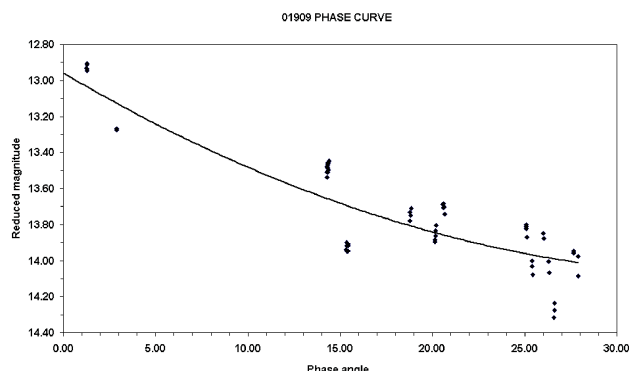




BYPRODUCT TARGETS DURING PHOTOMETRIC OBSERVATIONS FROM MODRA

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Lightcurve analysis of asteroids 1446 Sillapää, 2986 Mrinalini, 4979 Otawara, (12815) 1996 DL2, (14901) 1992 SH, (15914) 1997 UM3, (16717) 1995 UJ8, (24039) 1999 SS8, (27204) 1999 CY74, 44217 Whittle, (48073) 2001 FC13, and (99812) 2002 LW31 is reported.

The field of view of the 0.60-m f/5.5 telescope with AP8p CCD-camera at Modra is 25' x 25'. It sometimes enables us to observe some “byproduct asteroids” along with those that were part of our planned observations. A set of 12 of such byproduct asteroids is presented here.

1446 Sillapää. This target appeared by chance in the field of another asteroid being worked at Modra one month after it was studied by a group of observers in Photometric Survey for Asynchronous Binary Asteroids (Pravec, 2006). However, our new observations could not be joined with the previous data obtained by Pray, Higgins, and Marchis (Pravec 2009) since the amplitude of the lightcurve had increased by ~ 0.16 mag due to increased solar phase angle.

2986 Mrinalini and (12815) 1996 DL2. Only tentative lightcurves based on two short linked sessions are presented for these targets. A simple shape of the lightcurves is assumed. Except for the periods given here, one of ~ 11.9 h also fits the data nearly as well for both asteroids.

4979 Otawara. The synodic rotation period of this asteroid was previously found to be 2.707 ± 0.005 h (Doressoundiram et al., 1999; Le Bras et al., 2001; Fauvaud et al., 2003; and Fornasier et al., 2003). Our observations are in agreement, within errors, with those results.

(14901) 1992 SH. Two branches of mutually linked but short sessions were not enough to determine the synodic rotation period unambiguously. The presented composite lightcurve is not fully covered by observations. However, visual inspection of other possible composite lightcurves (e.g., $P = 3.7464$ h) offers only less probable results.

(15914) 1997 UM3. Two linked sessions were obtained two months after a favorable apparition for this asteroid. Except for the presented result, a period near 8.5 h would fit the data about as well. Based on the relative brightness of other objects in the field of view, it seemed that the asteroid was fainter by ~ 0.5 mag than predicted when using the absolute magnitude (H) and slope parameter (G) values given by Minor Planet Center.

(16717) 1995 UJ8, (48073) 2001 FC13, and (99812) 2002 LW31. Linked sessions indicate that these faint asteroids rotate slowly.

(24039) 1999 SS8. The rotation period was unambiguously and quickly derived due to the large amplitude of the lightcurve.

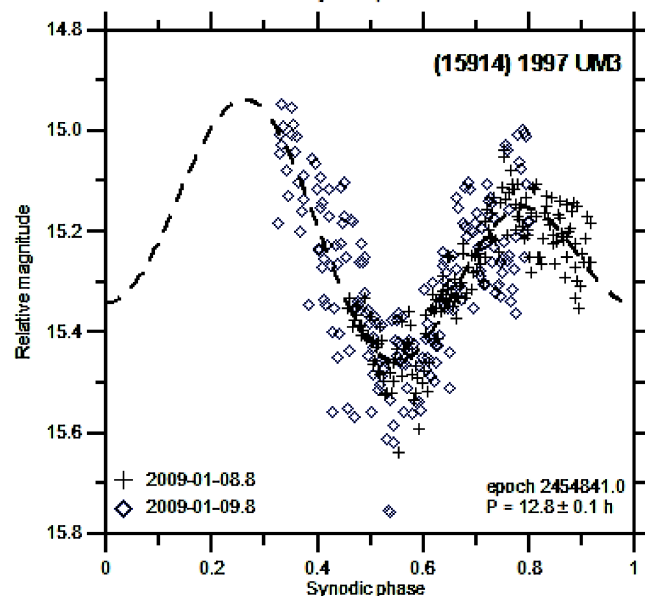
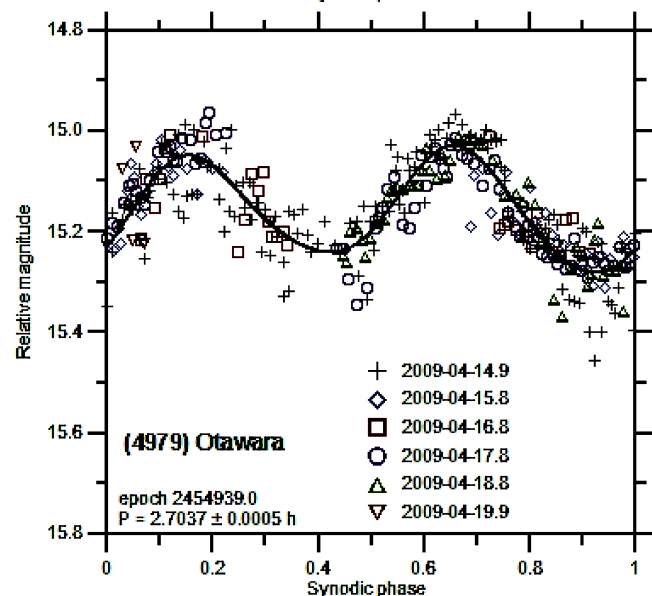
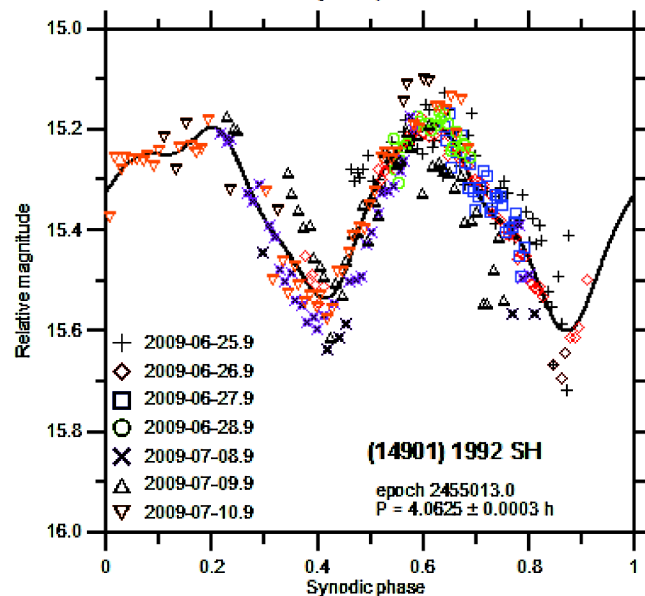
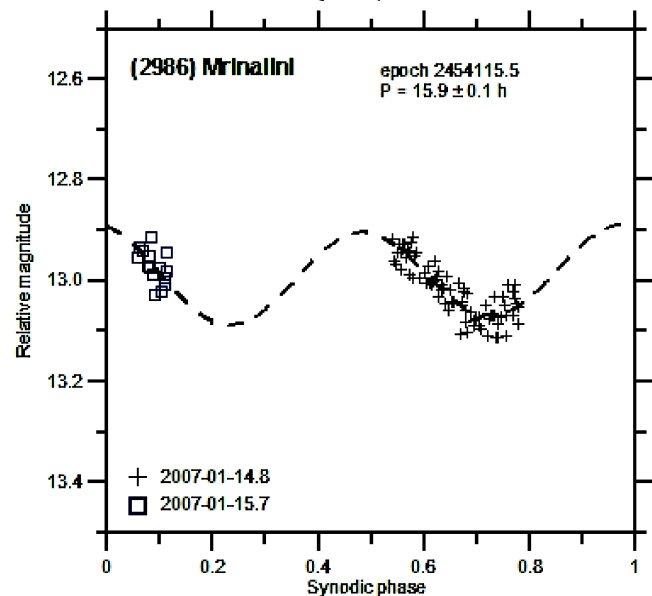
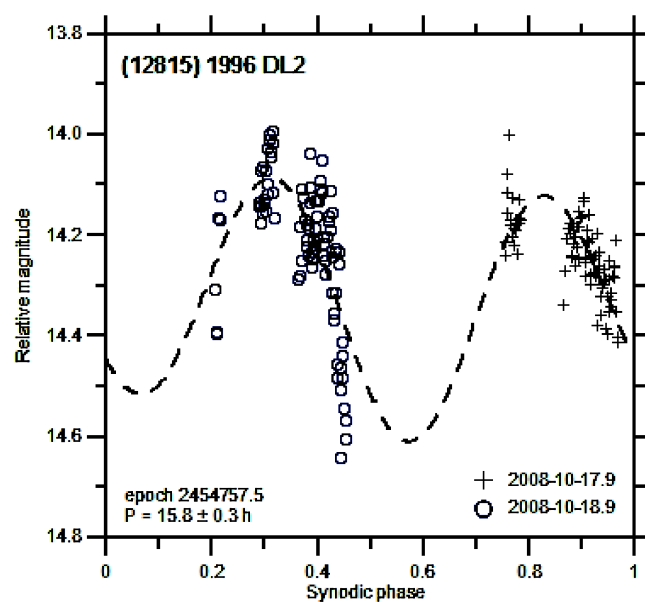
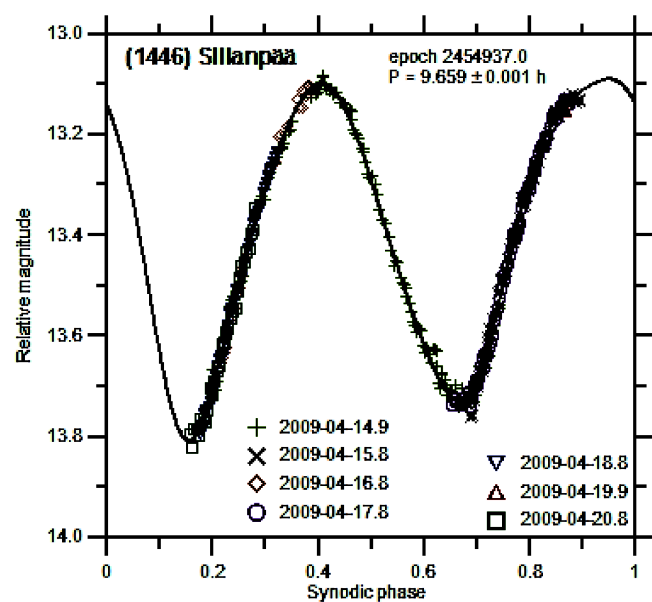
(27204) 1999 CY74 and 44217 Whittle. These asteroids were observed in the same field of view but only on two consecutive nights. Interestingly, the amplitude of their lightcurves was large and even the periods were similar. However, the results are not firm.

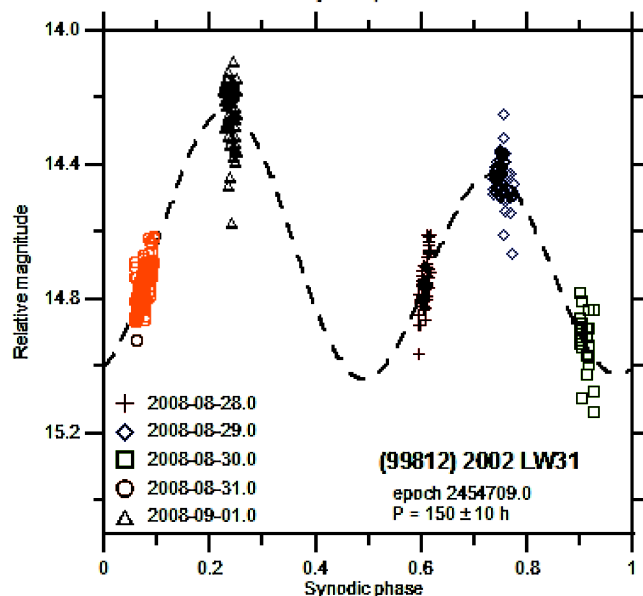
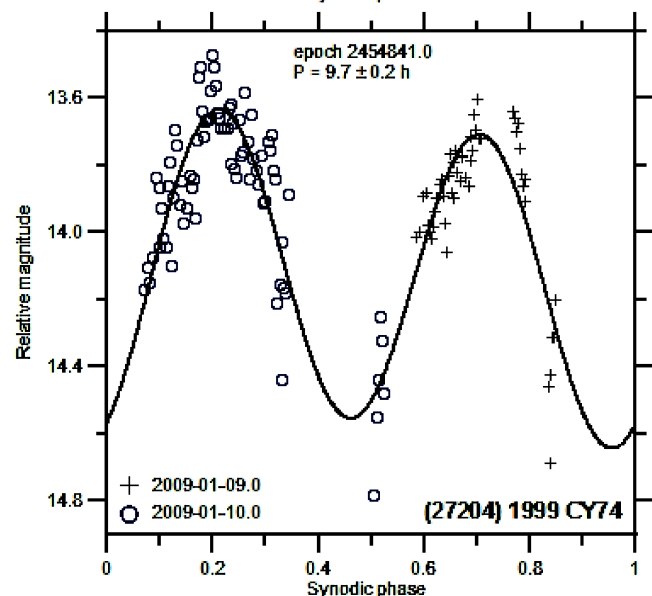
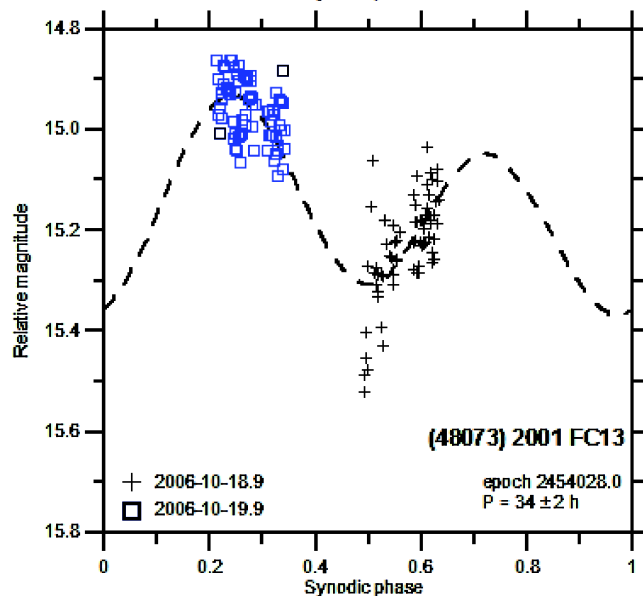
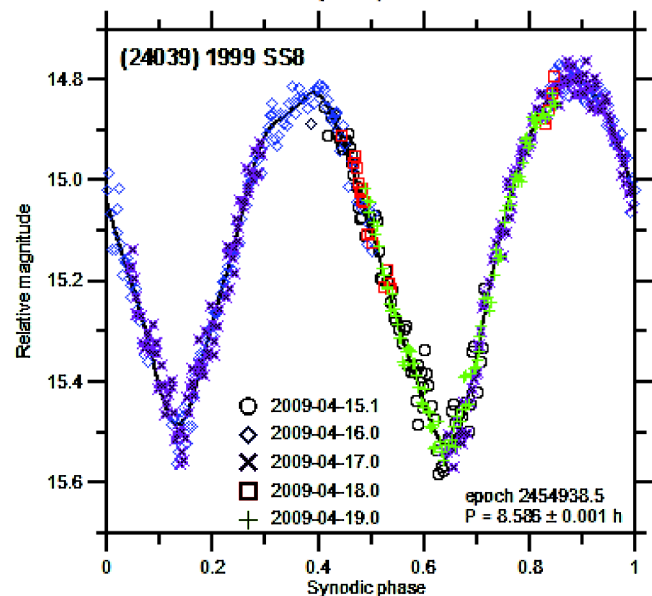
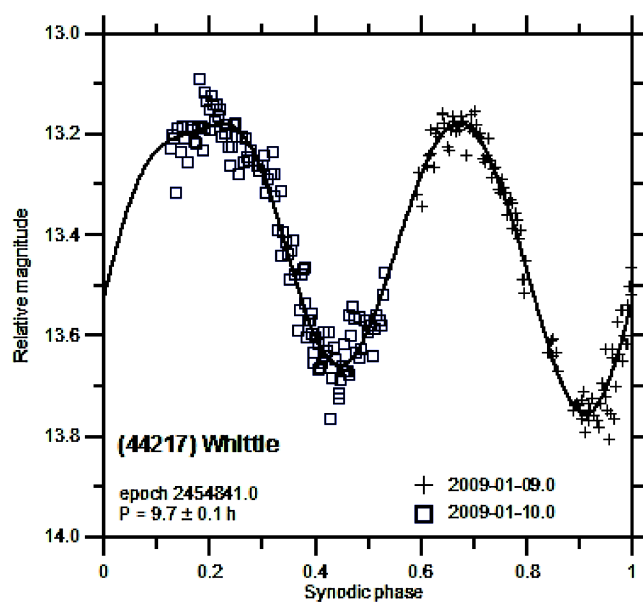
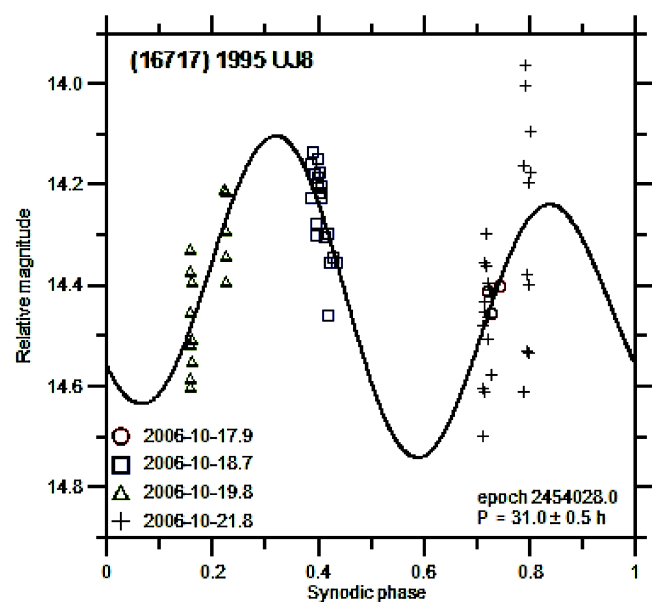
Acknowledgements

I'm grateful to Petr Pravec, Ondřejov Observatory, Czech Republic, for his ALC software used in data analysis. The work was supported by the Slovak Grant Agency for Science VEGA, Grant 2/0016/09 and the Grant Agency of the Czech Republic, Grant 205/09/1107.

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Number	Name	Dates yyyy mm/dd	Phases deg	LPAB deg	BPAB deg	Period [h]	Amp [mag]
1446	Sillapää	2009 04/15–21	14.6–17.4	182	1	9.659 ± 0.001	0.71
2986	Mrinalini	2007 01/15–16	17.0–17.2	61	1	(15.9 ± 0.1)	0.2
4979	Otawara	2009 04/15–20	14.0–16.5	181	1	2.7037 ± 0.0005	0.26
(12815)	1996 DL2	2008 10/18–19	7.4–7.8	7	–4	(15.8 ± 0.3)	(0.5)
(14901)	1992 SH	2009 06/26–07/11	13.4–18.3	255	16	4.0625 ± 0.0003	0.41
(15914)	1997 UM3	2009 01/09–10	27.7–27.9	57	3	12.8 ± 0.1	0.5
(16717)	1995 UJ8	2006 10/18–22	7.6–8.9	9	9	31.0 ± 0.5	0.6
(24039)	1999 SS8	2009 04/15–19	8.1–9.2	215	12	8.586 ± 0.001	0.73
(27204)	1999 CY74	2009 01/09–10	2.8–3.0	114	–5	9.7 ± 0.2	1.0
44217	Whittle	2009 01/09–10	3.3–3.6	114	–5	9.7 ± 0.1	0.58
(48073)	2001 FC13	2006 10/19–20	1.7–2.2	29	2	34 ± 2	(0.5)
(99812)	2002 LW31	2008 08/28–09/01	4.0–5.4	344	6	150 ± 10	0.8

Table I. Asteroids with observation dates, minimum and maximum solar phase angles, phase angle bisector values, derived synodic rotation periods with uncertainties, and lightcurve amplitudes.

LIGHTCURVES FOR FIVE CLOSE APPROACH ASTEROIDS

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Lightcurves for five near-Earth asteroids observed from Great Shefford Observatory during close approaches between 2009 March and 2009 May are reported: (143651) 2003 QO104, 2009 FH, 2009 HM82, 2009 KW2 and 2009 KL8.

Targets with favourable viewing circumstances were selected based on the ongoing NEO astrometric programme being conducted at Great Shefford Observatory (MPC code J95). A 0.40-m Schmidt-Cassegrain (SCT) operating at $f/6$ and an Apogee Alta U47+ CCD camera were used. The CCD was operated at 2x2 binning, resulting in a resolution of 2.16 arcsec/pixel and the camera was cooled to between -30°C and -40°C , depending on the local ambient temperature. All exposures were taken unfiltered and integrations were limited generally by the fast apparent motion of the objects. *MPO Canopus* version 9.5.0.3 (Warner, 2008), incorporating the Fourier algorithm developed by Harris (Harris et al., 1989) was used for image measurement using differential aperture photometry and lightcurve analysis. The fast motion of 2009 FH, 2009 HM82, 2009 KW2 and 2009 KL8 required frequent telescope repositioning and by necessity, many different sets of comparison stars. Each of the four objects has a relatively short rotation period and in all cases two or more rotations occurred for

each field captured. Small adjustments to the zero points of the comparison star sets used for these four objects have been made to reduce the RMS of the fitted lightcurves to a minimum. All lightcurve plots are “phased” according to the period values given below.

(143651) 2003 QO104. Data were collected on 15 nights from 2009 Apr 22 through May 28. This confirms a similar result by Warner et al. (2009) from observations covering significantly more of the lightcurve obtained between 2009 Mar 17 and Apr 19.

2009 FH. This small NEO was observed for over 2 h during a very close approach to Earth when it reached 15^{th} mag. Due to the fast apparent motion integrations were limited to 2 and 4 s.

2009 HM82. Observed for an hour on 2009 May 2 and for 3 hours on May 3/4, 2009 HM82 was relatively faint at 18^{th} mag and this resulted in a very noisy lightcurve. Integrations were between 8 and 16s.

2009 KW2. Although 15^{th} mag when observed during a close approach on 2009 May 24/25 it was at low altitude (12 deg, rising to 19 deg) and integrations were limited to 2 s due to its fast motion. 35 rotations were completed during the 2 hours of observation.

2009 KL8. Observed on 2009 May 31 when it was at its brightest at 18^{th} mag, two days before closest approach. Another noisy lightcurve resulted from the low S/N measurements.

Acknowledgments

The author is indebted to Brian Warner for his work on *MPO Canopus* and his invaluable assistance and support.

#	Name	2009 mm/dd	Data pts	Phase (deg)	PAB _L (deg)	PAB _B (deg)	Per (h)	PE	Amp (mag)	AE
143651	2003 QO104	04/22–05/28	1768	60.7–85.9	184.0	14.9	113.3	0.1	1.4	0.1
	2009 FH	03/17	422	46.7–48.4	153.5	–2.1	0.1073	0.0001	0.33	0.05
	2009 HM82	05/02–05/04	393	25.7–36.1	228.8	16.4	0.1270	0.0001	0.9	0.3
	2009 KW2	05/24–05/25	916	6.1–9.5	247.5	1.1	0.05686	0.00008	0.67	0.15
	2009 KL8	05/31	580	74.2–75.4	249.5	38.3	0.0447	0.0001	0.75	0.25

Table I. Observing circumstances, including observation dates, phase angle range, average phase angle bisector longitude and latitude, derived synodic rotation period with error estimate, lightcurve amplitude with error estimate.