Thermo-Chemical Evolution and Structure of Venus', Mars' and Earth's Mantle and Crust: 3-D Spherical Modelling

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We systematically investigate the evolution of the mantle, lithosphere and crust of Venus, Mars and Earth (also Mercury) using the code StagYY [1], including selfconsistent lithospheric behavior (rigid lid, plate tectonics, episodic plates), chemical differentiation induced by melting, large viscosity variations, a parameterized core evolution, and a realistic treatment of phase diagrams and material properties. Results may explain first-order observations of planets including the crustal dichotomy of Mars [2], global resurfacing of Venus, geodynamo evolution and mantle seismic tomography [3]. Model geoid and topography are compared to those of planets, giving important constraints. Outgassing is also studied.

Keywords: Venus; Mars; mantle convection; plate tectonics, evolution.



Figure 1. 3-D spherical simulations of Mercury, Venus, Earth and Mars.

References

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