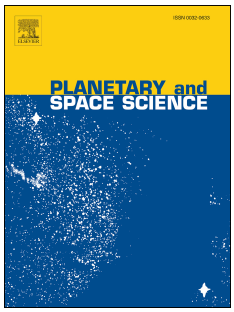
Accepted Manuscript



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PII: S0032-0633(17)30386-0

DOI: 10.1016/j.pss.2018.03.009

Reference: PSS 4494

To appear in: *Planetary and Space Science*

Received Date: 26 October 2017

Revised Date: 2 February 2018

Accepted Date: 16 March 2018

Please cite this article as: Carruba, V., Vokrouhlický, D., Novaković, B., Asteroid families interacting with secular resonances, *Planetary and Space Science* (2018), doi: 10.1016/j.pss.2018.03.009.

Asteroid families interacting with secular resonances

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Abstract

Asteroid families are formed as the result of collisions. Large fragments are ejected with speeds of the order of the escape velocity from the parent body. After a family has been formed, the fragments' orbits evolve in the space of proper elements because of gravitational and non-gravitational perturbations, such as the Yarkovsky effect. Disentangling the contribution to the current orbital position of family members caused by the initial ejection velocity field and the subsequent orbital evolution is usually a difficult task. Among the more than 100 asteroid families currently known, some interact with linear and non-linear secular resonances. Linear secular resonances occur when there is a commensurability between the precession frequency of the longitude of the pericenter (g) or of the longitude of node (s) of an asteroid and a planet, or a massive asteroid. The linear secular resonance most effective in increasing an asteroid eccentricity is the ν_6, that corresponds to a commensurability between the precession frequency g of an asteroid and Saturn's g_6. Non-linear secular resonances involve commensurabilities of higher order, and can often be expressed as combinations of linear secular resonances. This is the case, for instance, of the $z_k = k(g-g_6)+(s-s_6)$ resonances. Asteroid families that are crossed by, or even have a large portion of their members, in secular resonances are of particular interest in dynamical astronomy. First, they often provide a clear evidence of asteroid orbit evo-

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