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ANALYSIS OF PHYSICAL PHENOMENA ASSOCIATED WITH ASTEROIDS DEFLECTED BY KINETIC IMPACT

Abstract

Asteroids are the smallest bodies in the solar system, usually with diameters in the order of a few hundreds or even only tens of kilometers. The total mass of all asteroids in the solar system is expected to be less than the mass of the Earth's Moon. Despite this fact, they are objects of great importance. They are believed to contain information about the formation of the solar system, since its chemical and physical compositions remain practically constant over time. These bodies also pose a danger to the Earth, as many of these bodies are in trajectories that passes close to the Earth. There is also the possibility of mining on asteroids extract precious metals and other natural resources. Asteroids have a very irregular shape, which makes their study difficult. In addition, they have rotational movement, in general very complex, due to their irregular shape. Asteroids are classified into groups: NEA (Near-Earth Asteroid), Trojans, Kuiper Belt, etc. NEAs are the most dangerous from the point of view of collision with Earth, since their trajectories are close to Earth's orbit. There is even a mission, AIDA (Asteroid Impact and Deflection Assessment), which goal is to achieve a binary system (65803 Didymos). There is also the American Asteroid Redirect Mission (ARM), which plans to collect items over a long period of time to deflect the asteroid's orbit. The present work aims to study the use of a kinetic impact technique as a way to deflect asteroids that may present some risk of collision with the Earth at a given moment. This is a very current research topic and is related to planetary defense. It has received the attention of researchers around the world. In the work to be developed here, it is intended to evaluate in more detail the possibility of deflecting the orbits of asteroids in different situations of approach to Earth and to evaluate possible physical phenomena that may influence the results of the deflection. The main idea is to consider different dates for the impact, as well as different matematical models for the dynamics, including the presence of the planets of the solar system. This more complete dynamical system may originate chaos in some regions of the phase space and this fact may change our strategy of deflections.