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Rotation of Mars and the Earth revealing their core properties.

Veronique Dehant[1,2]
[1]Royal Observatory of Belgium, Brussels, Belgium (veronique.dehant@oma.be)
[2]Université catholique de Louvain, Belgium

The core is the deepest part of the planets. It is partially or totally liquid in all the terrestrial planets of the Solar System and sometimes generates a magnetic field (it is the case for the Earth and Mercury). Rapidly rotating planets like Earth and Mars, which are in addition inclined in space, undergo gravitational effects from the Sun and their moons (as well as from the other planets to a minor extend). Consequently, Mars and the Earth wobble in space: their rotation axis is doing a precession around the perpendicular to the ecliptic and additional periodic motions called nutations. Nutations provide information about the core and about the coupling mechanisms between the core and the mantle. Additionally, these two planets exhibit variations in their rotation called length-of-day (LOD) variations. The most recent data from using the VLBI (Very Long Baseline Interferometry) technique for the Earth and from the NASA InSight (Interior exploration using Seismic Investigations, Geodesy and Heat Transport) mission on Mars provide insights on the processes modifying their rotation and orientation in space. While nutations are very well understood, LOD are difficult to predict. Seasonal changes are mostly related to external geophysical fluids: atmosphere, ocean, and hydrosphere for the Earth, atmosphere and icecaps for Mars. While we have no precise series long enough for Mars, it is not the case for the Earth for which long timescale (decadal) LOD variations are mostly linked to the core. Even polar motion of the Earth can provide information about the core.