Mars Interior Models

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Recent adjustments to interior structure models of Mars (Sohl et al., 2005) have used improved values of the polar moment of inertia factor. These models were correctly calculated from the mean moment of inertia factor rather than using the polar moment of intertia factor. The latter are linked through the gravitational oblateness J2. The new models suggest larger cores by tens of kilometers and mantle densities smaller by several tens of kilograms per cubicmeters in comparison with previous models. The larger cores make a present day perovskite layer at the base of the mantle even less likely than previously thought but such a layer may still have been present in the early evolution when mantle temperatures were higher. The absence of a perovskite layer makes it more difficult to accept models in which Tharsis is presently supported by a mantle super plume. The super plume model is also difficult to reconcile with thermal evolution models of the mantle which suggest a decrease of the core heat flow over time. While these models would allow Tharsis to be formed by a super plume they would suggest that the super plume disappeared some time in the Hesperian. Post-Noachian volcanism may be fed by an asthenosphere caused by the thermal blanketing of the thick Tharsis crust (Schuhmacher and Breuer, 2006).

Schuhmacher, S. and D. Breuer 2006, JGR, 111, doi: 10.1029/2005JE002429

Sohl, F., G. Schubert, and T. Spohn 2005, JGR, 110, doi:10.1029/2005JE002520