Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SCG08-08 Room:311 Time:April 29 11:30-11:45

Role of the second continent

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It has been thought that granitic crust, having been formed on the surface, must have survived through the Earth's evolution because of its buoyancy. Recent geological studies have suggested that a significant amount of crustal material has been lost from the surface due to delamination, continental collision, and subduction at oceanic?continental convergent margins (von Huene and Scholl 1991; Yamamoto et al. 2009; Ichikawa et al. 2013a). If so, then the subducted crustal materials are expected to be trapped in the mid-mantle due to the density difference from peridotitic materials induced by the phase transition from coesite to stishovite (Kawai et al. 2013). In order to study the effect of the subducted granitic materials floating around the mantle transition zone, we conducted two-dimensional numerical experiments of mantle convection incorporating a continental drift with a heat source placed around the bottom of the mantle transition zone. We found that the addition of heat source in the mantle transition zone considerably enhances the onset of upwelling plumes in the upper mantle, which further reduces the time scale of continental drift. The heat source also causes massive mechanical mixing, especially in the upper mantle. The results suggest that the heat source floating around the mantle transition zone can be a possible candidate for inducing the supercontinent cycle (Ichikawa et al. 2013b).

Keywords: Second continent, Wilson's cycle, Granite, Tectonic erosion