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Constraining the interior structure of Mercury by geodesy data

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Abstract

Geodetic properties of planets are strongly related to their interior structure and can be used to infer Mercury's deep structure. The moments of inertia of the planet and the core, deduced from combination of Mercury's gravity field and rotation, constrain the mass distribution inside the planet, giving information on the core and mantle densities and on the position of the core-mantle boundary. Additional constraints on the core size and on the rigidity of the shell and density can be obtained from tides.

In this study we combine the 88-day libration amplitude, the obliquity, the gravitationnal field, and the tidal Love number k_2 in order to constrain Mercury's interior structure, and in particular its core and inner core sizes. Our interior models are in agreement with thermal evolution calculations of the planet. We consider iron-rich cores with light elements and mantle bulk compositions in agreement with the reducing formation conditions of Mercury. Recent thermoelastic and melting properties of the constituents are used.

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