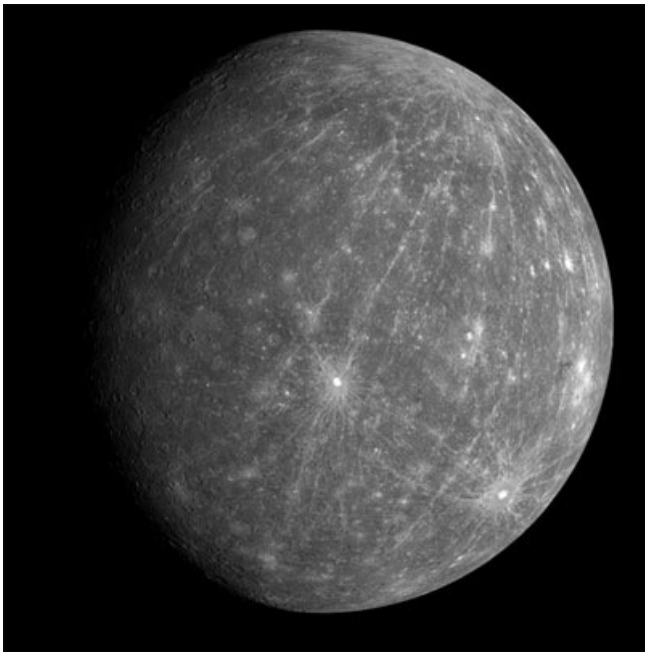
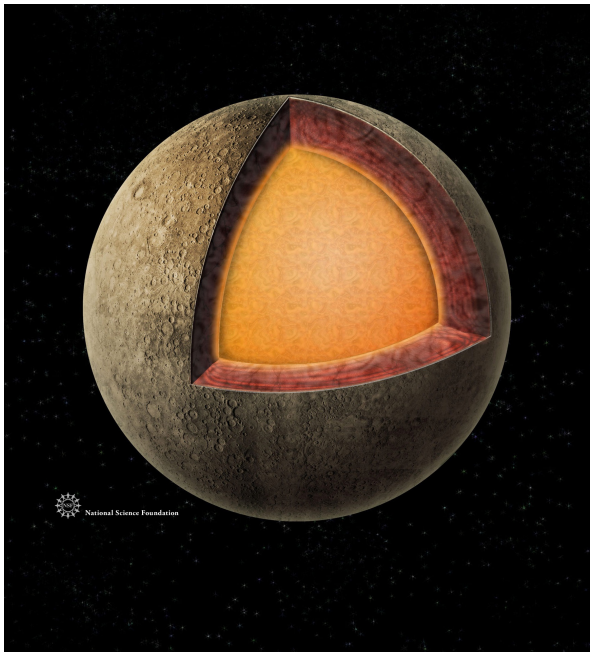
The interior structure of Mercury

Master Thesis

SEG - Seismology and Geodynamics





In this Master thesis project we want to employ the recent determination of Mercury's gravity field and Earth-based radar observations of the planet's spin state to constrain its interior structure.

On account of Mercury's elevated bulk density, it has long been known that its average composition is enriched in metallic iron compared to the other terrestrial planets. Mercury is in a 3:2 spin-orbit resonance and most probably occupies a Cassini state in which the rotation axis is almost perpendicular to its orbital plane and the spin and orbital precession rates are equal. As a result of this resonant state, combining knowledge of Mercury's orientation with the long-wavelength shape of the gravity field and the amplitude of the forced libration, allows for estimates of the normalized moment of inertia (polar), including the ratio of the polar moment of inertia of the solid outer shell of the planet to that of the whole planet.

Here, we determine possible models of the internal structures of Mercury that are compatible with the geodetic data described above by considering a broad range of possible mantle and core compositions. Finally, we will examine the implications of the internal structure models for Mercury' s evolution.

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