



Slow rotators and binary candidates among the Jovian Trojans with K2

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The Kepler space telescope collected continuous photometry of several Jovian Trojan asteroids in the Solar System during its K2 mission. We extracted light curves 43 new targets from K2 Campaigns 11-19 using our own photometric package developed for moving objects in the Kepler images which, together with the 56 asteroids from Campaign 6, brings the total sample size up to 99 asteroids. We calculated rotational frequencies and amplitudes for each object and their distributions, and we derived statistics on the binary fraction and possible compositions of these asteroids. We find an excess of very slow rotators (>100 hours) and a possible dichotomy in the period distribution. When compared to other space-based photometric results, we find that the distribution of Hilda rotation periods detected with K2 shows the same possible dichotomy, but the large sample of main-belt asteroids measured with the TESS space telescope does not.

The excess of slow rotators corroborates with an outward origin, with synchronized binaries migrating inwards from the Kuiper belt, and some of them dissociating along the way, creating very slowly rotating single objects. Both a low critical density limit and comparison with strengthless ellipsoid models indicate that none of the objects exceed the density of icy objects, further strengthening an inward migration scenario.

We estimate a binary fraction of at least 21% based on the number of high-amplitude, long-period objects, in agreement with earlier results. Large photometric amplitudes are prevalent over the entire period range, and we cannot fit all objects with a strengthless model in rotational equilibrium.

We highlight a few individual objects as well. (99306) 2001 SC101 is the only asteroid observed in two campaigns, from different sides of the Sun, and we find clear differences in the light curve shape. (13062) Podarkes is the principal body of a proposed small family: we detect a rotation period of 245 hr which puts it into the very slow rotator group. Finally, we present the first continuous light curve of (11351) Leucus, one of the targets of the Lucy spacecraft, and confirm that it also rotates exceedingly slowly, with a period of 445 hr.