

PHOTOMETRY OF SMALL MAIN-BELT ASTEROIDS: SOME RESULTS. V. G. Chiorny. Institute of Astronomy of Kharkiv Karazin National University, Sumska str. 35, 61022, Kharkiv, Ukraine. chiorny@astron.kharkov.ua

Introduction: The photometric observations are the most abundant data source for determining the physical properties of asteroids. The present study continues the CCD photometry of the main-belt asteroids, conducted with the 0.7-m telescope at the Institute of Astronomy of Kharkiv National University [1,2]. Using the high-sensitivity CCD camera IMG 47-10 (1024x1024 pixels) in 2006-2008 we carried out photometric observations of small main-belt asteroids ($D < 15$ km), whose visible magnitudes during the observations were in the range of 14.8 - 16.3 mag. In most cases the objects of these observations are the small main-belt asteroids included in the collaboration project "Photometric Survey for Asynchronous Binary Asteroids" (BinAst) [3]. The present study also contains observations for relatively small, but more distant asteroids 1320 Impala and 4967 Glia.

Observations and results: The observations data represent series of 30-150 CCD-images, obtained mainly in the R and V filters of the standard Johnson-Cousins photometric system. To achieve reasonable signal/noise ratios, the selected exposure time was typically from 120 sec to 300 sec depending on the asteroid magnitude, as well as on the magnitudes of comparison stars in the field of view. Reduction of the observations was performed by using the synthetic aperture photometry package ASTPHOT developed by S. Mottola [4]. The CCD-image reduction also included dark subtraction and flat-fielding of the raw images. Differential photometry of an asteroid in the CCD frame provides an uncertainty of measurements of the order of 0.01-0.03 mag (rms). Standardization of observations was carried out in photometric nights.

This work contains observational results for 13 main-belt asteroids, namely – 685 Hermia, 1320 Impala, 3940 Larion, 4375 Kiyomori, 4555 1987 QL, 4967 Glia, 5484 Inoda, 6394 1990 QM2, 6949 Zissell,

10208 1997 QN1, 16635 1993 QO, 32008 2000 HM53 and 130845 2000 UQ62.

Altogether 36 lightcurves of the studied objects were obtained during 32 nights of observations. To determine asteroid rotation period we used the Fourier analysis method, similar to that described by Harris et al. [5]. Figures 1-4 show the individual and composite lightcurves for some asteroids.

Analysis of the obtained lightcurves for asteroids 10208 1997 QN1, 16635 1993 QO i 32008 2000 HM53 (together with lightcurves obtained by the other observers of the BinAst project) displays binary nature of these objects. For examples, obtained lightcurves of asteroid 16635 1993 QO (see Fig. 3a) show the rotation period of a primary body $P_1 = 2.2083$ h and amplitude of 0.17 mag. At the same time the lightcurve of this asteroid on September 4, 2007 (see Fig. 3b) shows one mutual eclipse/occultation event in this binary system which corresponds to the orbital period of 32.25 h [8]. Fig. 4a and 4b demonstrate lightcurves for another binary asteroid 32008 2000 HM53 with the rotation period of primary body $P_1 = 3.0171$ h and the orbital period of 40.24 h [6].

The Table contains the obtained rotation period and lightcurve amplitude of each observed asteroid as well as the albedo, diameter and the object's taxonomic class.

References: [1] Shevchenko V. G. et al., (2003) *Planet. Space Sci.*, 51. 525-532. [2] Chiorny V.G. et al., (2007) *Planet. Space Sci.*, 55, 586-597. [3] Pravec P. (2005), in *Proceed.24th Ann. Conf. Soc. Astron. Sci.*, 61. [4] Mottola S. et al, (1995) *Icarus* 117, 62-70. [5] Harris et al. (1989), *Icarus*, 77. 171-186. [6] Pravec P. et al., (2007), *CBET* 1078. [7] Oey J. et al., (2007) *CBET* 1087. [8] Prey D. et al., (2007), *CBET* 1143. [9] Stephens R. et al., (2007), *MPB* 34. 14-15.

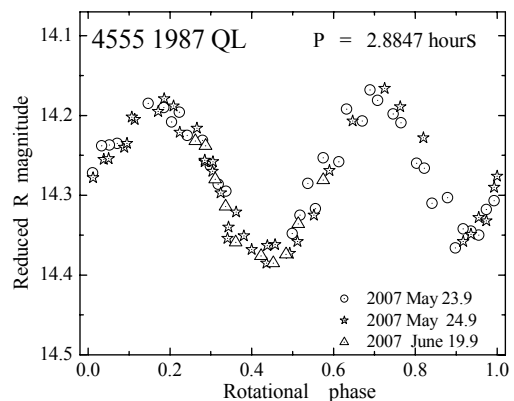
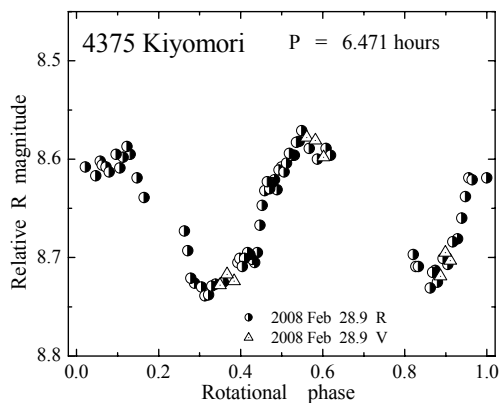


Fig 1. Composite lightcurve of asteroid 4375 Kiyomori.

Fig. 2. Composite lightcurve of asteroid 4555 1987 QL.

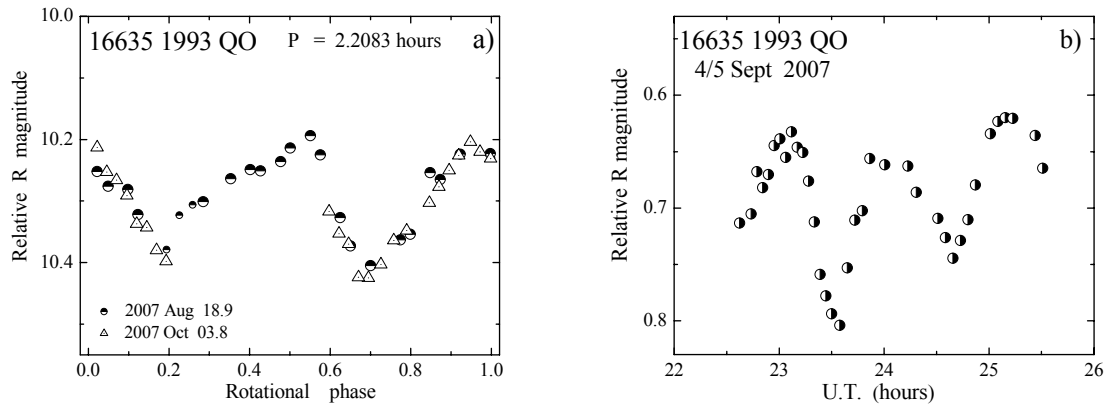


Fig. 3. Composite (left) and individual (right) lightcurves of asteroid 16635 1993 QO

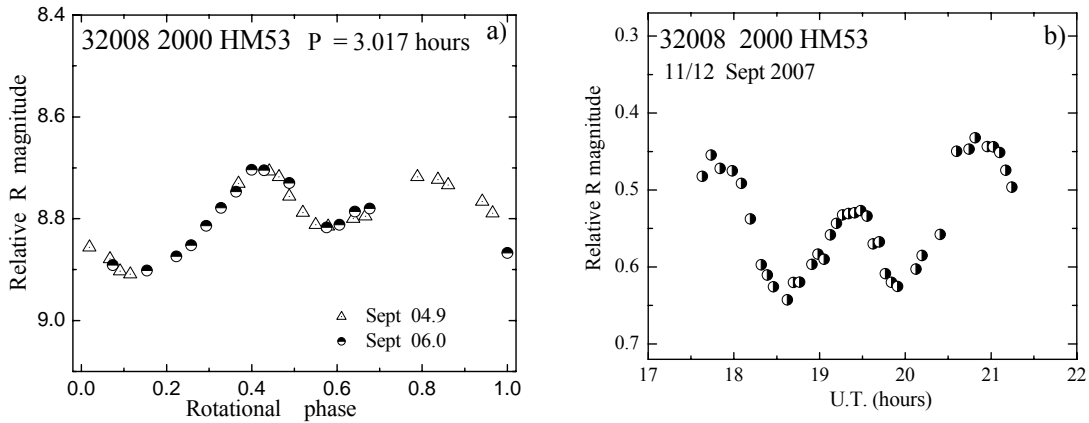


Fig. 4. Composite (left) and individual (right) lightcurves of asteroid 32008 2000 HM53

Table . Physical characteristic of observed of asteroids

Asteroid	Albedo	D (km)	Type	Period (hr)	Ampl (mag)	Comment
685 Hermia	0.2807	10.95	S	50.44	0.9	Stephens R., 2007 [9]
1320 Impala	0.0775	39.72	C	6.171	0.60	This work
3940 Larion	0.35	6.5	E	>12.0	>0.03	This work
4375 Kiyomori	0.18 ^{*)}	9.0	-	6.471	0.16	This work
4555 1987 QL	0.18 ^{*)}	6.1	-	2.8847	0.22	This work
4967 Glia	0.1054	29.67	-	7.06	0.37	This work
5484 Inoda	0.1062	12.32	-	14.1479	0.21	This work; BinAst
6394 1990 QM2	0.34	4.76	E	3.497	0.31	This work
6949 Zissell	0.18 ^{*)}	7.5	-	3.6336	0.33	This work
10208 1997 QN1	0.18 ^{*)}	3.8	-	3.3484 ^{**)}	0.13	This work; Binary [7]
16635 1993 QO	0.18 ^{*)}	4.1	-	2.208 ^{**)}	0.18	This work; Binary
32008 2000 HM53	0.18 ^{*)}	3.76	-	3.017 ^{**)}	0.20	This work; Binary
130845 2000 UQ62	0.18 ^{*)}	3.6	-	4.7	0.45	This work

^{*)} - accepted value

^{**)} - rotation period of primary body