

The effects of continental plate distributions on the horizontal scale and heat transfer of mantle convection

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The effect of continental plate distributions on heat transfer of mantle convection is studied by using a two-dimensional Boussinesq fluid model. The Prandtl number is infinite. There is no internal heating. The Rayleigh numbers are 100000 and 1000000. Continental plates are realized as zero-velocity regions.

The plates with the same horizontal length are placed beneath the upper surface at the same intervals as the plate length.

The numerical results show that the Nusselt number becomes maximum when the plate length is the same as the layer thickness. Its value is about 30 larger than those in the cases with the longer or shorter plates. When the plates are longer, the convection cells are as long as the plates, while when the plates are shorter, they become longer than the plates.