Spectro-photometric studies of near-Earth asteroids using broad-band filters over the visible wavelengths

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The spectro-photometric observations of asteroids provide the first information regarding their composition. They allow to classify the observed objects in given taxonomic types which are associated with compositional groups. This technique has been successfully applied both for the data retried from all-sky surveys and for studies of individual minor planets. The main advantage of it is that the measurements are obtained with much less effort compared to the spectral ones, and it allows to characterize targets having faint magnitudes. The draw-back is the accuracy of the results.

Our project aims to characterize a large sample of near-Earth asteroids (NEAs) using the observations obtained with four broad-band filters g (400-550), r (550-700), i (700-820) and z_s (820-920) nm. They are performed with the MUSCAT-2 instrument which is mounted on the 1.52-m Carlos Sanchez Telescope, located on Teide Observatory, Canary Islands. The images corresponding to the four bands are acquired simultaneously. We used the Photometry Pipeline (PP) software and several Python scripts for reducing the data. We applied several pattern recognition algorithms for determining the class of each object. The NEAs observed within our project and for which the spectral data is available were used as a training set.

We present the results of this program and the applicability of spectro-photometry in the visible region for studying the near-Earth asteroids. The various inaccuracies and the method limitations are constrained. The possibility to detect objects with a heterogeneous composition trough this technique is also discussed.

The observations with the MUSCAT-2 instrument are performed regularly (1-2 nights every month). The project started in 2018 and up to now we were able to obtain the spectro-photometric classification for 191 NEAs (107 were classified for the first time) with the absolute magnitudes distributed in the range of 12 -24. A number of 44 objects were observed multiple times in various conditions. This allowed us to assess the reliability of the method.

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