MODELLING VERY-HIGH-ECCENTRICITY ASTEROIDAL LIBRATIONS WITH THE ANDOYER HAMILTONIAN

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High-eccentricity asteroidal librations are modelled using the high-eccentricity non-planar asymmetric expansion (Roig *et al* 1997). This second-degree expansion gives us the potential of the perturbing forces acting on a resonant asteroid in a first order resonance in explicit form, as a quadratic polynomial in the canonical non-singular variables. Secular and short periodic perturbations are introduced in the model, giving a more realistic description of the dynamics.

The reducing Sessin's transformation (Sessin, 1981; Sessin & Ferraz-Mello, 1984) is used to include the main effect of Jupiter's ecc entricity in the main part of the Hamiltonian. It leads to an integrable first-order approximation known as the second fundamental model for resonance (Henrard & Lemaitre 1983) or Andoyer Hamiltonian (Andoyer 1903).

The solution of Andoyer Hamiltonian may be computed in closed form either with elliptic integrals or with truncated, but explicit, Fourier series with coefficients analytically known. The canonical transformation which gives the action integral is also explicit. The semi-analy tical averaging method of Henrard (Henrard 1990, Henrard & Lemaitre 1986) is then applied to the model in the region of high asteroidal eccentricity. Our approach takes into account the fact that the perturbation is known explicitly as a function of the angles and actions. The planar and spatial parts of the problem are well separated, at the order of approximation used. The planar part of the averaged Hamiltonian depends only on one angle and is, thus, reduced to one degree of freedom.

The construction of this semi-analytical model is useful to allow the identification of all kinds of secular and non-secular resonances acting in the central part of the Hecuba gap; as we can switch on and off the different perturbations, the different rôle of each one in the depletion of the gap may be assessed.

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