Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SIT39-06 Room:105 Time:May 24 10:15-10:30

Slab dynamics inferred from kinematic observations of the subduction zone with various slab depths

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Our numerical study showed that trench backward migration is generated when the slab stagnates around the phase boundary at the 660 km depth (Nakakuki et al, 2013). To verify validity of our models, we have studied relationship between the slab dynamics and depths using kinematic observations of the subduction zone. We use data compiled by Lollemand et al. (2005). The data contain ages, dip angles, maximum depths, motions of the subducting plate, migrations of the overriding plate and the trench, back-arc deformations, and slab descending rates. We classified the observations notifying to the maximum depths and dip angles. Our findings are as follows. (1) The most of overriding plate with a shallow slab is compressional. (2) Back-arc extension often occurs in the subduction zone in which the maximum slab depth is 660 km. (3) The trench advances in the subduction zones with the lower mantle slab except in those at the east coast of American continents. (4) Dip angles of the slab penetrating into the lower mantle correlates with the trench migration. (5) Trench with older lithosphere advances and the older slab has steeper dip angles. (6) (4) and (5) means that tips of the lower mantle slab are anchored to the ambient mantle. (7) Dip angle of shallow slab facing to the west direction is steeper than those facing to the east direction. Implications of these observations to the slab dynamics will be discussed in the presentation.

Keywords: subduction zone, back-arc basin, subducted slab, phase transition, mantle convection