

K02a Nutation Theory of Mercury

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We present a first step to obtain a precise analytical theory of Mercury rotation. We study the librations of the rotation of Mercury caused by the Sun around the spin-orbit resonance (3/2) in the general case. That's to say in the case where Axis of angular momentum, Axis of figure and Axis perpendicular to the Mercury orbit are three distinct axis. The method is similar to the Moons'one (1981) for the Moon libration. This is an Hamiltonian method and the variables are the canonical Andoyer's variables. This method is divided into two parts: In a first time we look the secular part of the Hamiltonian and determine the mean position of the libration center and the libration frequencies.

In a second time we use the methode of Lie transformation (Hori, 1966) to take the non-secular part of the Hamiltonian into account. Since the principal moments of inertia A, B and C of Mercury are not well-known (Anderson, 1987), we keep $(C-A)/C$ and $(B-A)/C$ as explicit parameters in our solution. The construction of this model is justified by two spacecraft projects, the mission bepi Colombo of E.S.A. and the Messenger mission of N.A.S.A., which must be thrown in the near future