

APPARENT COLOURS AS MANUFACTURING MARKERS FOR GEO SATELLITES

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Abstract. We present a multi-band photometric analysis of GEO satellites, observed by using three optical telescopes in different observational sites. Our dataset consists of more than 1,200 scientific images acquired in the BVRI Johnson-Cousin filters. The observational strategy we adopted is based on alternating the filter-sequence, thus obtaining consecutive multi-band images, in order to reduce the color-indexes uncertainty. By using the color-color planes we investigated possible correlations between photometric colors and the satellites' structural features, obtaining that some of the considered parameters seem to significantly affect the color indexes.

Keywords: Photometry, GEO satellite

1 Introduction

Space debris pose a significant risk for operational satellites, astronauts and new launches, as well as for uncontrolled re-entry in the Earth's atmosphere. The observational and tracking activities of space debris are currently on-going worldwide. Among different techniques used to characterize these objects, the multi-band photometry is a powerful tool for investigating their physical parameters (surface materials, shape, etc). Interesting results have been obtained by Schmitt 2020, Cowardin et al. 2010, Schildcknet et al. 2008. Following, we present a photometric analysis.

1.1 Observations and data analysis

We observe 23 GEO satellites from three different observational sites. In particular, the Cassini-Loiano and Teramo Normale Telescope are located in Italy and belong to the National Institute for Astrophysics (INAF), while the third telescope be-

longs to the Guillermo Haro Astrophysical Observatory (GHAO) located in Cananea, Mexico.

The entire dataset consist of more than 1,200 images acquired in the Johnson-Cousin BVRI filters. Bias, dark current and flat-field frames, as well as Landolt's standard fields were also acquired for calibration process. We reduced the data by using the DAOPHOT software. By using VRI filter-sequence, we reconstructed the lightcurves for each GEO satellite in our sample (Fig.1, left). Moreover, we reconstructed the color-lightcurves by calculating the difference between two consecutive frames, and we estimated the mean color-index as the average value of the color-lightcurve. The obtained values were investigated through color-color planes (Fig. 1, right), where a search for possible correlations with the structural features (retrieved from the web) of the bus and model of each satellite is underway, showing promising results.

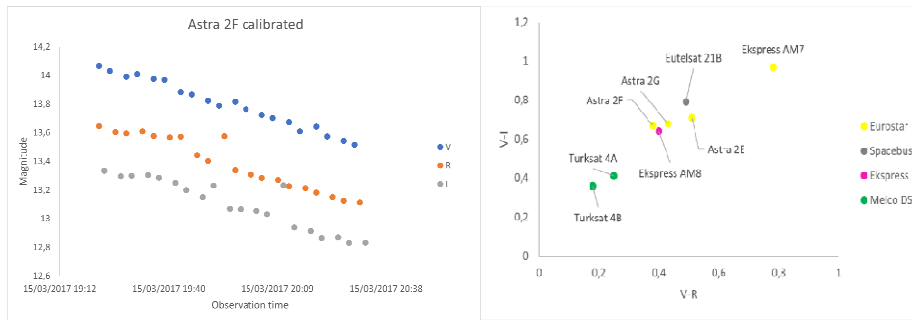


Fig. 1. *Left:* Light-curves obtained for the ASTRA 2F GEO satellite. *Right:* Subset of our sample in the V-I vs V-R color color plane, tagged with the satellites' names and colored according to their bus family.

Conclusions.

We studied the photometric properties of GEO satellites by comparing observational color-indexes with different satellite structural parameters. Preliminary results suggest a possible correlation between some of the considered features (i.e. bus, model, etc) and photometric colors (V-I, V-R). However, before to impose firm conclusions several investigations are still required.

References

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