Collision vs. subduction - from a viewpoint of slab dehydration -

Tetsuzo Seno

Earthquake Research Institute, University of Tokyo

Abstract

Low-frequency tremors (LFT) recently found in the southwest Japan fore-arc likely occur due to dehydration from the subducting crust of the Philippine Sea slab. However, there are some places without such LFT; they are N. Izu-Kanto, E. Shikoku, and S. Kyushu. These are the places where island-arc type crust is subducting. We propose that dehydration of the subducted crust does not occur beneath these regions, because it is composed mainly of tonalite, lacking the quantity of hydrous minerals seen in normal subducting oceanic crust. We show that almost no earthquake occurs within the subducted crust in such regions, consistent with dehydration embrittlement hypothesis for intraslab seismicity. The lack of dehydration from the crust would also affect the mode of occurrence of interplate earthquakes, because pore fluid pressure is more difficult to rise at the thrust zone. This might be reflected in the irregular occurrence of great earthquakes in these regions. There is no intraslab seismicity or low-frequency tremor north of the Izu collision zone in central Honshu. I suggest that the entire lack of dehydration of the subducted slab may characterize collision. The plate boundary thrust is then devoid of pore fluid and large interplate earthquakes become rare.