Geophysical Research Abstracts Vol. 17, EGU2015-2901-3, 2015 EGU General Assembly 2015 © Author(s) 2015. CC Attribution 3.0 License.



Revealing Saturn's Rotation Period from its Gravitational Field

Ravit Helled (1), Eli Galanti (2), and Yohai Kaspi (2)

(1) Tel-Aviv University, Geophysics and Planetary Sciences, Tel Aviv, Israel (rhelled@post.tau.ac.il), (2) The Weizmann Institute of Science, Rehovot, Israel

Knowledge of the rotation period of a giant planet is fundamental for constraining its internal structure and atmosphere dynamics. Until the arrival of the Cassini spacecraft to Saturn, Saturn's rotation period was set to the Voyager 2 radio period, 10h 39m 22.4s that was derived from the periodicity in Saturn's kilometric radiation (SKR). Surprisingly, Cassini's SKR measured a rotation period of 10h 47m 6s using the exact same method. It was then realized that Saturn's rotation period is unknown to within a few minutes. We show that Saturn's rotation period can be determined from its measured gravitational field. We find that without imposing any constraints on the planetary shape and internal density profile the rotation rate can be determined to within several minutes, and is 10h 43m 10s \pm 4m. If we include limits based on the observed shape and possible internal density profiles, the rotation period is found to be 10h 32m 45s \pm 46s. The success of our method is confirmed by applying it for Jupiter and reproducing exactly its measured rotation period that is well constrained.