**Dynamical study of a family of asteroids**

**Authors:**

- Àngel Jorba, Departament de Matemàtiques i Informàtica, Universitat de Barcelona. CRM. (angel@maia.ub.es)
- Begoña Nicolás, Departamento de Matemática Aplicada, Universidade de Santiago de Compostela. (bego.nicolas@usc.es)
- Óscar Rodríguez, Departament de Matemàtiques, Universitat Politècnica de Catalunya. (oscar.rodriguez@upc.edu)

**Abstract:** Many families of asteroids describe very specific motions. The aim of this talk is to dynamically study one of this families, the Hilda family, constituted by more than 5,000 asteroids located beyond the main asteroid belt but within Jupiter's orbit. These asteroids exhibit a 3:2 orbital resonance with Jupiter and follow orbits that sequentially approach three Lagrangian Points ($L_3$, $L_4$, and $L_5$) in the Sun-Jupiter system. Our objective is to analyze their orbits within the Sun-Jupiter Circular Restricted Three Body Problem (CRTBP) and the Elliptical Restricted Three Body Problem (ERTBP), both in the planar case. One of our goals is to investigate the impact of Jupiter's eccentricity on this phenomenon.

To achieve this, we first select Hilda asteroids from the JPL database based on their orbital elements. The database provides coordinates in an inertial ecliptical reference frame, centered at the solar system's mass center. To transform these coordinates into the CRTBP or ERTBP Sun-Jupiter systems, we perform a non-trivial change of coordinates using the instantaneous orbital elements of the Sun and Jupiter.

Subsequently, we numerically compute periodic and quasi-periodic orbits for the Hilda asteroids within our simplified models. We employ temporal or spatial Poincaré sections to identify families of invariant objects governing these asteroids motion.