



Mantle convection modelling: intermittent plate tectonics and dichotomy of Mars

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Terrestrial planets differ in their surface expression of the underlying mantle convection system. While the Earth is the only planet with several moving plates, the others are all covered by one immobile plate. The planet Mars is of special interest, as it possibly had a phase of plate tectonics earlier in its evolution which manifested itself as dichotomy. Over the last years of mantle modeling much progress has been achieved in generating plates. A key role in the self-consistent modeling plays the rheology. In convection with a temperature-, pressure- and stress-dependent viscosity different flow regimes have been observed. The stagnant lid regime resulting for a strong temperature dependence and low stresses represents the one-plate planets. For higher stresses the stagnant lid breaks and plate boundaries, moving plates and subduction events result. We use a three-dimensional Cartesian model of mantle convection with variable viscosity to show that also typical features of Mars, such as the cessation of plate tectonics and the dichotomy can be explained.