NEOROCKS: COLOR AND COMPOSITIONAL CHARACTERISTICS OF NEAR-EARTH OBJECTS DERIVED FROM DIGITAL SKY OBSERVATIONS A. Sergeyev[1], B. Carry[1], and the NEOROCKS team [*2]
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Introduction: The NEOROCKS project focuses on the study of characterizing the population of Near-Earth objects (NEOs) [1]. This comprehensive study aims to improve our understanding of these celestial bodies, their origins, and the potential risks they may pose to Earth.

We have prepared an extensive database of asteroid colors. This database is compiled by combining multi-wavelength observations, to analyze the compositional properties and surface characteristics. Through the analysis of the database, we identified trends, correlations, and potential links between asteroid properties, gaining a deeper understanding of their origins and the processes shaping their surfaces.

NEOs Dataset collecting: We collected and compared NEOs color data from four recently published sources:
1. Sloan Digital Sky Survey (SDSS) [2]
2. SkyMapper Southern Survey (SMSS) [3]
3. Gaia DR3 visible spectra [4]
4. Ground-based spectra [5]

Asteroid reflectance was transformed from spectral surveys into a set of colors within the SDSS photometric system, with the goal of establishing a large, uniform dataset. In such a way we gathered the colors of 7,401 individual NEOs including 2,277 Near-Earth and 5,124 Mars-Crosser asteroids.

Multicolor taxonomy: We employed a method adapted for multi-color photometry, based on M. Mahlke's [5] recent taxonomy update, which is updated upon the popular Bus-DeMeo classification system. To determine the likelihood of each asteroid belonging to one of ten extensive taxonomic groups, we utilized a probabilistic technique that factored in the uncertainties in asteroid measurements.

The taxonomic distribution of NEOROCKS NEOs was calculated using precise color boundaries for taxonomy within the three-dimensional color indices of the Sloan Digital Sky Survey (SDSS) space. Color boundaries for taxonomy were determined by transforming spectral templates from the Mahlke classification system into the SDSS color system space. Asteroids' pseudo-reflectance spectra were derived from their *g-r* , *g-i* , and *i-z* colors.

Space mission targets: The NEOROCKS NEOs data was utilized to examine the composition of prospective candidates for future space missions, including around one hundred potential candidates for the ESA Hera mission. In this context, we present the Gaia spectra for two of these candidates (95802) Francismuir and (42532) 1995 OR, selected from a narrowed-down list of seven remaining contenders being considered for a flyby.

Space weathering: We present here the results of analysis on space weathering, that includes 1,175 weathered S-type and 196 fresh Q-type silicate asteroids. To analyze the factors contributing to the rejuvenation of asteroid surface features, we calculated the Q-type to S-type ratio in relation to various asteroid dynamical and orbital properties.

Our analysis clearly demonstrates a rise in the fraction of fresh asteroids as the perihelion distance decreases. The proportion of Q-type asteroids increases from approximately 0.2 to 1 over a distance range of 1.6 to 0.2 astronomical units. The Q/S ratio increases as the asteroid diameters decrease but falls for the smallest NEOs, which could be due to the prevalence of monoliths where resurfacing is challenging.

References

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