

SECULAR DYNAMICS AND FAMILY IDENTIFICATION AMONG HIGHLY INCLINED ASTEROIDS IN THE EUPHROSYNE REGION. F. Machuca¹, and V. Carruba¹, ¹UNESP, Univ. Estadual Paulista, Grupo de dinâmica Orbital e Planetologia, Guaratinguetá, SP, 12516-410, Brazil, email: vcarruba@feg.unesp.br.

Introduction: Among highly inclined asteroids the external region of the main belt beyond the 5J:2A mean motion resonance with Jupiter has long been known to host the Euphrosyne and Alauda families. The region is confined in semi-major axis between the 5J:-2A and 2J:-1A mean-motion resonances with Jupiter, and is characterized by the presence of the ν_6 , ν_5 and ν_{16} linear secular resonances, as well as by the z_1 , z_2 , z_3 , and other non-linear secular resonances.

In this work we employed the Frequency Modified Fourier Transform method to obtain synthetic proper elements for 6841 numbered and 4034 multi-opposition objects in the region of the Euphrosyne family, and used this data to obtain families and clumps in the domain of proper elements and frequencies. With respect to other works on family identification in the area, here we focused our investigation on the effect that the complicated local web of secular resonances has had on the dynamical evolutions of families and clumps.

We detected all main linear and non-linear secular resonances, up to order six, in the region and identified for the first time new populations of objects in ν_6 anti-aligned librating and ν_5 anti-aligned and aligned librating resonant states. We identified two new clumps among ν_6 anti-aligned librating objects, making them the second and the third groups in this resonant configuration ever found after the discovery of the Tina family.

Once the local dynamics was fully understood, we then obtained dynamical groups in the domain of proper elements and in the domain of proper frequencies most apt to study the secular resonance present in each region, and computed ν_6 resonant proper elements to study groups in regions affected by the ν_6 secular resonance.

We identified 18 families and 39 clumps in the Euphrosyne region, of which 12 families and 5 clumps were in frequency domains. Of particular interest was the group around (69559) (1997 UG5), found in both proper element and frequency domains, characterized by its interaction with five secular resonances. It is the first time that a group of asteroids is found in such an interesting resonant configuration. More importantly, we introduced new techniques for asteroid family identification in presence of secular resonances, that could in principle be used for other areas of the asteroid belt.

References:

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 [1] Machuca F., Carruba V. (2011), MNRAS, 420, 1779-1798.

Additional Information:

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