



Mars rotation and deformation as seen from a lander or a spacecraft orbiting a planet.

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Information on planetary interiors can be obtained from measurements of global parameters such as the gravity field and the rotation variations (including precession). These properties can be derived from radioscience experiments in which Doppler shifts of radio signals between the Earth, planetary landers, and orbiters are measured. A radio link between the Earth and a lander on Mars has been successfully used to constrain the rotation and the precession, and consequently to obtain the moment of inertia of the planet, the global mass repartition, and its seasonal variations. A radio link between the Earth and an orbiter has also been used to determine the rotation variations and moreover to obtain the gravity field and its time variations. In particular, the tidal Love number k_2 has been determined, from which the Martian core has been shown to be at least partially liquid. New missions in this perspective are presented. A lander could probe the interior of the planet through seismic monitoring, tidal monitoring, magnetic sounding, heat flow measurements, and rotation dynamics measurements by radio science. Landers and orbiters can thus be jointly used in a synergetic approach. This would allow determining the overall interior structure, including crust, mantle, and core divisions, and the state of the core (liquid/solid, density). Also composition, mineralogy, density, and temperature profiles could be inferred.