Geophysical Research Abstracts
Vol. 18, EGU2016-16771-1, 2016
EGU General Assembly 2016

Effective resonant stability of Mercury

Christoph Lhotka (1), Marco Sansottera (2), and Anne Lemaitre (3)

(1) Space Research Institute, Austrian Academy of Sciences, Graz, Austria (christoph.lhotka@oeaw.ac.at), (2) Dipartimento di Matematica, Università degli Studi di Milano, Via Cesare Saldini, 50, 20133 Milano, Italy, (3) naXys, Université de Namur, Rue de Bruxelles, 61, 5000 Namur, Belgium

Mercury is the unique known planet that is situated in a 3:2 spin-orbit resonance nowadays. Observations and models converge to the same conclusion: the planet is presently deeply trapped in the resonance and situated at the Cassini state 1, or very close to it. We investigate the complete non-linear stability of this equilibrium, with respect to several physical parameters, in the framework of Birkhoff normal form and Nekhoroshev stability theory. We use the same approach adopted for the 1:1 spin-orbit case, published in Sansottera et al. (2014), with a peculiar attention to the role of Mercury's non negligible eccentricity. The selected parameters are the polar moment of inertia, the Mercury's inclination and eccentricity and the precession rates of the perihelion and node. Our study produces a bound to both the latitudinal and longitudinal librations (of 0.1 radians) for a long but finite time (greatly exceeding the age of the solar system). This is the so-called effective stability time. Our conclusion is that Mercury, placed inside the 3:2 spin-orbit resonance, occupies a very stable position in the space of these physical parameters, but not the most stable possible one.