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A photometric survey of Near-Earth Objects in support of the NEOShield-2 project.

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Abstract

More than 85% of the 16,000 NEOs discovered up to now lack a physical characterization. The study of their physical properties is essential to define a proper mitigation scenario. One of the main aims of the NEOShield-2 project (2015-2017), financed by the European Community in the framework of the Horizon 2020 program, is therefore to retrieve physical properties of a wide number of NEOs, in order to design impact mitigation missions and assess the consequences of an impact on Earth.

1. Introduction

There is an urgent need to undertake a comprehensive characterization of the Near-Earth Object (NEO) population, due to the fact that these objects are crucial to put important constraints on the models of formation and evolution of our Solar System, and they could be responsible for the delivery of water and organics on early Earth [1]. Other than favouring life, NEOs can pose a serious hazard on human civilization. More than 16,000 NEOs are known nowadays. However, only less than 15% of them are physically characterized [2]. The lack of physical characterization is even more uncanny going to smaller objects (D < 300 m), since these bodies are the ones with a higher likelihood of catastrophic impact with the Earth. Moreover, NEOs show a great variation in terms of all mitigation-relevant quantities (size, shape, rotational period, composition, internal structure). The only way to proper design a future mitigation mission is therefore to obtain the physical properties for a wide number of NEOs.

The NEOShield-2 project (2015-2017) has been approved and financed by the European Commission in the framework of the Horizon 2020 program with the aims i) to study detailed technologies and instruments to conduct close approach missions to NEOs or to undertake mitigation demonstration, and ii) to retrieve physical properties of a wide number of NEOs, in order to design impact mitigation missions and assess the consequences of an impact on Earth.

In particular, the Italian team has been responsible for the Task 10.2.1 **'Colours and Phase function'**, with the aim to acquire photometric measurements of several NEOs in order to:

- perform a preliminary taxonomic classification using computed color indexes and obtain the first constraints on their surface composition and albedo;
- study the phase function to derive their H-G1-G2 parameters and have independent constraints on the taxonomic composition.

2. Results

We will present the results obtained at the Telescopio Nazionale Galileo (TNG, La Palma, Spain), during a 2-year Long-Term Program (September 2015 – September 2017), in which we carried out BVRI photometry of ~150 high profile NEOs, together with the phase functions we characterized using the Campo Imperatore telescope (L'Aquila, Italy) and the Observatório Astronômico do Sertão de Itaparica (Nova Itacuruba, Brazil). Targets were chosen among the ones with no physical characterization and preferentially with H > 20, which correspond, assuming a mean albedo, to objects with a diameter

D < 300 m. Using these data, we obtained color indexes and phase functions and we were able to derive visible color indexes and a preliminary taxonomic classification for each target in our sample. Then, we analyzed our sample according to their orbital parameters and their estimated size.

Acknowledgements

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References

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