

Polarimetric observations of Jupiter Trojans

I.N. Belskaya (1), A. Stinson (2), S. Bagnulo (2), A. Christou (2), K. Muinonen (3)

(1) Astronomical Institute of Kharkiv, V.N. Karazin National University, Sumska Str. 35, Kharkiv 61022, Ukraine, (2) Armagh Observatory, College Hill, Armagh BT61 9DG, Northern Ireland, United Kingdom. (3) Department of Physics, University of Helsinki, P.O. Box 64, Gustaf Hällströmin katu 2a, FI-00014, Finland

Abstract

We present polarimetric observations of six Jupiter Trojans carried out in 2013 at ESO VLT. The polarization-phase angle behaviour of the observed Trojans is very similar to that of some low albedo asteroids, in particular the P-type asteroids.

1. Introduction

Polarimetry is a technique routinely used for investigating the physical properties of Solar-system bodies. Jupiter Trojans remain the only group of small bodies for which the polarimetric properties have not been yet investigated. This work is aimed to fill this gap, and probe the polarimetric properties of Trojans.

2. Observations and results

We have observed six objects: (588) Achilles, (1583) Antilochus, (3548) Eurybates, (4543) Phoinix, (6545) 1986 TR6, and (21601) 1998 XO89. All these targets belong to the L4 population of Jupiter Trojans and present objects of different sizes with the diameter range of 50-160 km [1]. The observations were carried out in April-June 2013 at the ESO VLT using the FORS2 instrument in polarimetric mode. Each object was observed at 3-4 different phase angles in the phase angle range from 7 deg up to 11-12 deg, the largest possible phase angles in the ground-based observations of Trojans. Our polarimetric measurements were obtained using the well established beam-swapping technique. A series of measurements is obtained setting the retarder waveplate at all positions between 0 and 157.5°, at 22.5° steps. For each observation, the exposure time cumulated over all exposures varied from 8 minutes to 1 h and 20 minutes. Observations were made in the R band with a typical accuracy of 0.05%. We have measured negative polarization branch for each object with polarization minima varied from -1% to -1.3%.

3. Discussion and conclusions

The measured Trojans have visible surface albedos from 0.04 to 0.07 [1]. We have not found a correlation of polarization minima and albedo. Two objects, (588) Achilles and (4543) Phoinix, show shallower polarization branches, while other Trojans have deeper negative polarization.

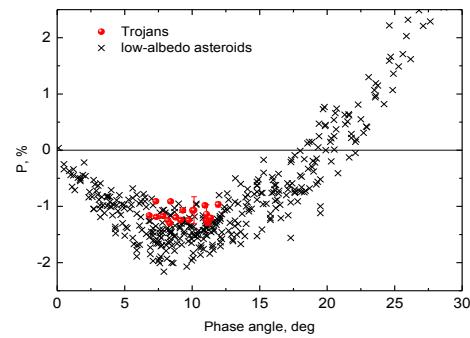


Figure 1: Measured polarization phase dependence of Jupiter Trojans in comparison with low albedo asteroids [2]

As compared to main belt asteroids, the polarization-phase angle behaviour of the observed Trojans is within the range of low albedo asteroids (Fig.1). In particular, both polarimetric and photometric phase dependences of Trojans are very similar to the P-type asteroids.

References

- [1] Grav T., Mainzer, A.K., Bauer J.M., Masiero J.R., Nugent C.R. AJ, v.759, id. 49, 2012.
- [2] Lupishko, D. F.; Vasilyev, S. V. Asteroid Polarimetric Database V7.0 NASA Planetary Data System, EAR-A-3-RDR-APD-POLARIMETRY-V7.0, 2012

