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Determination of spin axes and shapes of NEAs from one apparition

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1. Abstract

The majority of asteroid models, which include the rotation period, spin axis and shape, are derived from the analysis of asteroid light variations, observed at different geometries. While for the Main Belt asteroids it takes at least three, well spaced oppositions to collect the necessary data, some near-Earth asteroids, when passing by the Earth, sweep long arcs in the sky enabling observations at different geometries. This potentially can help in determination of their models from relatively short observing campaigns.

It can be argued that the minimum arc length in the sky, covered by photometric observations, needed to derive a uniqe spin axis and shape model for a NEA in favourable conditions is about 120 deg (Josef Durech, private communication). Hence it is interesting to check how often NEAs are observable in such a way that a coordinated, world-wide photometric campaign can collect enough data for derivation of their models from a short, one to two months observing period. Apart from the length of arc in the sky, other observing conditions should be taken into account such as the Moon conditions, background stars' density, asteroid brightness, sky movement, etc.

To answer those questions computations of NEA ephemerides have been performed using both the historic orbits of the NEAs discovered in the past as well as the simulated orbits based on the Granvik et al. model of the NEO population [1]. They were then used to select objects which can potentially be used for spin axis and shape analysis. The analysis of the obtained results will be presented at the conference.

2. References

[1] GRANVIK, M., MORBIDELLI, A., JEDICKE, R., BOTTKE, W. F., BOLIN, B., BESHORE, E., VOKROUHLICKY, D., NESVORNY, D., MICHEL, P. (2013) A New Population Model of the Orbits and Absolute Magnitudes of Near-Earth Objects. AAS/Division for Planetary Sciences Meeting Abstracts #45, 106.02