

Institut für Geophysik

Geophysikalisches Kolloquium  
Sommersemester 2020

Montag, 22. Juni 2020

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## Double diffusive convection and Layer Formation in Planetary Mantles

The thermal history of the Earth, its chemical differentiation and also the reaction of the interior with the atmosphere is largely determined by convective processes within the Earth's mantle. A simple physical model, resembling the situation, shortly after core formation, consists of a compositionally stably stratified mantle, as resulting from fractional crystallization of the magma ocean. The early mantle is subject to heating from below by the Earth's core and cooling from the top through the atmosphere. Additionally internal heat sources will serve to power the mantle dynamics. Under such circumstances double diffusive convection will eventually lead to self organized layer formation, even without the preexisting jumps in material properties. We have conducted 2D and 3D numerical experiments in Cartesian and spherical geometry, taking into account mantle realistic values, especially a strong temperature dependent viscosity and a pressure dependent thermal expansivity. The experiments show that in a wide parameter range, distinct convective layers evolve in this scenario. The layering strongly controls the heat loss from the core and decouples the dynamics in the lower mantle from the upper part. With time, individual layers grow on the expense of others and merging of layers does occur. We observe several events of intermittent breakdown of individual layers. Altogether an evolution emerges, characterized by continuous but also spontaneous changes in the mantle structure, ranging from multiple to single layer flow. Such an evolutionary path of mantle convection allows to interpret phenomena ranging from stagnation of slabs at various depth to variations in the chemical signature of mantle upwellings in a new framework.

Das Kolloquium findet um **16 Uhr c.t.** als Zoom Videokonferenz statt. Der Link dazu wird auf der Homepage und per eMail rechtzeitig mitgeteilt.  
Alle an dem Thema Interessierten sind hierzu herzlich eingeladen.

Die Dozenten des Instituts für Geophysik