PDC2015
Frascati, Roma, Italy

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IAA-PDC-15-P-06

NEW RESULTS OF NEO-SURFACE: NEAR-EARTH OBJECTS SURVEY OF ASTEROIDS CLOSE TO THE EARTH

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Keywords: *mitigation, impactor, NEO, PHA, spectroscopy*

ABSTRACT

There is a high degree of diversity in terms of physical properties among the Near Earth Object (NEO) population: some objects have very elongated shapes, others are tumbling asteroids, very long and very short rotational periods are observed, and even binary and ternary systems are known. Taxonomy classes, which reflect to some extents the chemical and mineralogical surface composition, are unevenly distributed among the main belt, with E, Q and S-type objects being mostly located in the inner asteroid belt, C-types from the mid to the outer belt, and P and D-types in the outer belt.

The study of the physical nature of NEOs is also compelling in view of the potential hazard posed to our planet. Physical characterization of NEOs is essential to define successful mitigation strategies in case of possible impactors. In fact, whatever the scenario, it is clear that the technology needed to set up a realistic mitigation strategy strongly depends upon the knowledge of the physical properties of the

impacting object. NEOs can also be suitable targets for space missions, but in order to guarantee both the technical feasibility and the high scientific return of the mission, physical characterization is needed. Unfortunately, our knowledge of the structure and composition of NEOs is still rather limited, since less than 10% of the known NEOs have spectral types determined from observations.

In order to increase the present knowledge of the physical properties of NEOs, we are carrying out a survey called NEO-SURFACE: Near Earth Objects — SURvey oF Asteroids Close to the Earth (http://www.oaroma.inaf.it/planet/NEOSurface.html). We perform VNIR spectroscopy and photometry focusing our efforts on NEOs with possible encounters with Earth (PHAs, the Potentially Hazardous Asteroids), and on NEOs easily accessible for future rendez-vous space missions. We collected 45 spectra in the visible and near-infrared range for 13 NEOs which are possible targets of future missions and 32 PHAs. Our taxonomic classification and our curve-matching with RELAB spectra of meteorites seem to confirm the presence of a large number of silicate S-types in near-Earth orbits. For silicate asteroids we also perform a mineralogical analysis using equations specifically derived by Dunn et al. (2010), which sample the position of the strong 1 and 2 um bands, typical of olivine and pyroxene assemblages, and compute the molar content of fayalite and ferrosilite. Finally we compare the results with laboratory data for ordinary chondrites.

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