Mantle dynamics of the Earth through time

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Since the initial discovery of the superplume in the central Pacific Ocean in ca. 1990, the role and driving force of plumes and superplumes has been discussed in the framework of plate and plume tectonics, and more specifically whether a sufficient thermal budget is given solely from the core. Here, it is considered insufficient. Instead, the more important factor for the thermal budget is TTG enriched in radiogenic elements such as U, K and Th in the D" layer and mantle transition zone at 410-660 km depth, formed along the subduction zone through plate tectonics. In particular, primordial continents (initial solidified magma ocean at 4.53 Ga) were removed from the surface of the Earth through tectonic erosion and are now concentrated in the core mantle boundary. The distribution of these primordial rocks has been revealed in association with the mantle dynamics documented in the surface geology of the modern Earth. Accumulated primordial continent during Hadean eon raised the temperature in the D" layer to create liquid core by melting outer solid core, and resulted in the generation of strong geomagnetism.

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