

Subduction zone dynamics controlled by the hot material next to the subducting slab

Satoru Honda^{1*}, Alik Ismail-Zadeh², Manabu Morishige³, Igor Tsepelev⁴

¹Earthquake Research Institute, University of Tokyo, ²Institut für Angewandte Geowissenschaften, Karlsruhe Institut für Technologie, ³IFREE, JAMSTEC, ⁴Institute of Mathematics and Mechanics, Russian Academy of Sciences

The origin and past evolution of seismically detected hot material in the sub-slab mantle under the subducting Pacific plate are studied. Forward modeling studies show that its origin is likely to be originated from the hot material next to the cold sinking material typically observed in the internally heated convection. Backward modeling of thermal structure under Japanese Islands and their surroundings show the common source of present hot materials in the sub-slab mantle and the mantle wedge. The results also suggest the leakage of hot material from the sub-slab to the back-arc regions, which is also observed in the forward modeling studies. Thus, the thermal anomaly next to the subducting slab plays potentially important role in controlling the dynamics of subduction zone and back-arc mantle such as back-arc spreading, break-off of subducting plate and geochemical mixing.

Keywords: subduction zone, back-arc opening, backward modeling