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Geoid calculations from a Mantle Circulation model

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Studies of the geoid provide strong constraints on the internal mantle density structure. Here we combine geoid modeling with independent constraints on the mantle density structure derived from a history of plate subduction assimilated in global high resolution mantle circulation models. We apply a number of scaling relations in order to transform the temperature pattern resulting from the circulation model into density. We built up a forward study of the mass transport in the mantle, where only few free parameters remain: the viscosity profile in the mantle, the values of absolute viscosity, as well as different ratios of core heating mainly influence the system.

These parameters are varied in order to gain deeper insight into the underlying physical processes of mass transport in the earth's mantle. We find in a first stage that the geoid of the convection model correlates quite well with the measured one. Furthermore we observed that the rotational stability depends critically upon the overall viscosity structure. We find that changes in the core heating do not induce big changes in the stability of the earth's rotation.