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SCG71-P06 Room:Convention Hall Time:May 21 17:15-18:15

The second continent model

KAWAI, Kenji[1*], YAMAMOTO, Shinji[2], TSUCHIYA, Taku[3], ICHIKAWA, Hiroki[3], MARUYAMA, Shigenori[1]

[1]Tokyo Institute of Technology, [2]University of Tokyo, [3]Ehime University

At subduction zones continental crust is predominantly created by arc magmatism (Rudnick, 1995) and is returned to the mantle via sediment subduction, subduction erosion, and continental subduction (Scholl and von Huene, 2007). Granitic rocks, the major constituent of the continental crust, are lighter than the mantle at depths shallower than 270 km, but we show here, based on first principles calculations, that beneath 270 km they have negative buoyancy compared to the surrounding material in the upper mantle and transition zone and thus can be subducted in the depth range 270-660 km (Irifune et al., 1994). This suggests that there can be two reservoirs of granitic material in the Earth, one on the surface and the other at the base of the mantle transition zone (MTZ). The accumulated volume of subducted granitic material at the base of the MTZ might amount to a few times the present volume of the continental crust. Our calculations also show that the seismic velocities of granitic material in the depth range from 270 km to 660 km are faster than those of the surrounding mantle. This could explain the anomalous seismic-wave velocities observed around 660 km depth. The observed seismic scatterers and reported splitting of the 660 km discontinuity could be due to either jadeite dissociation and/or chemical discontinuities between granitic material and the surrounding mantle.

Keywords: granite, tectonic erosion, mantle transition zone