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CHARACTERIZING THE NEAR-EARTH ASTEROID POPULATION IN THE FRAMEWORK OF THE NEOSHIELD PROJECT

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ABSTRACT

Knowledge of the physical characteristics of near-Earth asteroids (NEAs) is fundamental to assessing the impact risk on our planet and designing efficient mitigation strategies.

In the framework of the NEOShield project, financed by the European Commission, the activity of Work Package 2 (January 2012 – July 2014) was aimed at improving our knowledge of NEA physical properties. In particular:

- Use was made of observational data catalogues (e.g. DLR EARN, NASA Planetary Data System Small Bodies Node, Minor Planet Center, JPL Small-

Body Database, NEOWISE and Spitzer Space Telescope survey data), to investigate the distribution of mitigation-relevant physical properties of NEAs, such as size, albedo, composition, structure, etc.

- We assessed how the number and quality of observations are impacting orbit refinement and, hence, impact probability (including the importance of physical characterization for determining the influence of non-gravitational forces on a NEA's orbit), and identified which physical properties are relevant to a particular type of deflection method. We examined the relevance and accuracy of a variety of observational techniques and data types, and ways in which this crucial information can best be provided. We considered a program of reconnaissance observations, including Earth-based remotely-sensed observations and in-situ investigations from a spacecraft.

- We studied the appropriate instrumentation for both i) a “real” mitigation precursor mission and ii) reconnaissance for a deflection demonstration mission. We determined the minimum performance requirements and examined the applicability of already developed instrumentation, thereby determining necessary modifications to achieve the required performance.

- We specified high-level requirements and interfaces for modeling/simulation work and laboratory experiments to be performed in order to improve NEA characterization and investigate the response of an asteroid to external solicitation (e.g. a kinetic impactor, the deployment of a device on the surface, etc.) as a function of its physical/compositional properties.

A summary of our results will be presented and discussed.

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