Convective regimes in "soft matter": implications for the dynamics of planetary interiors

The morphology and characteristics of convective patterns strongly depend on the mantle physical properties. Using laboratory experiments and quantitative techniques of visualization, we have therefore studied systematically the characteristics of thermal convection in viscous fluids with complex rheologies (strongly temperature-dependent, yield stress, visco-elastic, brittle). We show that strongly temperature-dependent viscosity at high Rayleigh number is sufficient to produce at least three scales of convection in mantle interiors with sheet-like cold downwellings encasing several 3D hot plumes. But it is the "soft matter" character of silicate materials (elastic and/or brittle on short time scales, viscous on long time scales), which is essential in producing asymmetric subduction, episodic whole surface rejuvenation, and/or Plate Tectonics. Moreover, the experiments reveal that as a planet cools, it can undergo a succession of different regimes. Scenarios for the evolutions of Venus, Mars and the Earth can then be proposed.

Das Kolloquium findet um 16 Uhr c.t. im Seminarraum GEO 315, Corrensstraße 24, 48149 Münster statt.
Alle an dem Thema Interessierten sind hierzu herzlich eingeladen.

Die Dozenten des Instituts für Geophysik