inclined multi-slabs on PC slab due to the intermittent southward (or northward) shift of accumulation sites of short-length slab tips with episodic subduction at just south (or north) of the previously active paleo- Sagami trough(s), and (3) the combination of the above two models.

More complicated 3D evolution models of slab SG include (4) the E-W compressive and destructive folding down process of the northeastern edge of the Philippine sea plate into the wedge mantle, and/or (5) the westward underthrust fault(s) formation with E-W compressive forces along some areas east of the northern part of the N-S striking paleo- Izu-Bonin arc and the following subduction process of the northeastern part of the paleo- Izu-Bonin outer-arc block, during the absolute motion change period of the Philippine sea plate in ~5Ma. In both tectonics models (4) and (5), we can suggest that the irregularly rough surface of the westerly moving Pacific plate near the Izu-Bonin and Japan trenches, as suggested by recent marine geophysical surveys, functioned to provide large E-W compressive and westward drag forces to the overriding northeastern edge of the easterly moving Philippine sea plate in ~5Ma.