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**Ongoing and Upcoming Mission Highlights**

**Apophis T-4 Years**

**Hypothetical Asteroid Threat Exercise**

**Key International and Political Developments**

**Near-Earth Object (NEO) Discovery**

X **NEO Characterization**

**Deflection & Disruption Modeling and Testing**

**Space Mission & Campaign Design**

**Earth Impact Effects & Consequences**

**Disaster Management & Impact Response**

**Public Education and Communication**

**The Decision to Act: Political, Legal, Social, and Economic Aspects**

## **Overview of NEO-related research by the Planetary Science Team at University of Alicante (Spain)**

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The Planetary Science Team at the University of Alicante (Spain) is currently formed by 10 researchers dedicated to modeling and physical characterization of small bodies in the Solar System. Here are some current topics:

**IEO Survey:** Currently, 34 objects have an Interior Earth Orbit (IEO) that don't pose an immediate risk but may eventually lead to Earth-crossing trajectories due to close encounters with Mercury and Venus[1]. Identifying these objects while they still have an IEO is crucial for detecting potential future threats. Major surveys can't detect them due to the need for observations at low solar elongations during twilight[2]. To address this, we've launched two parallel twilight surveys using the TFRM telescope in Montsec in Catalonia, Spain (Northern Hemisphere) and the Springbok telescope in Namibia (Southern Hemisphere).

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**Analysis of surface features:** The different internal structures of an asteroid influence how different small-bodies form and evolve and how different geomorphologies occur on their surfaces [3]. Consequently, a way of characterizing the interiors of asteroids is based on interpretation of the external properties of their surfaces [4]. We map, analyze, and compare different surface features (e.g., boulders, fractures, cracks, lineaments, pits chains, impact craters, etc.) to continuously explore the geological evolution of each body [5] and the correlation of such features with their physical properties.

**Boulder-reaccumulation in the Didymos System following from the DART impact [6]:** The upcoming Hera mission [7] will characterize the surfaces of the two bodies that comprise the Didymos system in great detail after its rendezvous near the end of 2026. The effects of low-speed impacting boulders may be evident in what will be observed. Using a soft-sphere discrete element method (SS-DEM) contact model [8] included by Schwartz et al. [9] in the *n*-body software package *pkdgrav* [10, 11], we are analyzing the mechanics of these secondary impacts and the post-DART implications they may have on the surfaces of Dimorphos and Didymos.

**Determining the Physical Parameters of NEOs:** To characterize the physical parameters of Earth-bound Near-Earth Objects (NEOs), we utilize a variety of data sources, including light curves, radar observations, sparse photometry from surveys, and measurements from the Gaia mission. The SAGE method [12] and the SHAPE model [13] have been employed to analyze these data. Additionally, we account for the correction of the photocenter relative to the center of mass in order to refine orbital parameters and assess the Yarkovsky effect and bulk density.

**Fast gravity computation and surface stability analysis:** We have developed a Fast Fourier Transform (FFT) based method for an extremely fast and accurate computation of the gravitational field in any space region about a body with any shape and mass distribution. We are modeling the shape and stability on the surface of different asteroids using super-ellipsoids.

Other topics studied in our group are summarized in this conference by contributions: (1) Liu, P.-Y., et al. "Collisional Spin-Up of Asteroids: Alternative Mechanisms of Binary Asteroid Formation Independent of YORP Effects," and (2) Trogolo, N., et al. "Mass ejection by fast-spinning Didymos: orbiting dust and transference to Dimorphos."

#### Comments:

Poster

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