NEOROCKS: "Early-response" spectroscopy of small NEAs. V. Petropoulou[1], D. Perna[1], S.Ieva[1], J.D.P. Deshapriya[1], E. Dotto[1], E. Mazzotta Epifani[1], E. Perozzi[2], and the NEOROCKS team*, [1]INAF-OAR (via Frascati 33, Monte Porzio Catone 00078, IT, vasiliki.petropoulou@inaf.it); [2]ASI-Agenzia Spaziale Italiana, IT.

Introduction: Near-Earth Objects (NEOs), being the objects approaching most closely to the Earth, are of particular interest for science, space exploration, and planetary protection. We present results of our "early-response" observing program in the frame of the EU-funded "NEO Rapid Observation, Characterization and Key Simulations" (NEOROCKS) project aimed to improve our knowledge on the physical properties of NEOs. A specific challenge for NEOROCKS is to keep the physical characterization up with the increasing NEO discoveries dominated by small-size objects. In particular we aim at the physical characterization of newly discovered small – tens to hundreds of meters– Near-Earth Asteroids (NEAs), the smallest bodies in the Solar System possible to observe from ground. Prompt observations close after discovery (within a month of discovery) were executed in the framework of NEOROCKS projects, in order to investigate the physical nature of this population.

Spectroscopic survey: We obtained low-resolution optical spectroscopy of 41 newly-discovered NEAs at TNG-3.5m (la Palma, Spain) between April 2021 and September 2022. Visible-range low-resolution asteroid spectra allow to properly identify a number of broad absorption features (e.g., at 0.5, 0.55, 0.60-0.65, 0.7, 0.8-0.9 μm) related to the presence of different types of anhydrous and/or hydrated minerals, hence carrying information on the asteroid composition (e.g., siliceous, carbonaceous, metallic, etc.) and thermal history. Constraining surface chemical composition of NEAs has primordial importance for planetary defense purposes, such as for risk assessment and eventual developing mitigation strategies. Taxonomic classification gives important clues on albedo, and thus permits to constrain i) asteroid's size and ii) non-gravitational-effects on dynamical evolution, e.g. the Yarkovsky effect. For the taxonomic classification we used the established Bus-DeMeo taxonomy (DeMeo et al. 2009, Icarus, 202, 160). We also used the tool "Classy" (Mahlke et al. 2022, A&A, 665, A26). We found 23 objects (54%) corresponding to S-group, 3 objects assigned to the C-group, 6 objects assigned to X-group, 2 objects classified as A-type, 2 objects as D-type, 2 as O-type, 1 Q-type and 2 V-types. 90% of our sample has estimated diameter D < 350 m.

Discussion: We discuss the taxonomic distribution of the whole sample of NEAs with spectroscopic characterization, putting together our new dataset and published literature data, in relation with their dynamical properties. The investigation of the physical properties of the small NEAs is particularly important as it gives insights into i) the asteroidal contribution to the delivery of prebiotic material (water and organics) to our planet, and ii) the different evolutionary histories of asteroids as a function of their size. Finally we resume physical, dynamical and accessibility information for this enlarged spectroscopic sample as input for future exploration/mitigation space missions.

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