NEOROCKS project: results from photometric survey of Near-Earth objects

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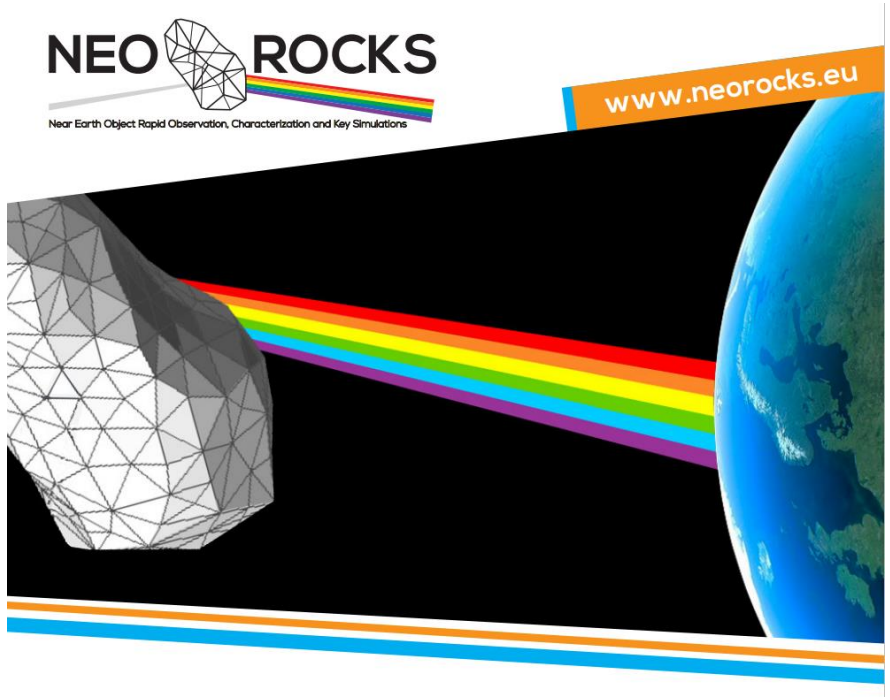

Introduction

NEO ROCKS
Near Earth Object Rapid Observation, Characterization and Key Simulations

- This work was done in the framework of European Community programme NEOROCKS. The goal of NEOROCKS programme is to improve the knowledge on the physical properties of the NEOs population, the implications for their origin and evolution, and the topics related to planetary defence. This goal is achieved by linking up the expertise in performing small body astronomical observations and the related modelling needed to derive their dynamical and physical properties to the pragmatic approach of planetary defence, which aims to provide operational loops and information systems to protect the citizens and the ground infrastructures from potential threats.

- During 2020-21 several observational runs were performed at the Observatoire de Haute Provence and Observatoire de Pic du Midi, in France, for colors of Near Earth Objects (NEOs).

Observations

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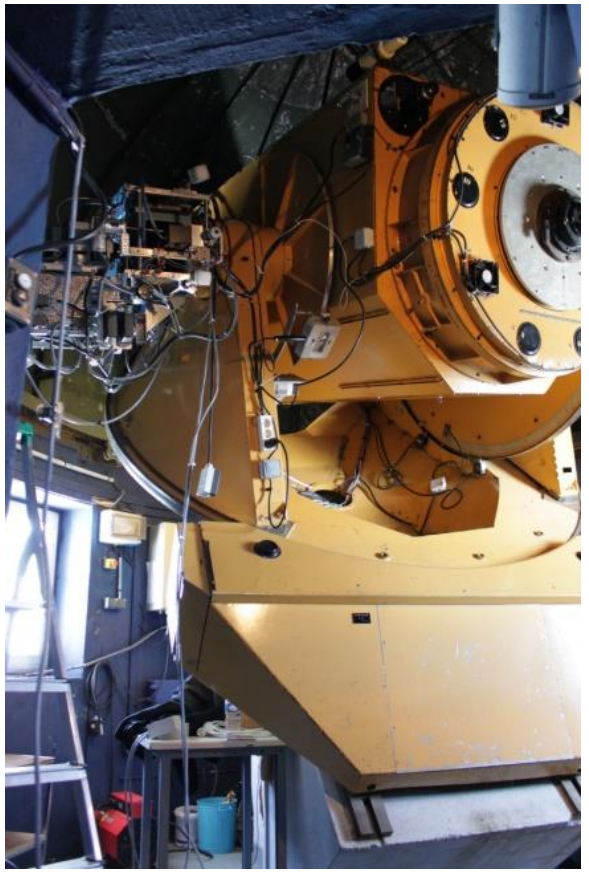
- **Observatoire de Haute Provence**

1.2m telescope
Programs granted by the Time Allocation Committee
FOV 13.1'x13.1', F/6
iKon-L 936 Andor camera 2kx2k E2V
Johnson UBV filters
Cousins RIJHK filters

- **Pic du Midi Observatory**

T1M – 1.05m telescope
Devoted mainly to Solar System programs
FOV 8'x8'
iKon-L Andor camera 2kx2k E2V (pixel scale 0.22''/pixel)
SLOAN system of filters
Johnson UBV filters
Cousins RIJHK filters



Results

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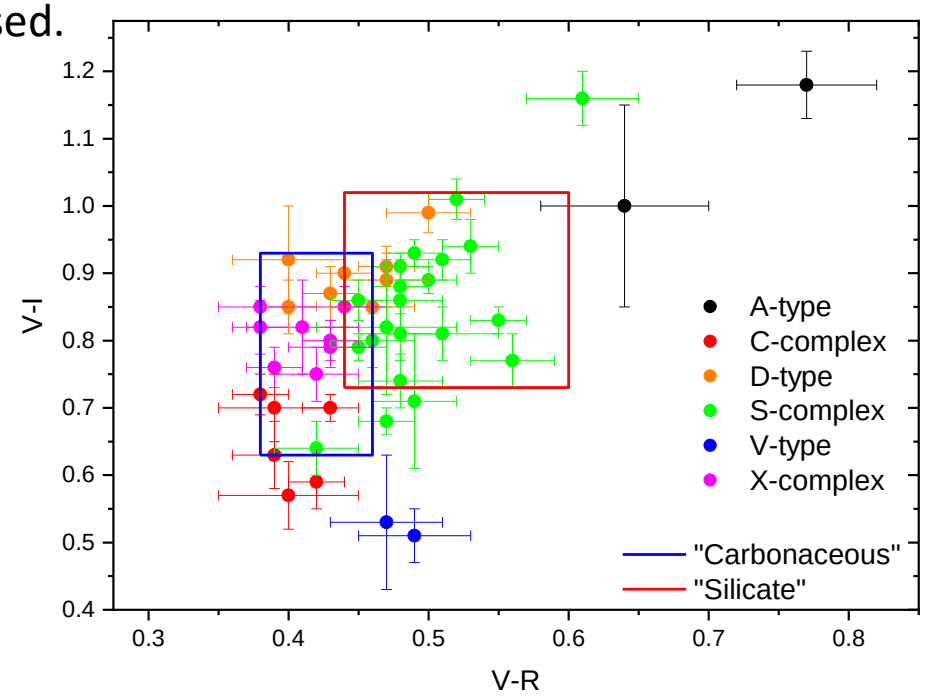
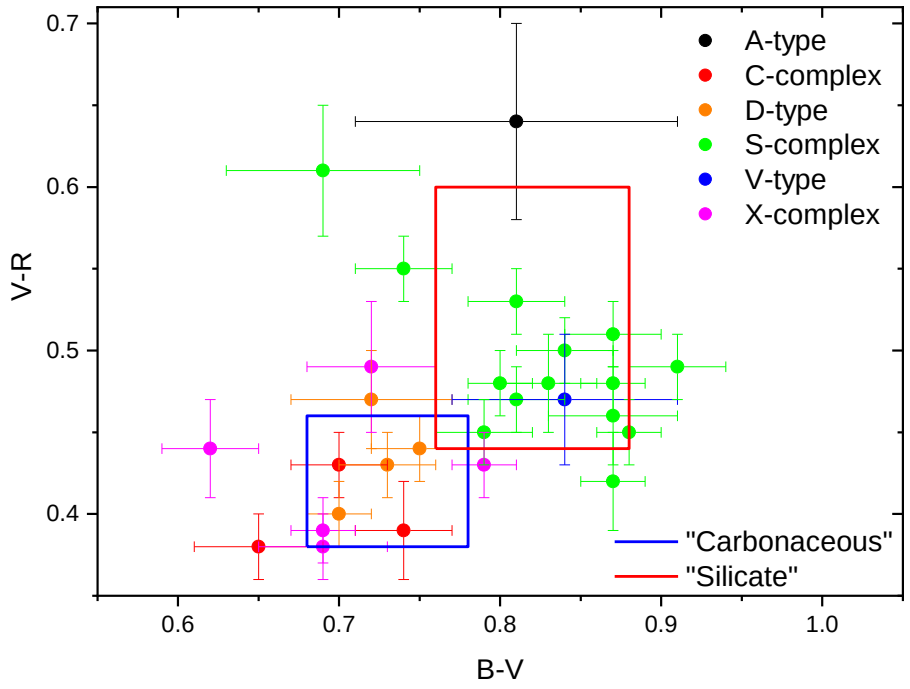
- Colors were measured for 51 NEOs. Among them 25 objects classified as Potentially Hazardous Asteroids (PHAs).
- Aperture photometry of targets and field stars was used. The absolute calibration was computed using the Pan-Starrs catalogue. Sloan photometric system and the transformation equations from Kostov & Bonev (BAJ, vol 28, 2018) were used.





Color-color diagrams for the objects in our survey showing their classification into the main taxonomic classes. The boxes represent the 1σ deviation from the mean colors for the groups of “carbonaceous” and “silicate” objects.

Results

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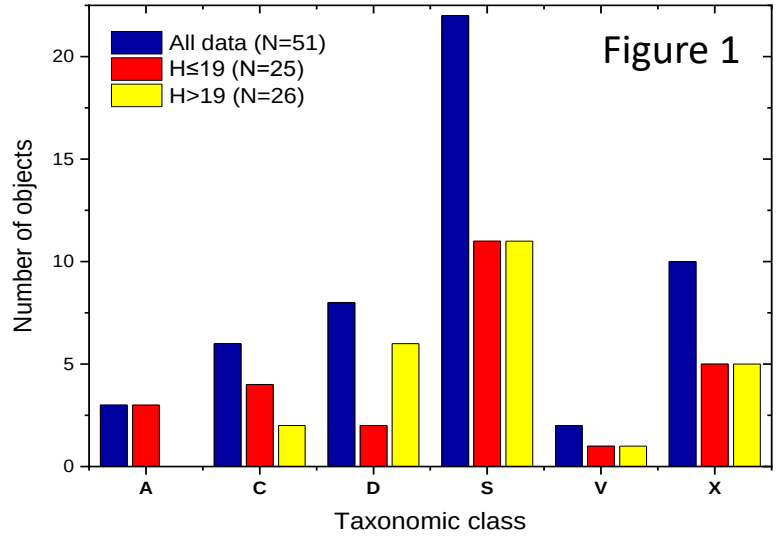
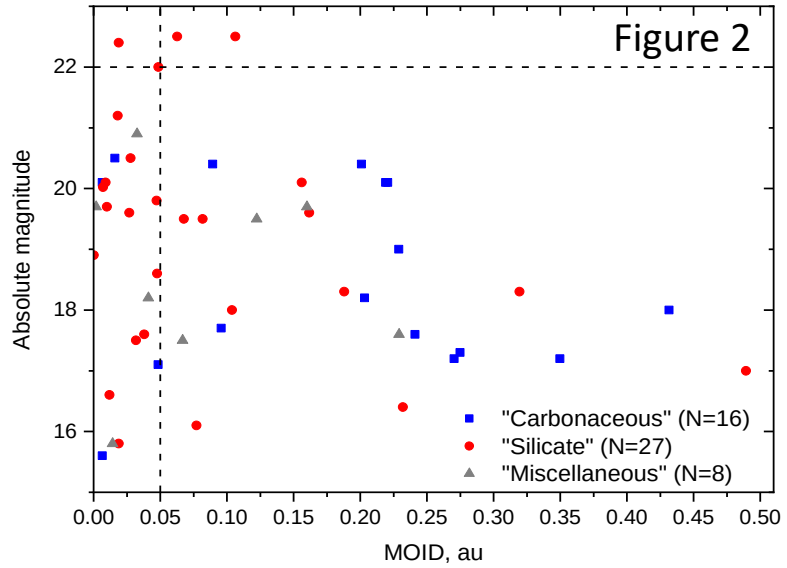
- The acquired colors were transformed into reflectances and compared with the mean spectra of the taxonomic classes from DeMeo et al. (2009) using M4AST service (Popescu et al. 2012).

- Based on the taxonomic classification, nearly a half of objects in our sample (22 out of 51) falls into the S-complex, 10 were classified into the X-complex, 8 as D-types, 6 into the C-complex, 3 as A-types, and 2 objects were classified as V-types (Figure 1).

- The absolute magnitude versus Minimal Orbital Intersection Distance (MOID) was derived. Potentially Hazardous Asteroids (PHAs) by almost 65% represented by “silicate” objects (Figure 2).





Conclusions and acknowledgements

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- The distribution of taxonomic classes among NEOs found in this work is in general agreement with previous surveys.
- The majority of sample consist of silicate S-complex asteroids.
- Among objects with measured colors, 25 bodies belong to a group of PHAs and are of a particular interest due to their potential hazard to humanity.
- No significant difference is seen in distribution of objects in our sample with H≤19 and H>19.

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