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| Title | Convection in the Earth-like Mantle with the Influence of Strong Viscosity Variation | | |
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| Abstract |  |
| A unit aspect-ratio Rayleigh-Bénard convection model that represents the Earth’s mantle is considered to strongly variable viscosity, internal heating, and viscous dissipation. Investigation of the convection pattern at high Rayleigh number with mixed convection, substantial viscosity change across the mantle depth, and viscous dissipation is the primary goal of this study. The model is solved with temperature- dependent, and temperature- and pressure-dependent Arrhenius full form of viscosity function using finite element method. The numerical values of heat transfer rate, i.e. Nusselt number and root mean square velocity are tabulated. The results of the simulation are shown in the temperature distribution and streamline contour figures. The tables and figures reveal that narrower convective cells are preferred for convection when internal heating and dissipation are strong enough. It is also found that the inclusion of internal heating and increase of viscous pressure number make the convection stronger whereas viscous dissipation weakens the vigor of convection. | |