

Interaction of plumes generated by boundary heat flux heterogeneity and mantle convection

Nayuta Matsumoto[1], Ikuro Sumita[2], Atsuko Namiki[3]

[1] Earth Sci., Kanazawa Univ, [2] Earth Sci., Kanazawa Univ., [3] Dept. Earth Sci., Kanawasa Univ.

Using laboratory experiments, we studied how the heat flux heterogeneity at the bottom affects the thermal convection of a high viscosity fluid. A total of 18 experiments were conducted for Rayleigh number (Ra) from 10^7 to 10^8 and Prandtl number (Pr) from 10^2 to 10^3 . In this experiments, a layer of fluid was heated from below and cooled from at the fixed temperatures. In addition, a localized small heater was attached to impose lateral heat flux heterogeneity. The effect of the heat flux heterogeneity differed among the case with large-scale flow ($Ra=1.2 \times 10^7$), three regimes were identified depending on the magnitude of the heat flux heterogeneity. In the presence of large-scale flow ($Ra=5.0 \times 10^7$, 2.0×10^8), no significant change of the convection pattern was observed.