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Contribution of heat source around the mantle transition zone on continental drift

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Distribution of heat source in the mantle is still poorly known in spite of its importance on the mantle convection. Here we consider a case where the heat source is concentrated around the mantle transition zone and upper part of the lower mantle. The candidate heat source materials are basalt and granite. Radioactive isotopes are highly concentrated on these rocks because they are incompatible implying that they can be strong heat sources if they have been buried somewhere in the deep mantle.

Recent geological studies have suggested that the huge amount of crustal materials have sunk from the surface aboard subducting slabs. For example, studies on the elastic properties show that granite is heavier than the ambient mantle rock around the transition zone and upper part of the lower mantle. Therefore continental materials are considered to be distributed somewhere around the mantle transition zone. In addition, the extensive mass of basalt had been accumulated at the base of the upper mantle if the mantle would have had double layered convection in Archean.

In this study, we conducted numerical experiments of mantle convection with chemically distinct heat source at around the mantle transition zone together with drifting motion of surface supercontinent. Here, in order to focus on the interplay between the heat source and supercontinent, we assumed that the chemically distinct heat source is initially located below the continents. This is because the heat source, either basaltic or granitic, is expected to accumulate below the supercontinent, considering that the subduction occurs around the continents. The aim of this study is to see the effect of the heat source on the drifting motion of the continent and thermal structure.

Keywords: granite, mantle convection, continental drift