INVESTIGATING THE PHYSICAL NATURE OF THE SMALL ASTEROID POPULATION WITH THE NEOROCKS PROJECT. V. Petropoulou[1], D. Perna[1], S. Ieva[1], E. Dotto[1], M. Banaszkiewicz[2], S. Banchi[3], M. A. Barucci[4], F. Bernardi[5], M. Birlan[6], B. Carry[7], A. Cellino[8], J. De Léon[9], M. Lazzarin[10], E. Mazzotta Epifani[1], A. Mediavilla Garay[11], J. Nomen Torres[12], E. Perozzi[13], P. Pravec[14], C. Snodgrass[15], C. Teodorescu[16] and the NEOROCKS team*

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Introduction: The "NEO Rapid Observation, Characterization and Key Simulations" (NEOROCKS) project is an HORIZONS 2020 program, financed by the European Commission since January 2020. The goal of this project is to progress our knowledge on Near-Earth Objects (NEOs), applying an omnidirectional approach: performing small body astronomical observations and the related modeling needed to derive their dynamical and physical properties, and profiting from international collaboration devoted to the asteroid hazard. A specific challenge for NEOROCKS is to keep up with the increasing NEO discoveries dominated by small-size objects.

Reflectance spectroscopy: In the framework of NEOROCKS we executed early-response (within a month from the discovery) spectroscopic observations of newly-discovered small – meters to hectometers – NEOs in order to investigate the physical nature of this size regime. We acquired data with the 3.5m TNG+DOLORES low-resolution spectrograph during three observing semesters, from spring 2021 to fall 2022 and our program is currently ongoing at NOT-2.56m with ALFOSC and NOTCam programmed observations. Our sample is composed by "high-priority" NEOs, identified due to small size and/or planetary protection considerations, which could be lost if not characterized with early-response observations; they usually becoming too faint for characterization within 2-8 weeks from discovery, whereupon becoming unobservable for years or even decades.

Physical properties of small-sized NEOs: The investigation of small-sized NEOs is particularly important to constrain asteroids' contribution to the delivery of prebiotic material (water and organics) to our planet [1]. The proximity of NEOs allows us to study asteroids about two to three orders of magnitude smaller than those observable in the main belt (i.e., down to meter-sized objects), hence to open new frontiers in asteroid science. Indeed, investigating the physical properties of small asteroids allows us to shed light on planetary accretion mechanisms that took place in the primordial solar system under the same low-gravity environments [2] and hints on differences in the small-size regime in terms of regolith generation [3] and taxonomic distribution [4,5,6] urge for further investigation. In terms of the current impact risk, the small objects deserve particular attention, as they have the highest statistical likelihood of impact, and can still produce a catastrophe at a regional/national scale [7].

NEOROCKS Results: Physical characterization (i.e. taxonomic classification, matching with meteorites laboratory spectra etc) of a large sample of small-sized NEOs sheds light on the poorly known physical properties of the small asteroid population and constitutes a fundamental input for an accurate planning of eventual impact risk mitigation measures. All our data finally flow into the NEOROCKS technical web portal, a unique dynamical and physical properties database which ensures an efficient data products dissemination, short/long-term data storage and data availability.

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