(NIMA), fitted to observations and determined a new ephemeris.

The difference between NIMA and JPL ephemerides is close to the offset at the date of observations but this difference then varies over time, according to a periodic one-year term and a secular term. For some objects, the offset method may remain accurate when the time between observations and occultation is short or when the offset's variations remain small. For other TNOs, the difference sharply increases making inaccurate predictions in the future. Consequently, new ephemerides should be used to make predictions. Finally, occultations also provide accurate astrometric positions and therefore new constraints on the TNO's motion. We analyze the contribution of previous occultations in the improvement of TNO'S ephemerides.

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SMALL ASTEROID FRAGMENTS IN EARTH-CROSSING ORBITS

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The meteorite that fell in Chelyabinsk, Russia, naturally made many people think it could be a smaller companion of the Asteroid 2012 DA14, which passed close to Earth on that same day. Some asteroid specialists discarded this hypothesis for two main reasons: The meteorite was too far away from the asteroid, because the collision happened sixteen hours before the asteroid passed close to Earth. Moreover, it was not traveling, similarly to asteroid DA14, from south to north. However the possibility of the meteorite being a companion of the Asteroid 2012 DA14 cannot be completely discarded. The Asteroid 2012 DA14, with a diameter of 45 meters, is very small. It can be considered an asteroids fragment, which is usually accompanied by other smaller fragments, scattered in space, practically in the same orbit and possibly being separated from each other by long distances. Assuming that 2012 DA14 is not an isolated asteroid, but the biggest remaining fragment from a previous impact, we developed a model to study the dynamics of an asteroid fragment, similar to DA14, and its companions, the smaller fragments. This dynamically interesting encounter with planet Earth is addressed and the orbital changes that could explain the Chelyabinsk event are discussed. As a result we find that, there could be a collision of a meteorite before, during, or after the Asteroid 2012 DA14 passing by, the same way that happens with meteorite showers, which can last several days. Therefore, it would be very interesting to look for asteroid fragments also, close to the larger fragments, more easily found.

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ATLAS OF THE THREE BODY RESONANCES IN THE SOLAR SYSTEM

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Three body resonances (TBRs) between a massless particle with an arbitrary orbit and two planets P_1 and P_2 in circular coplanar orbits occur when the critical angle $\sigma = k_0\lambda_0 + k_1\lambda_1 + k_2\lambda_2 - (k_0 + k_1 + k_2)\varpi_0$ being k_i integers is oscillating over time. The approximate localization in semimajor axis of the TBRs taking arbitrary pairs of planets is very simple, specially if we ignore the secular motion of the perihelion and nodes of the perturbing planets. When these slow secular motions are taken into account each of the nominal three body resonances split in a family of resonances all them very near the nominal one. The challenge is to obtain the width, strength or whatever that give us the dynamical relevance of these TBRs. We propose an algorithm to numerically estimate the strength of arbitrary TBRs between two planets in circular coplanar orbits and a massless particle in an arbitrary orbit. This algorithm allowed us to obtain an atlas of the TBRs in the Solar System showing where are located and how strong are thousands of TBRs involving all the planets from 0 to 1000 au. Relevant results for the population of asteroids and transneptunian objects will be presented.

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DYNAMICAL EVOLUTION OF DIFFERENTIATED ASTEROID FAMILIES

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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