The project aims to study the dynamical evolution of a family of asteroids formed from a fully differentiated parent body, considering family members with different physical properties consistent with what is expected from the break up of a body formed by a metallic nucleus surrounded by a rocky mantle. Initially, we study the effects of variations in density, bond albedo, and thermal inertia in the semi-major axis drift caused by the Yarkovsky effect. The Yarkovsky effect is a non-conservative force caused by the thermal re-radiation of the solar radiation by an irregular body. In Solar System bodies, it is known to cause changes in the orbital motions (Peterson, 1976), eventually bringing asteroids into transport routes to near-Earth space, such as some mean motion resonances. We expressed the equations of variation of the semi-major axis directly in terms of physical properties (such as the mean motion, frequency of rotation, conductivity, thermal parameter, specific heat, obliquity and bond albedo). This development was based on the original formalism for the Yarkovsky effect (i.e., Bottke et al., 2006 and references therein). The derivation of above equations allowed us to closely study the variation of the semi-major axis individually for each physical parameter, clearly showing that the changes in semi-major axis for silicate bodies is twice or three times greater than for metal bodies. The next step was to calculate the orbital elements of a synthetic family after the break-up. That was accomplished assuming that the catastrophic disruption energy is given by the formalism described by Stewart and Leinhardt (2009) and assuming an isotropic distribution of velocities for the fragments of the nucleus and the mantle. Finally, the orbital evolution of the fragments is implemented using a simpletic integrator, and the result compared with the distribution of real asteroid families.

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THE EVOLUTION OF THE G RING ARC UNDER THE EFFECTS OF THE RESONANCE WITH MIMAS AND THE SOLAR RADIATION FORCE

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The small satellite Aegaeon, less than 1km across, is embedded in an arc located in the G ring of Saturn. This satellite belong to a new class of structures imaged by the Cassini spacecraft, which is formed by small satellites immersed in arcs. Aegaeon is also locked in a 7:6 corotation resonance with the satellite Mimas. It has been proposed that Aegaoen, along with a set of large particles located in this arc, is responsible for the maintenance of the G ring against dissipative forces. In this work, we study the orbital evolution of a sample of tiny particles (sizes ranging from 1 to 100m) under the gravitational effects of Mimas and the solar radiation pressure. These particles were initially spread both along the ring, about ± 20 km from the semimajor axis resonance of Aegaeon, and close to the Aegaeon's surface. Our results show that, despite the particles are initially in a corotation resonance with Mimas, the effects of the solar radiation pressure remove by collision with Aegaeon most of smallest particles from the arc in a timespan of 100yrs. The remaining particles stay confined in the G ring.

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THE BEHAVIOR OF REGULAR SATELLITES DURING THE NICE MODEL'S PLANETARY CLOSE ENCOUNTERS

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In order to explain the behavior of the regular satellites of the ice planets during the instability phase of the Nice model, we used numerical simulations to investigate the evolution of the satellite systems when these two planets experienced encounters with the gas giants. For the initial conditions we placed an ice planet in between Jupiter and Saturn, according to the evolution of Nice model simulations in a jumping Jupiter scenario (Brasser et al. 2009). We used the MERCURY integrator (Chambers 1999) and we obtained 101 successful runs which kept all planets, of which 24 were jumping Jupiter cases. Subsequently we performed additional numerical integrations in which the ice giant that encountered a gas giant was started on the same orbit but with its regular satellites included. This is done as follows: For each of the 101 basic runs, we save the orbital elements of all objects in the integration at all close encounter events. Then we performed a backward integration to start the system 100 years before the encounter

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