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Plume-induced geoid from 2D axi-symmetric variable viscosity convection

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A collection of numerical simulation of 2D axi-symmetric thermal convection to investigate shape of the geoid at top of the plume is presented. The simulation is based on Boussinesq approximation and infinite Prandtl number which is carried out in spherical shell with strongly temperature and depth dependent Arrhenius-type viscosity. According to the Arrhenius law plume models with purely depth-dependent rheology are unphysical and should be take with care.

The strongly coupled temperature - depth dependent viscosity enables us for better understanding of the plume behavior inside the earth.

We used GRACE gravity models in order to differentiate between plumes and their geoid to classify them into different groups depending on their mantle rheology.

We found different types of geoid for depth-dependent viscosity and the temperature-dependent one. While in the convection model of depth-dependent viscosity, local maximum geoid obtained at the model's pole, local minimum will appear in the temperature-dependent viscosity. Different characteristics of obtained geoids are discussed and some numerical results are given.