ITAM
INSTITUTO TECNOLÓGICO AUTÓNOMO DE MÉXICO

Seminario Departamento Académico de Matemáticas

Diffusion along Mean-Motion Resonances in the Restricted 3-Body Problem

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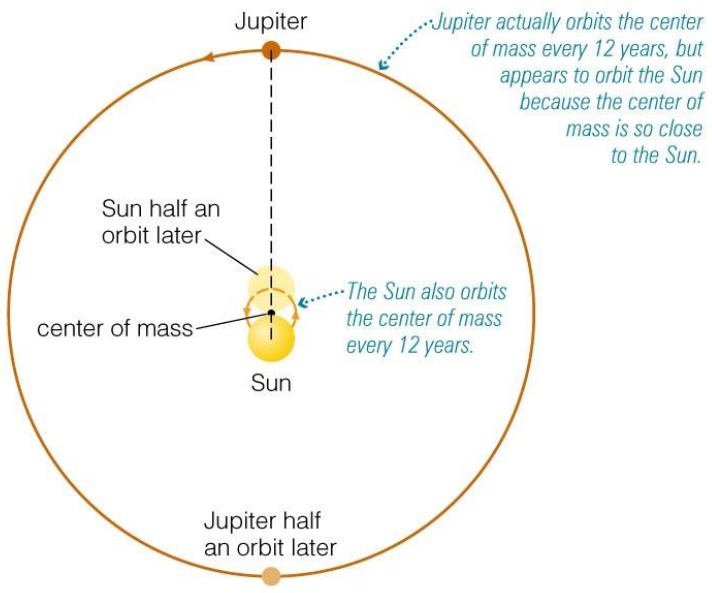

Abstract:

Consider the Restricted Planar Elliptic Three Body Problem, which models the Sun-Jupiter-Asteroid dynamics. For eccentricity of Jupiter $e_0 = 0$ (circular approximation) we show numerically that there exists a normally hyperbolic invariant manifold Λ_0 composed of periodic orbits in 3:1 mean motion resonance. We also show that the stable and unstable manifolds of Λ intersect transversally along four homoclinic manifolds, except for an exceptional set of periodic orbits. *Assuming* the existence of this geometric structure (which is only verified numerically), we can prove the following. For eccentricity of Jupiter e_0 small enough we prove that there exists a family of probability measures ν_{e_0} supported at the 3:1 mean motion resonance such that the pushforward under the associated Hamiltonian flow has the following property: at the time scale $t{e_0}^{-2}$, the distribution of the eccentricity of the Asteroid weakly converges to an (Ito stochastic) diffusion process on the line as $e_0 \to 0$. This resonance corresponds to the biggest of the Kirkwood gap on the Asteroid belt in the Solar System. Our results address conjectures made by Arnold and Chirikov.

Joint work with Marcel Guardia, Vadim Kaloshin and Pau Martin.

Lunes 16 de Diciembre 2019
16:30-17:30 hrs., salón 213

Fondo: diagrama del sistema Sol - Júpiter.