

Numerical simulation of mantle convection: viscoelastic effects on plate dynamics

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The evidence of plate tectonics is found only on Earth, not on other terrestrial planets or satellites. On what condition plate tectonics occur is not known so well at present. In the past, the interaction of mantle convection and plate motion is investigated, regarding mantle convection and plate motion as flows of incompressible viscous material. However, because actual plates are highly viscous material, they should have elastic nature that should affect on dynamics of mantle and plates. Numerical simulation of mantle convection with high viscosity contrast shows that flow patterns of mantle convection is controlled by plate dynamics, especially slab subduction.

In this study, we investigate the relations of mantle convection and plate motion, in view of viscoelastic properties of the mantle and plates. Modeling the flow of viscoelastic materials is expected to show the highly viscous plate's behavior and plate motion including slab subduction.