The 431st Geodynamics Seminar

Numerical simulations of thermochemical mantle convection with drifting supercontinent in two-dimensional cylindrical geometry

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Abstract

It is commonly accepted that the “Wilson cycle” a periodic assembly and breakup of supercontinents of the Earth’s surface, is related with the activity of upwelling plumes in the convecting mantle. On the other hand, it is also generally considered that the formation of upwelling plumes from the base of the Earth’s mantle is strongly affected by the presence of chemical heterogeneity in the lowest mantle, which is thought to be denser than the surrounding materials. In this study we are conducting numerical simulations of thermochemical mantle convection in 2-D cylindrical geometry with a highly viscous lid drifting along the top surface, in order to investigate the interrelation between the motion of surface supercontinent and the behavior of chemical heterogeneities initially imposed in the lowest mantle.

The results of our preliminary calculation show that the negative buoyancy of chemically dense materials in the lowest mantle affects not only the thermochemical structure in the deep mantle but also the motion of surface supercontinent. When the effect of negative buoyancy is sufficiently large, in particular, the dense materials form a few thermochemical piles (or small studs on a global layer above the CMB), which act as source regions of that of surface supercontinent, which occurs with a timescale comparable to the Wilson cycle of the Earth. In other words, a sufficiently high negative buoyancy of dense materials in the lowest mantle might help the operation of Wilson cycle on the Earth.

詳細は当センターホームページ：http://www.grc.ehime-u.ac.jp/ をご覧ください
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