Supplementary Material

Asteroid clusters similar to asteroid pairs

Photometric observations of asteroid cluster members

We carried out photometric observations using our standard asteroid lightcurve photometry techniques. The data were corrected for light-travel time and standard calibration with bias, dark and flatfield frames was applied to all images. We analysed the observations using our methods described in Pravec et al. (2006).

The individual observing sessions in the Supplementary Information are identified with the date given to the nearest 10th of a day to the midtime of the session's observational interval. All dates and times in Suppl. Fig. 1 to 29 are asterocentric JD (UTC), i.e., they were light-time corrected. In Suppl. Table 1, there are listed the participating observatories, instruments and observers. We give references and descriptions of observational procedures on the individual observatories in following. The original digital data are available at `http://www.asu.cas.cz/~ppravec/astclusters_201702_lc_data.zip`

Abastumani – The observations at the Abastumani Astrophysical Observatory were carried out with the 0.7-m meniscus Maksutov telescope with FLI IMG6303E CCD camera in the primary focus (f/3). Observational method and reduction procedures at Abastumani were the same as we used at Simeiz (see below). The observations were made without filter.

Kharkiv – CCD photometry was done with the 0.7-m reflector at Chuguev Observatory of Kharkiv National University using the CCD camera IMG 47-10 (1056 × 1027 pixels, 13 × 13 μm pixel) installed in Newtonian focus (f/4) equipped with a 3-lens focal corrector (0.951 arcsec/pixel, FOV 16.7×16.3 arcmin^2). The method of observations and data reduction were described in Krugly et al. (2002).

La Silla – For observations with the Danish 1.54-m telescope, we used the same or analogous procedures as those we used for observations from Ondřejov (see below) and for observations of Apophis (Pravec et al., 2014).

Maidanak – Observations were carried out at Maidanak Astronomical Observatory (Uzbekistan) with 1.5-m telescope AZT-22 (Cassegrain f/7.7), equipped with back-illuminated Fairchild 486 CCD camera (4096 × 4096 CCD, 15 × 15 μm pixel, 0.27 arcsec/pixel, FOV 18.4 × 18.4 arcmin^2). The observations were carried out unfiltered to get higher S/N and they were reduced in the

standard way with master-bias subtracting and median flat-field dividing. The aperture photometry of the asteroid and comparison stars in the images was done with the ASTPHOT package developed at DLR (Mottola et al. 1995). The effective radius of aperture was equal to $1-1.5\times$ the seeing that included more than 90% of the flux of a star or the asteroid. The relative photometry of the asteroid was done with typical errors in a range of 0.02–0.03 mag using an ensemble of comparision stars.

Modra – Observational system, data analysis and reduction process are described in Galád et al. (2007) and later they made use of tools provided by Astrometry.net (Lang et al. 2010).

Nauchny – Procedures of observations and image reduction with the 2.6-m telescope of the Crimean Astrophysical Observatory were largely the same as we used at Kharkiv (see above). The CCD camera FLI PL4240 was used in the primary focus of the telescope (f/3.85). We observed without filter. During night the telescope was shifted several times between exposures in different directions. The night images were used for constructing a median flatfield (sky flat). The image reduction includes dark removal and correction using the sky flat.

Ondřejov – Observational system, data analysis and reduction process are described in Pravec et al. (2006).

Rozhen – At the Rozhen National Astronomical Observatory (Bulgaria), the observations were carried out with the 2-m Ritchey-Chretien reflector using CCD camera VersArray1300B (1340×1300 pixels, 20×20 μm pixel) installed with a focal reducer FoReRo2 in the Cassegrain focus. The field of view was about 15 arcmin. The method of asteroid observations and reduction is described in Krugly et al. (2002). The observations were done through the standard R filter and reduced by means of subtracting a master-bias and normalizing on a median master-flat. The ASTPHOT package developed at DLR (Mottola et al. 1995) was used for aperture photometry of asteroid. Absolute photometry was done using observed standard stars with colors close to the solar ones taken from Skiff (2007). An accuracy of calibrated photometry is typically around 0.03 mag.

Simeiz – The observations were carried with a 1-m Ritchey-Chrétien telescope at Simeiz Department of the Crimean Astrophysical Observatory using camera FLI PL09000. The observations were made in the Johnson-Cousins photometric system. Standard procedure of image reduction included dark removal and flatfield correction. The aperture photometry was done with the AstPhot package described in Mottola et al. (1995). The differential lightcurves were calculated with respect to an ensemble of comparison stars by the method described in Erikson et al. (2000) and Krugly (2004).

Skalnaté Pleso – The photometric observations at the Skalnaté Pleso Observatory were carried with the 0.61-m f/4.3 reflector through the Cousins R filter and SBIG ST-10XME with 3×3 binning with resolution of 1.6 arcsec/px. CCD frames were reduced in standard way using bias, dark and flat field

frames with IRAF tools. The images were photometrically reduced using the procedure described in Husárik and Kušnirák (2008).

SRO – The Sonoita Research Observatory (SRO) observations were collected with a 0.5-m folded Newtonian operating at f/4 and an SBIG STL-6303E with an image scale of 0.92 arcsec/pixel. The system was mounted on a Software Bisque Paramount ME. Image acquisition and observatory control are automated via DC-3 Dreams ACP. Integration times were 300 sec and images were unfiltered. The images were dark subtracted and flat fielded, then reduced using MIRA. The differential photometry was performed against an ensemble of comparison stars for (11842) Kap'bos and against single comparison stars for (16598) Brugmansia. The images were examined for interfering stars and those images were discarded.

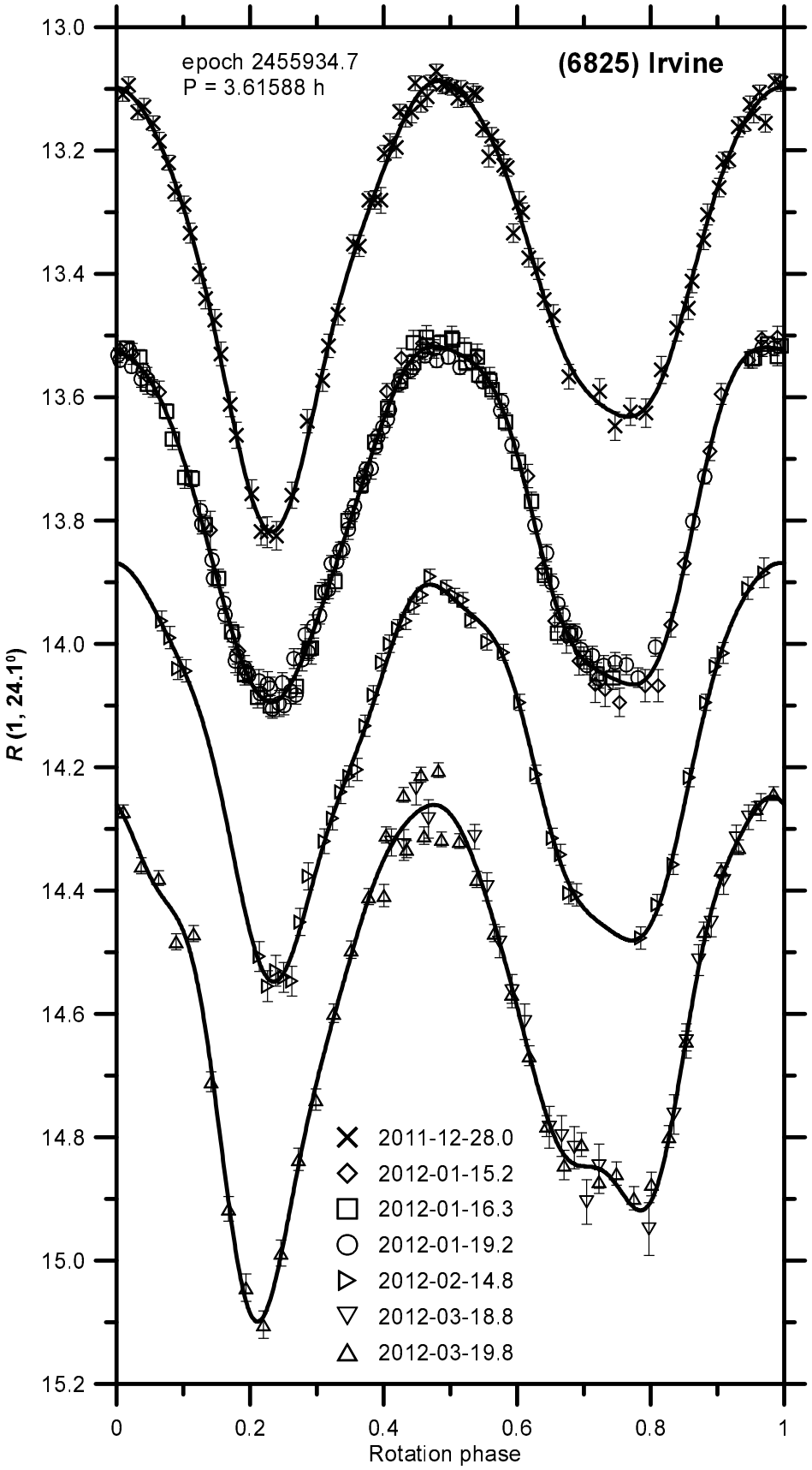
Sugarloaf Mountain – Observations at Sugarloaf Mountain Observatory were made using a 0.5-m, f/4.0 reflector on a Paramount ME mount. The imaging CCD was a SBIG ST-10XME cooled to -15°C, where images were taken through a clear filter. The image scale was 1.38 arcsec/pixel, and the fov was 25.0×16.8 arcmin^2. Derived magnitudes were estimated using a method inherent in the analysis software, *MPO Canopus*. The method is based on referencing a hybrid star catalog consisting mostly of 2MASS stars in the V band. Images were calibrated using master bias, dark and flat field images.

Suppl. Table 1
Observatories, Instruments and Observers/Reducers

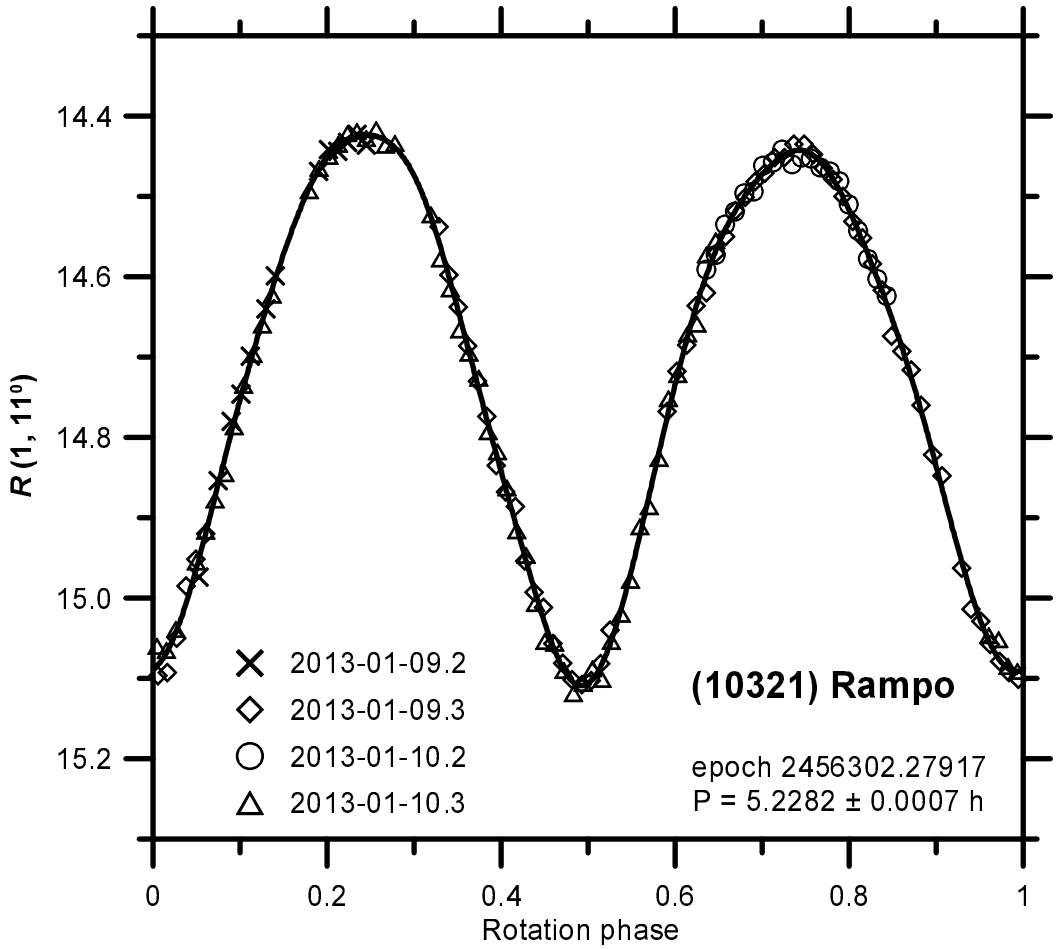
Observatory	**Telescope**	**Diameter (m)**	**Observers/Reducers**
Abastumani		0.7	Inasaridze, Krugly, Kvaratskhelia, Ayvazian, Zhuzhunadze
Kharkiv		0.7	Krugly
La Silla	Danish	1.54	Pravec, Kušnirák, Hornoch, Galád, Fatka
Maidanak		1.5	Krugly, Burkhonov, Ehgamberdiev
Modra		0.60	Galád, Világi, Gajdoš, Kornoš
Nauchny		2.6	Rumyantsev, Krugly
Ondřejov		0.65	Kušnirák, Hornoch, Vraštil
Rozhen		2.0	Donchev, Borisov, Bonev, Krugly
Simeiz		1.0	Gaftonyuk, Krugly
Skalnaté Pleso		0.61	Husárik, Pikler, Červák
SRO		0.5	Cooney, Gross, Terrell
Sugarloaf Mountain		0.50	Pray

(6825) Irvine

We observed this asteroid from Sugarloaf Mountain, Skalnaté Pleso, Modra, Ondřejov and Abastumani on 7 nights during 2011-12-28 to 2012-03-19. The Ondřejov run of 2012-03-18.8 was absolutely calibrated in the Cousins R system using Landolt (1992) standards to an accuracy level of 0.015 mag; the observations from the other stations were on relative (differential) magnitude scales. We derived a period of 3.61589 ± 0.00005 h. The lightcurve amplitude evolved, apparently in correlation with solar phase: it was 0.58 mag at solar phase 5° to 0.85 mag at solar phase 24° . The asteroid's mean absolute R magnitude is $H_R = 13.58 \pm 0.14$, assuming the slope parameter $G = 0.24 \pm 0.11$. These our results compare well to those obtained by Waszczak et al. (2015) in 2012: They observed a period of $P = 3.6156 \pm 0.0012$ h with an amplitude of 0.70 mag. Our lightcurve data are shown in Suppl. Fig. 1.



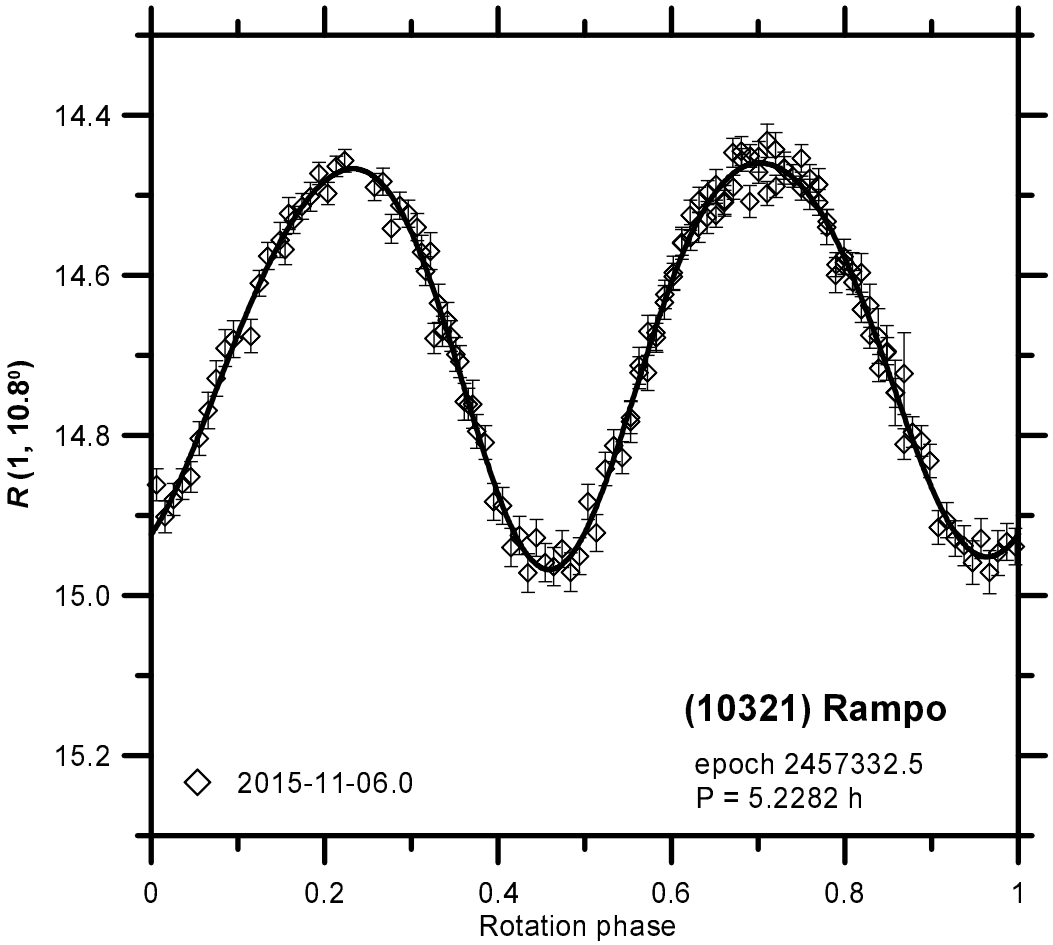
Suppl. Fig. 1. Rotational lightcurves of (6825) Irvine. The absolute R magnitude scale refers to the calibrated 2012-03-18.8 data (the bottom curve); the other data are on relative magnitude scales and their composite lightcurves were shifted in magnitude for clarity.



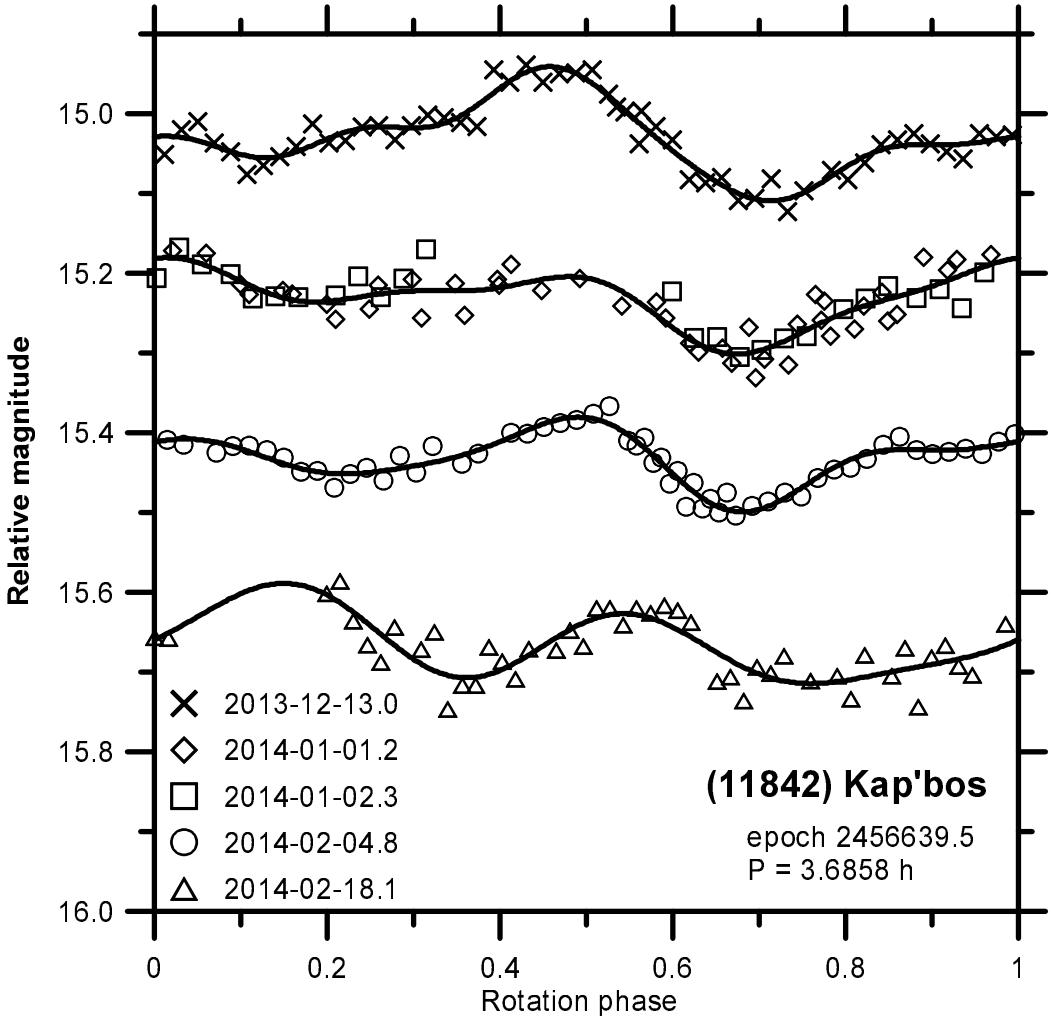
Suppl. Fig. 2. Rotational lightcurve of (10321) Rampo in 2013.

(10321) Rampo

We observed this asteroid from La Silla on 2 nights 2013-01-09 and 10 and from Ondřejov on 1 night 2015-11-06. The observations were absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01–0.02 mag. From the 2013 observations, we derived a period of 5.2282 ± 0.0007 h. The lightcurve amplitude was 0.69 mag on 2013-01-09 to 10 and 0.51 mag on 2015-11-06. On 2013-01-09.3 we measured the color index $(V - R) = 0.500 \pm 0.01$. The mean absolute R magnitude was $H_R = 14.11 \pm 0.09$ and 14.08 ± 0.09 in 2013 and 2015, respectively, both derived assuming $G = 0.24 \pm 0.11$. Our lightcurve data are shown in Suppl. Figs. 2 and 3.



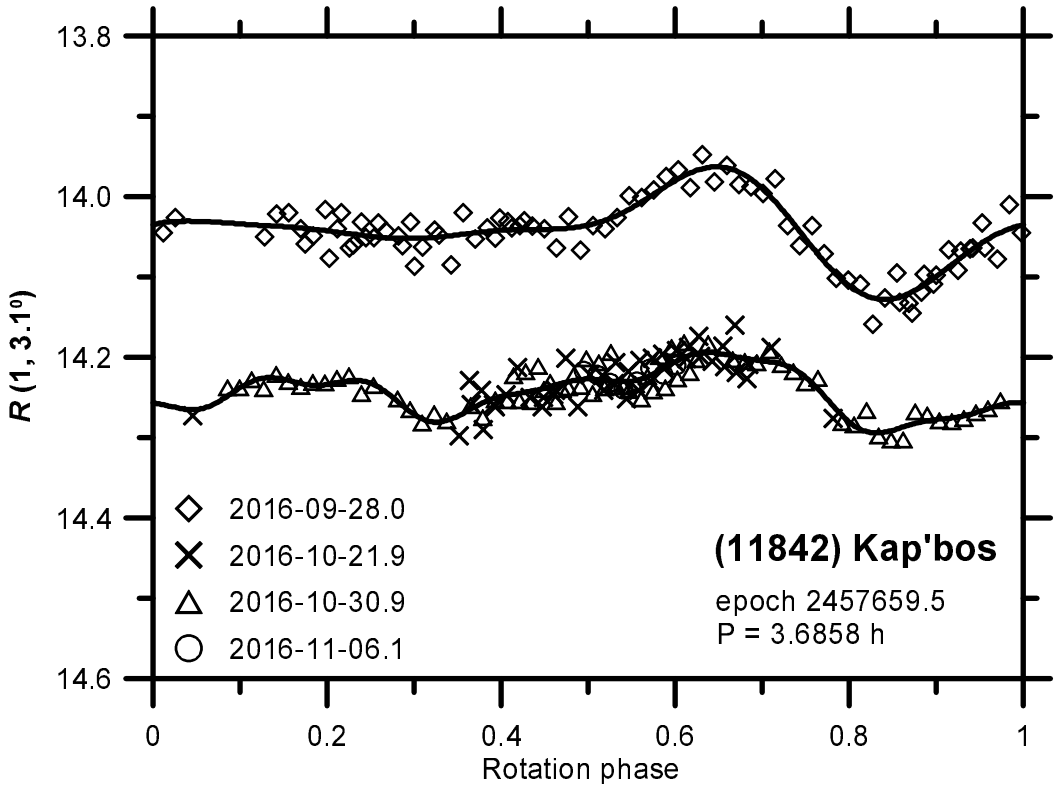
Suppl. Fig. 3. Rotational lightcurve of (10321) Rampo in 2015.



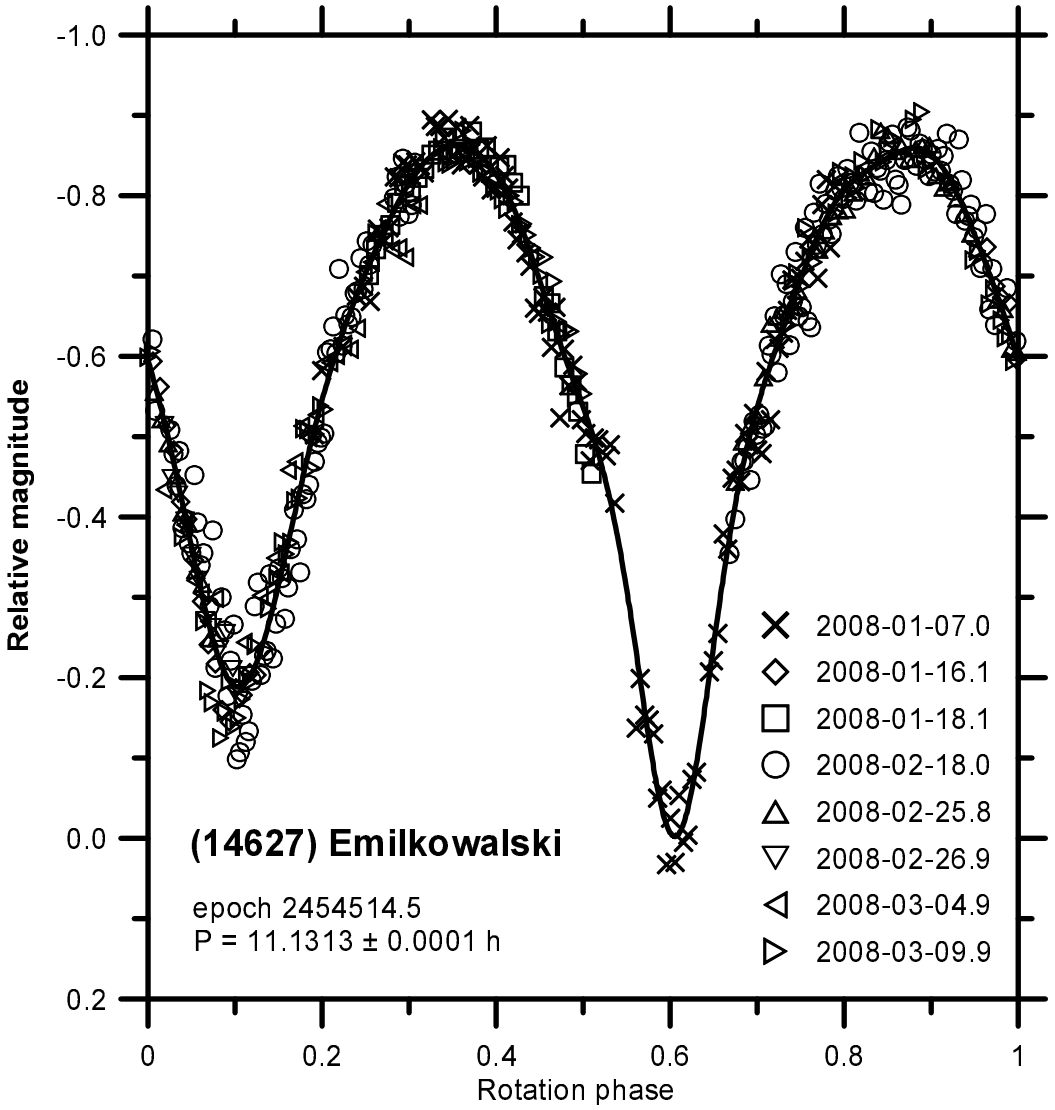
Suppl. Fig. 4. Rotational lightcurve of (11842) Kap'bos in 2013.

(11842) Kap'bos

We observed this asteroid from Simeiz, Sugarloaf Mountain and SRO on 5 nights during 2013-12-13 to 2014-02-18 and from La Silla and Ondřejov on 4 nights during 2016-09-28 to 11-06. The La Silla run of 2016-11-06 was absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01 mag; the observations from the other stations were on relative (differential) magnitude scales. They are consistent with the period 3.68578 ± 0.00009 h by Pravec et al. (2010). The lightcurve amplitude evolved, apparently in correlation with solar phase: it was 0.10 mag at solar phase 6° to 0.17 mag at solar phase 21°. Our lightcurve data are shown in Suppl. Figs. 4 to 5.



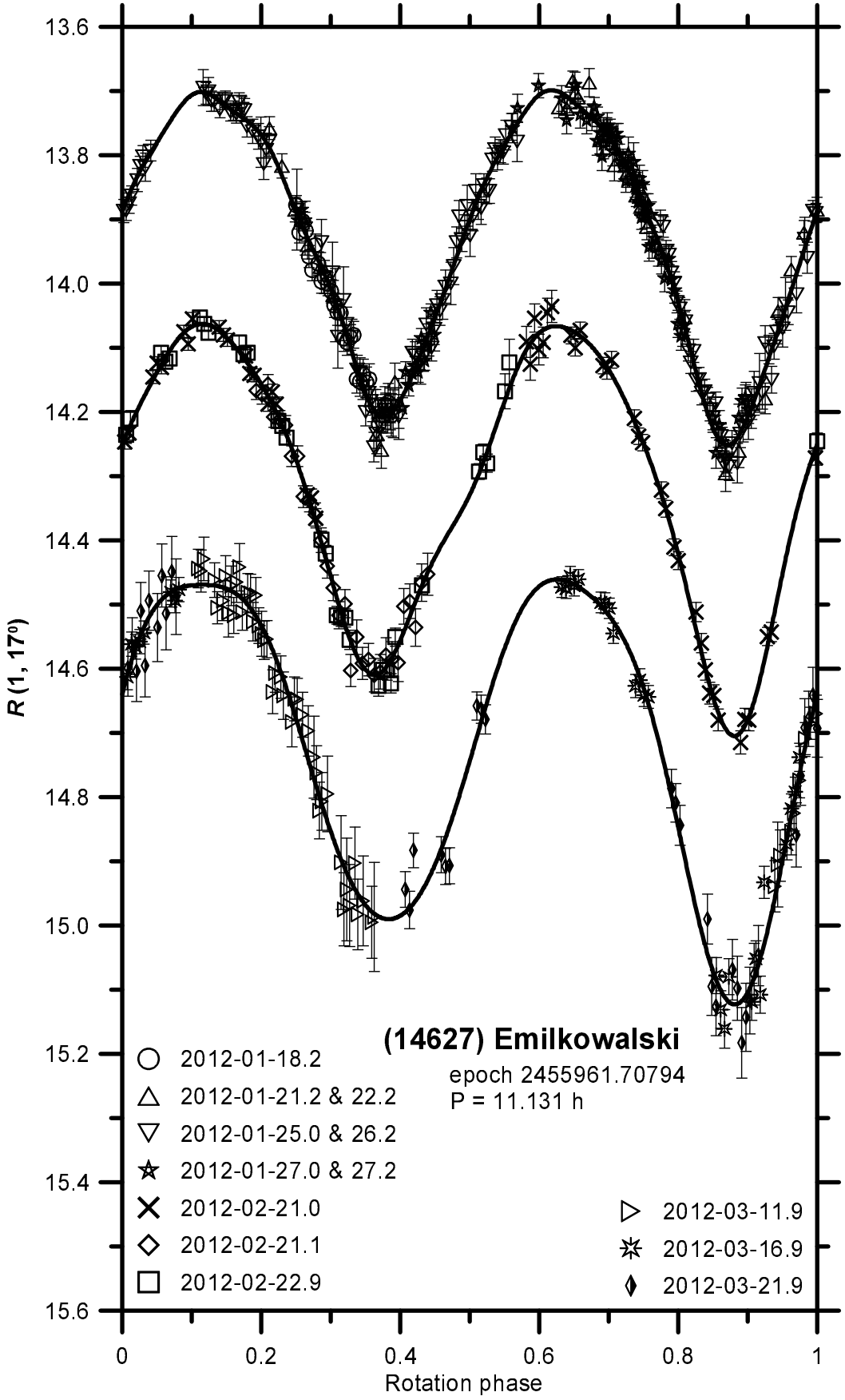
Suppl. Fig. 5. Rotational lightcurve of (11842) Kap'bos in 2016. The absolute R magnitude scale refers to the calibrated 2016-11-06.1 data (the bottom curve); the other data are on relative magnitude scales and they were shifted in magnitude for clarity.



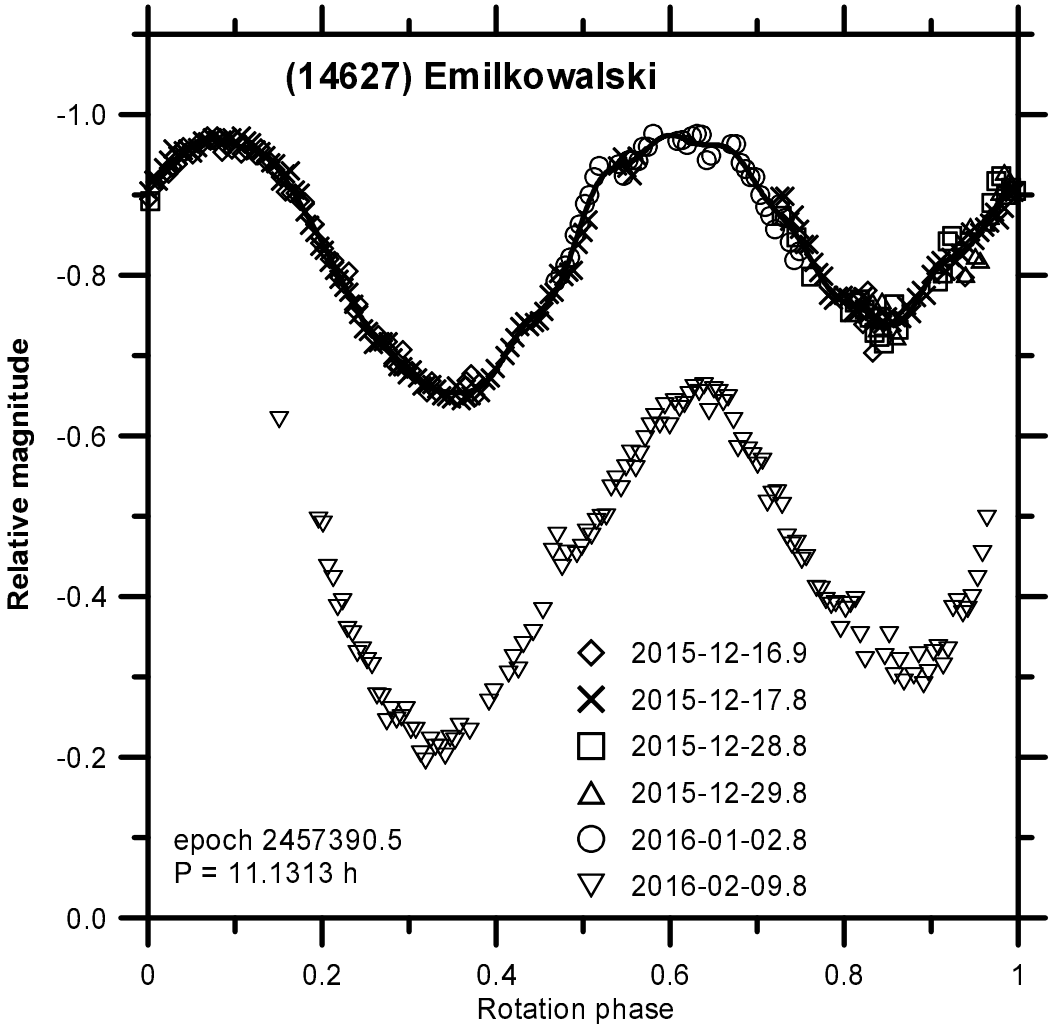
Suppl. Fig. 6. Rotational lightcurve of (14627) Emilkowalski in 2008.

(14627) Emilkowalski

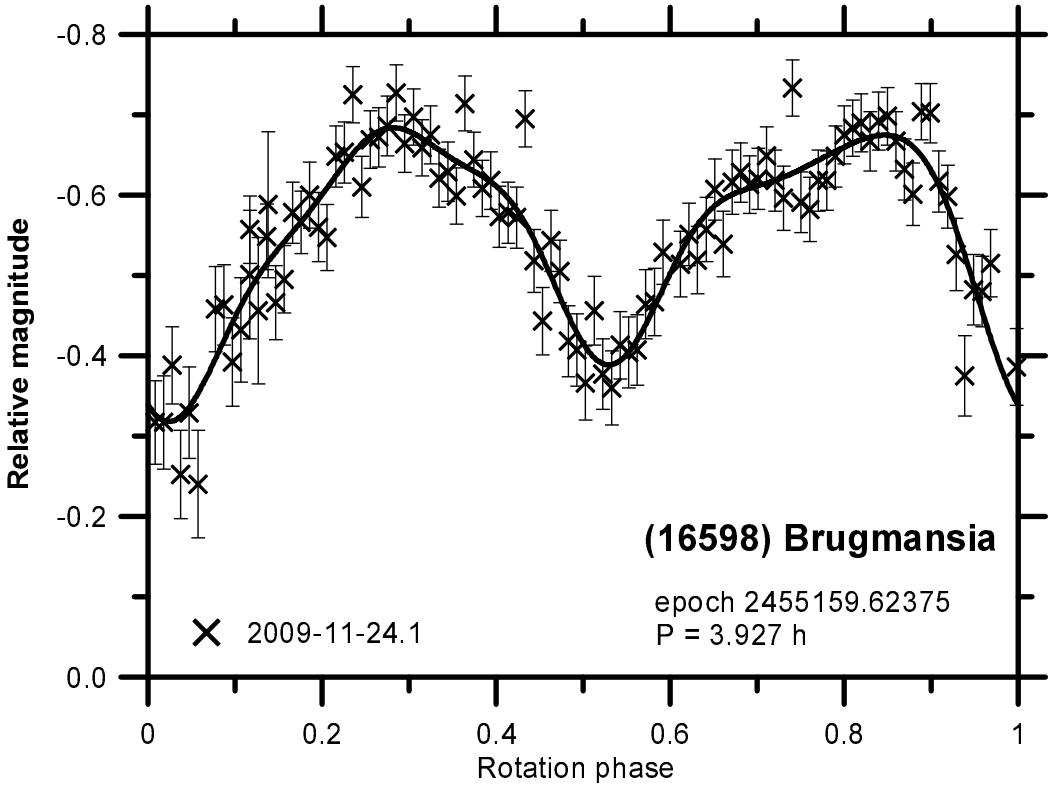
We observed this asteroid from Simeiz and Kharkiv on 8 nights during 2008-01-07 to 03-09, from Ondřejov, Modra, Sugarloaf Mountain, Skalnaté Pleso and Abastumani on 13 nights during 2012-01-18 to 03-21, and from Abastumani on 6 nights during 2015-12-16 to 2016-02-09. The Ondřejov observations were absolutely calibrated in the Cousins R system using Landolt (1992) standards to an accuracy level of 0.015–0.02 mag; the observations from the other stations were on relative (differential) magnitude scales. We derived a period of 11.1313 ± 0.0001 h (synodic-sidereal uncertainty ± 0.0009 h) and 11.131 ± 0.002 h from the 2008 and 2012 observations, respectively. The lightcurve amplitude changed, it was between 0.32 mag during 2015-12-16 to 2016-01-02 and 0.86 mag on 2008-01-07. We derived the asteroid's mean absolute R magnitude $H_R = 13.15 \pm 0.05$ and the slope parameter $G = -0.05 \pm 0.03$. Our lightcurve data are shown in Suppl. Figs. 6 to 8.



Suppl. Fig. 7. Rotational lightcurves of (14627) Emilkowalski in 2012. The magnitude scale refers to the middle composite lightcurve, the other two were shifted by −0.4 and +0.4 mag, for clarity.



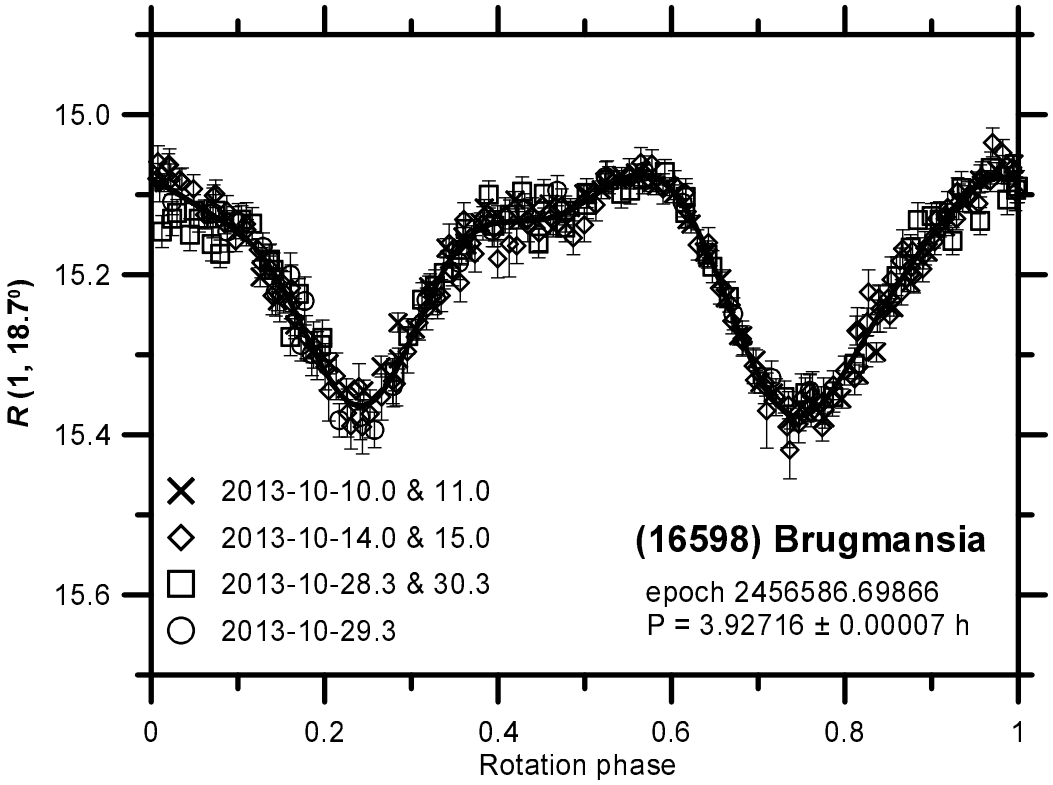
Suppl. Fig. 8. Rotational lightcurves of (14627) Emilkowalski in 2015–2016.



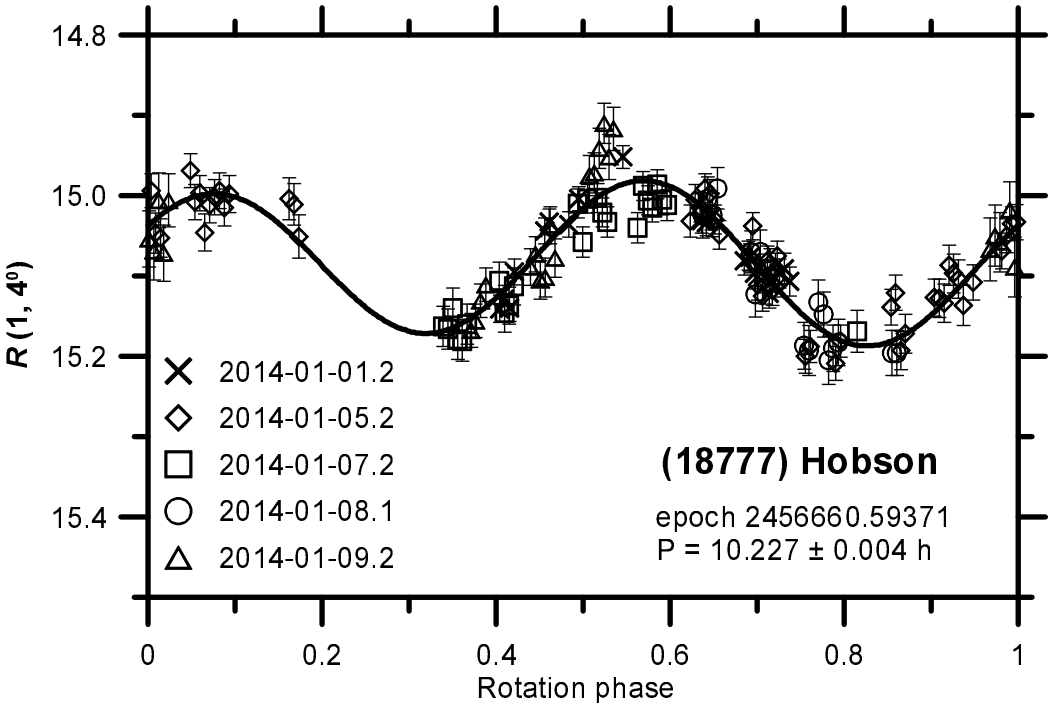
Suppl. Fig. 9. Rotational lightcurve of (16598) Brugmansia in November 2009.

(16598) Brugmansia

We observed this asteroid from Simeiz on 2009-11-24 and from Ondřejov, Abastumani, SRO and Sugarloaf Mountain on 7 nights during 2013-10-10 to 30. The Ondřejov observations were absolutely calibrated in the Cousins R system using Landolt (1992) standards to an accuracy level of 0.015 mag; the observations from the other stations were on relative (differential) magnitude scales. We derived a period of 3.9272 ± 0.0003 h with a lightcurve amplitude of 0.30 mag in October 2013, while it was 0.37 mag on 2009-11-24. The asteroid's mean absolute R magnitude is $H_R = 14.24 \pm 0.24$, assuming the slope parameter $G = 0.15 \pm 0.20$. Our lightcurve data are shown in Suppl. Figs. 9 to 10.



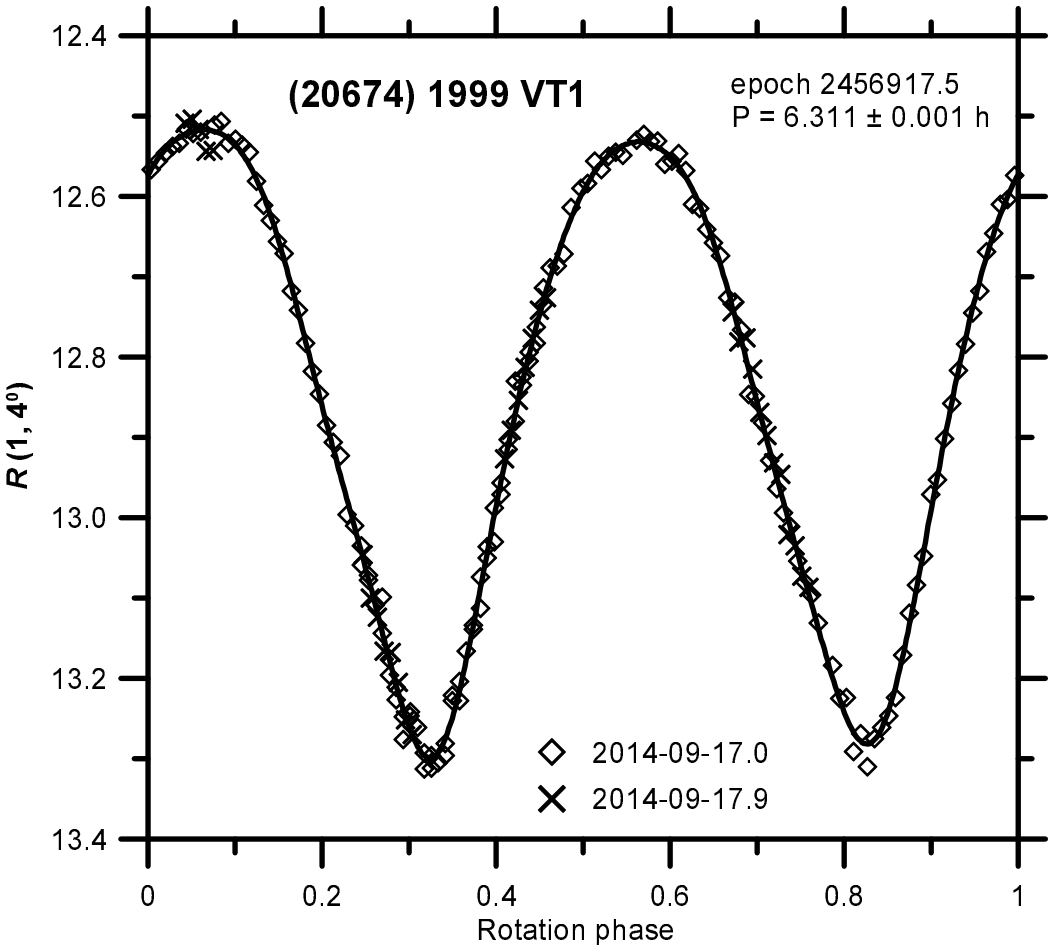
Suppl. Fig. 10. Rotational lightcurve of (16598) Brugmansia in October 2013.



Suppl. Fig. 11. Rotational lightcurve of (18777) Hobson.

(18777) Hobson

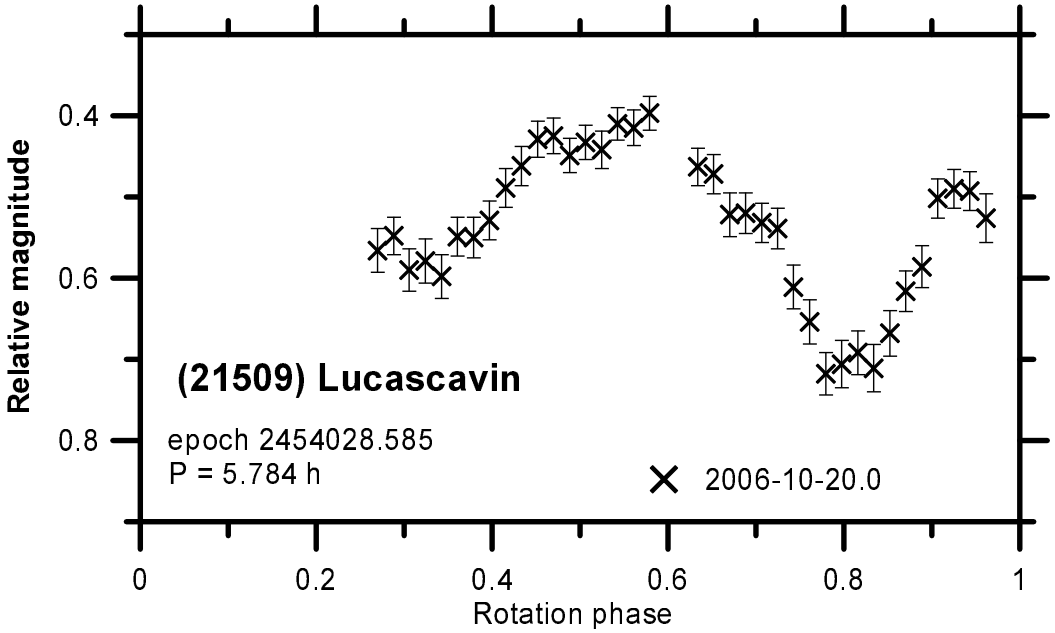
We observed this asteroid from La Silla on 5 nights during 2014-01-01.2 to 09.2. The observations were absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01–0.015 mag. We derived a period of 10.227 ± 0.004 h with a lightcurve amplitude of 0.21 mag. For the period derivation, we assumed it is a lightcurve with two pairs maxima/minima per period. There is a small but not zero probability that it has actually four maxima/minima per period (see Harris et al. 2014) and in such case the rotation period is twice the derived period above. On 2014-01-01 we measured the color index $(V - R) = 0.477 \pm 0.01$. We derived the asteroid's mean absolute R magnitude $H_R = 14.68 \pm 0.04$ and the slope parameter $G = 0.08 \pm 0.10$. Our lightcurve data are shown in Suppl. Fig. 11.



Suppl. Fig. 12. Rotational lightcurve of (20674) 1999 VT1.

(20674) 1999 VT1

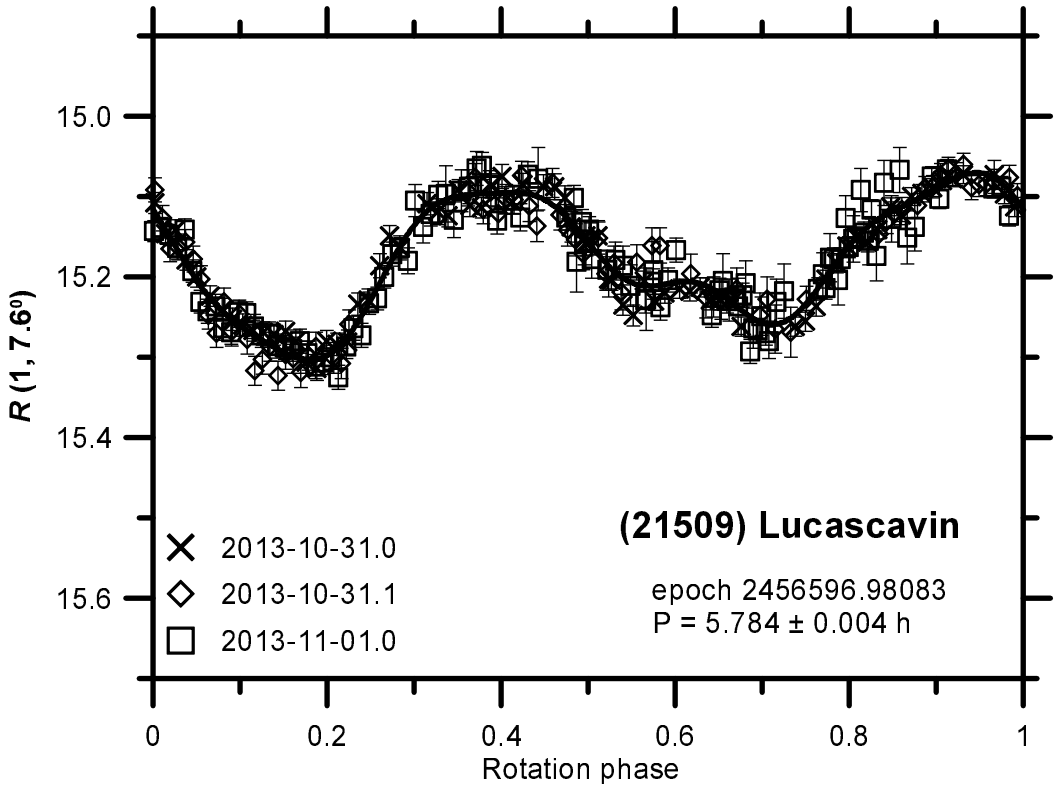
We observed this asteroid from Ondřejov on 2 nights 2014-09-17.0 and 17.9. The observations were absolutely calibrated in the Cousins R system using Landolt (1992) standards to an accuracy level of 0.01 mag. We derived a period of 6.311±0.001 h with a lightcurve amplitude of 0.78 mag. The asteroid's mean absolute R magnitude is $H_R = 12.43 \pm 0.03$, assuming the slope parameter $G = 0.12 \pm 0.08$. Our lightcurve data are shown in Suppl. Fig. 12.



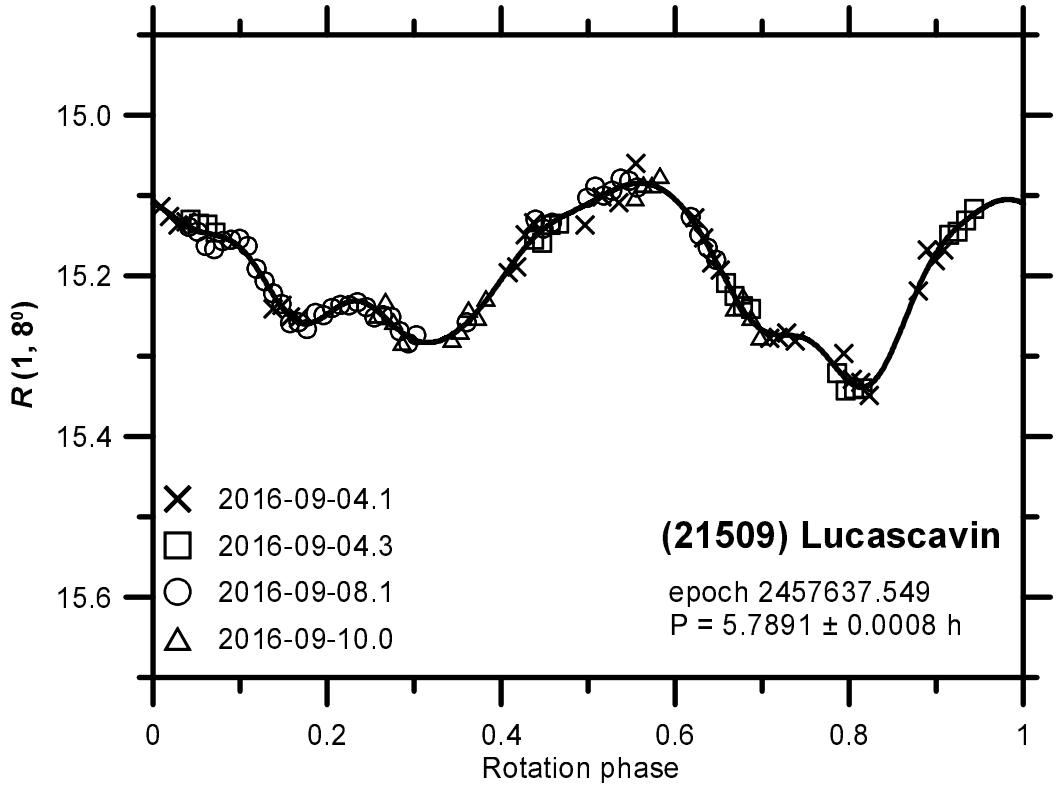
Suppl. Fig. 13. Rotational lightcurve of (21509) Lucascavin in 2006.

(21509) Lucascavin

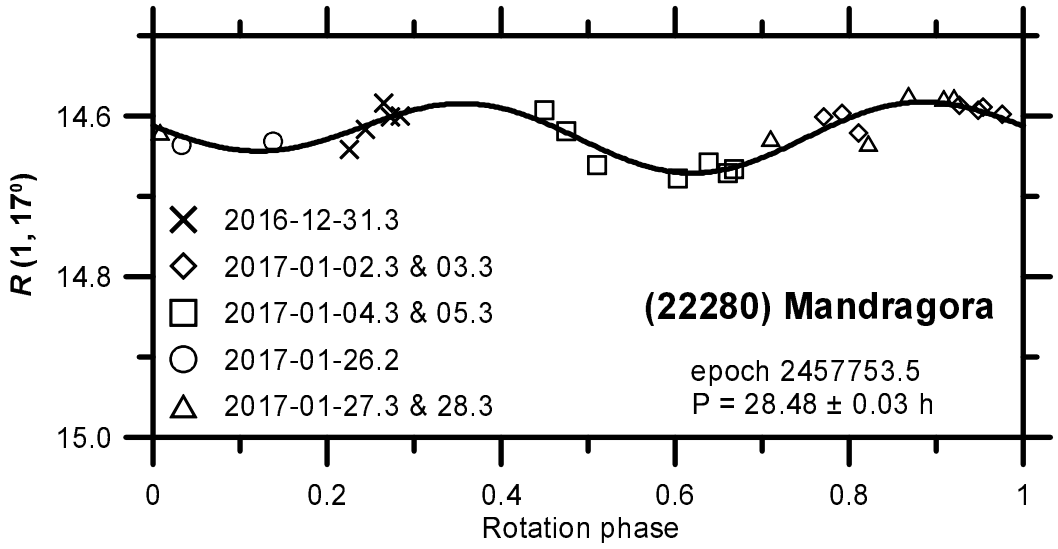
We observed this asteroid from Simeiz on 2006-10-20, from Ondřejov and Simeiz on 3 nights 2013-10-30, 31 and 11-01 and from La Silla on 3 nights 2016-09-04, 08 and 10. The La Silla and Ondřejov observations were absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01 mag; the Simeiz runs were taken on relative (differential) magnitude scales. We derived periods of 5.784 ± 0.004 h and 5.7891 ± 0.0008 h with lightcurve amplitudes of 0.23 and 0.25 mag in 2013 and 2016, respectively. The amplitude was ≥ 0.30 mag on 2006-10-20. On 2016-09-04.0 we measured the color index $(V - R) = 0.474 \pm 0.016$. The mean absolute R magnitude was $H_R = 14.67 \pm 0.07$ and 14.68 ± 0.07 in 2013 and 2016, respectively, both derived assuming $G = 0.24 \pm 0.11$. Our lightcurve data are shown in Suppl. Figs. 13 to 15.



Suppl. Fig. 14. Rotational lightcurve of (21509) Lucascavin in 2013.



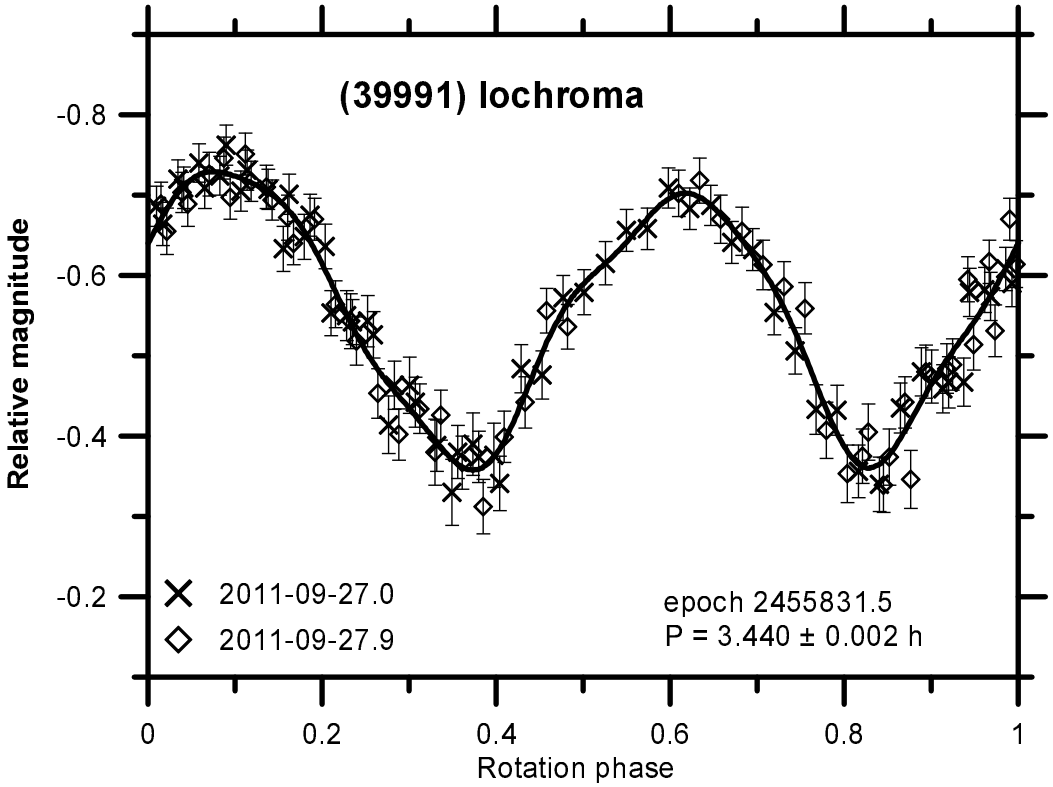
Suppl. Fig. 15. Rotational lightcurve of (21509) Lucascavin in 2016.



Suppl. Fig. 16. Rotational lightcurve of (22280) Mandragora.

(22280) Mandragora

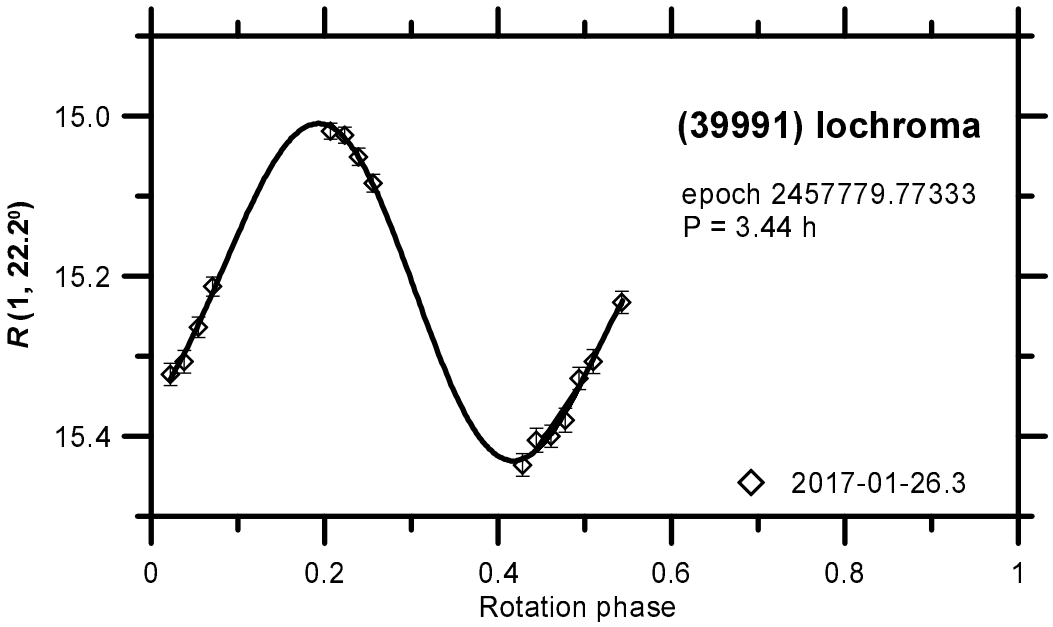
We observed this asteroid from La Silla on 8 nights during 2016-12-31 to 2017-01-28. The observations were absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01 mag. We derived a likely period of 28.48 ± 0.03 h with a lightcurve amplitude of 0.09 mag. For the low amplitude, this is an $U = 2$ result; we cannot rule out other periods with different numbers of maxima/minima per rotation. On 2016-12-31.4 we measured the color index $(V-R) = 0.405 \pm 0.012$. We derived the asteroid's mean absolute R magnitude $H_R = 13.62 \pm 0.07$ and the slope parameter $G = 0.07 \pm 0.05$. Our lightcurve data are shown in Suppl. Fig. 16.



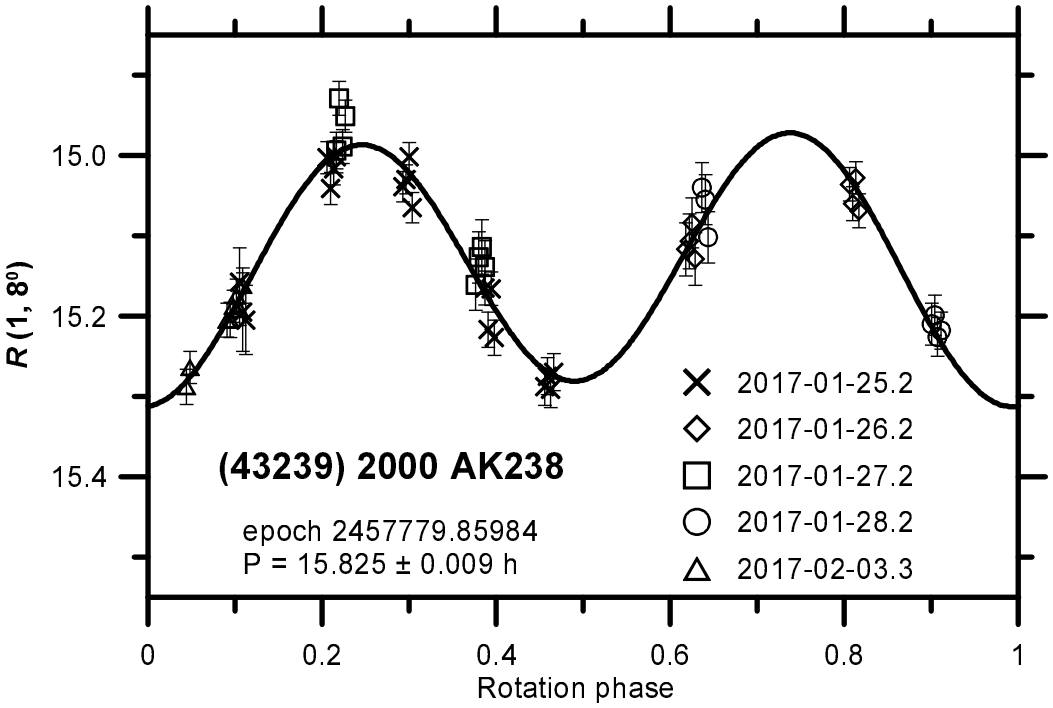
Suppl. Fig. 17. Rotational lightcurve of (39991) Iochroma in 2011.

(39991) Iochroma

We observed this asteroid from Skalnaté Pleso on 2 nights 2011-09-27.0 and 27.9 and on La Silla on 2017-01-26.3. While the La Silla observations were absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01 mag, the Skalnaté Pleso observations were on relative (differential) magnitude scales. We derived a period of 3.440± 0.002 h with a lightcurve amplitude of 0.37 mag from the 2011 data. On 2017-01-26 we measured the color index $(V - R) = 0.510 \pm 0.012$. We derived the asteroid's mean absolute R magnitude $H_R = 14.28 \pm 0.14$, assuming the slope parameter $G = 0.24 \pm 0.11$. Our lightcurve data are shown in Suppl. Figs. 17 and 18.



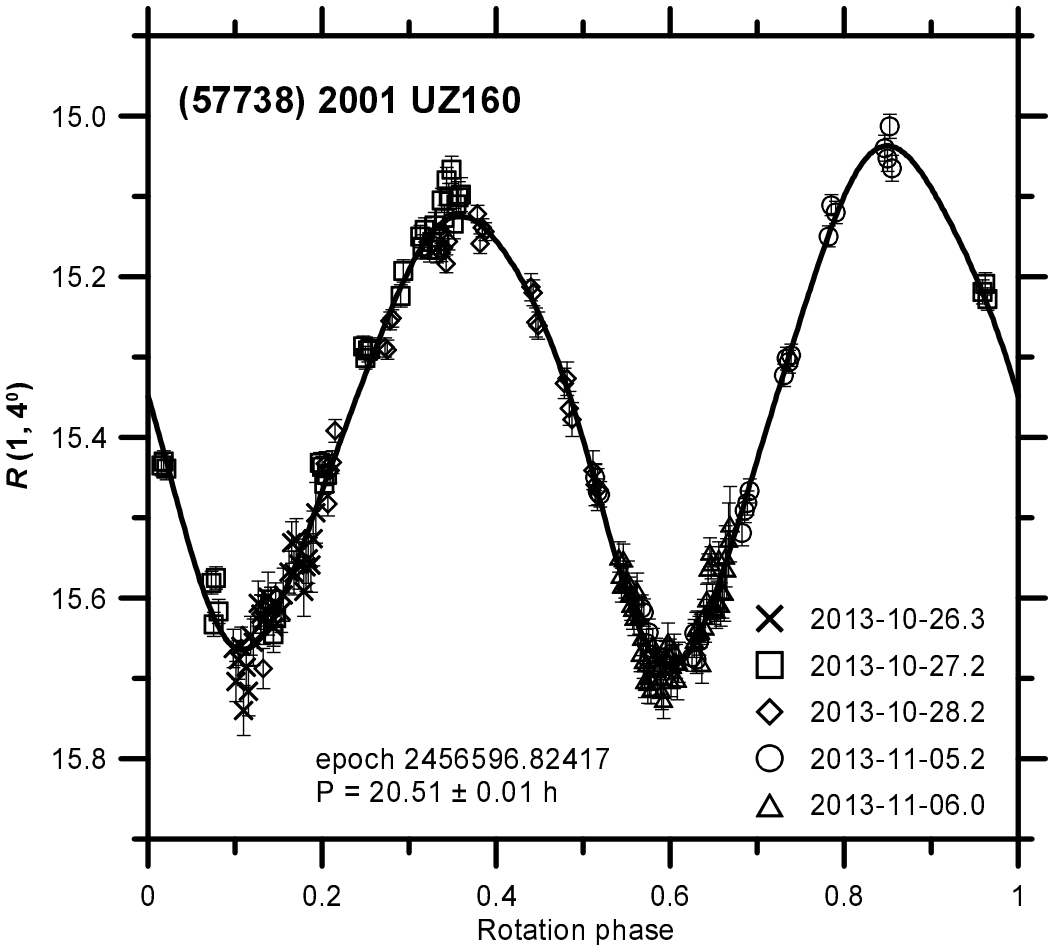
Suppl. Fig. 18. Rotational lightcurve of (39991) Iochroma in 2017.



Suppl. Fig. 19. Rotational lightcurve of (43239) 2000 AK238.

(43239) 2000 AK238

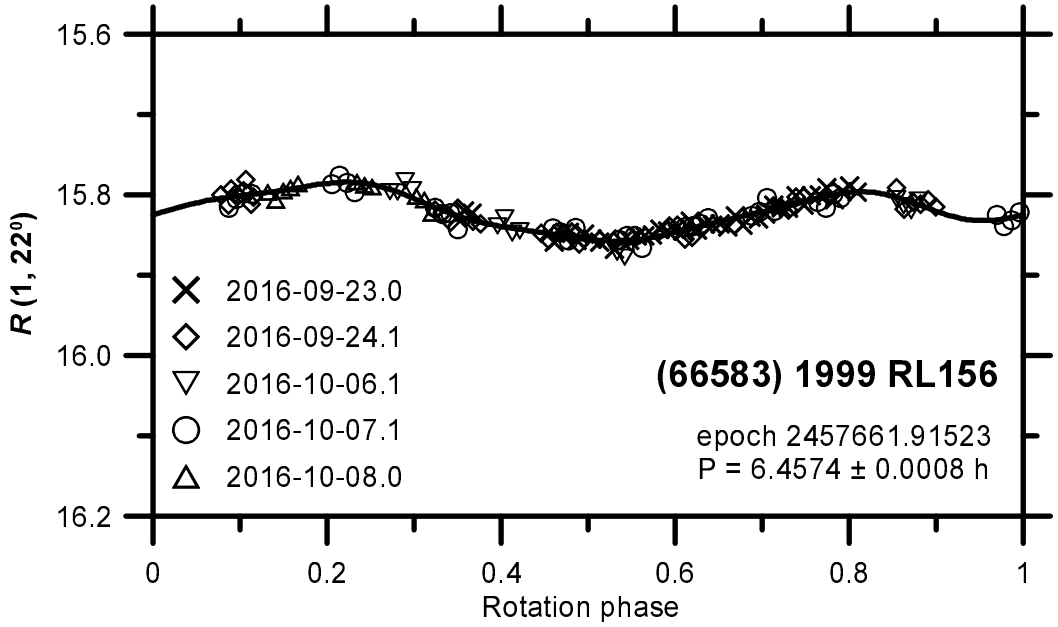
We observed this asteroid from La Silla on 5 nights during 2017-01-25 to 02-03. The observations were absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01–0.015 mag. We derived a period of 15.825±0.009 h (U = 3-) with a lightcurve amplitude of 0.34 mag. On 2017-02-03 we measured the color index $(V-R) = 0.396 \pm 0.017$. We derived the asteroid's mean absolute R magnitude $H_R = 14.50 \pm 0.04$, assuming the cluster primary's slope parameter $G = 0.07 \pm 0.05$ (see the section on 22280 above). Our lightcurve data are shown in Suppl. Fig. 19.



Suppl. Fig. 20. Rotational lightcurve of (57738) 2001 UZ160.

(57738) 2001 UZ160

We observed this asteroid from La Silla on 4 nights during 2013-10-26.3 to 11-05.2 and from Nauchny on night 2013-11-06.0. The La Silla observations were absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01 mag, while the observations from Nauchny were taken on a relative (differential) magnitude scale. We derived a period of 20.51 ± 0.01 h with a lightcurve amplitude of 0.65 mag. On 2013-10-26 we measured the color index $(V - R) = 0.46 \pm 0.02$. We derived the asteroid's mean absolute R magnitude $H_R = 14.95 \pm 0.04$, assuming the slope parameter $G = 0.08 \pm 0.10$. Our lightcurve data are shown in Suppl. Fig. 20.



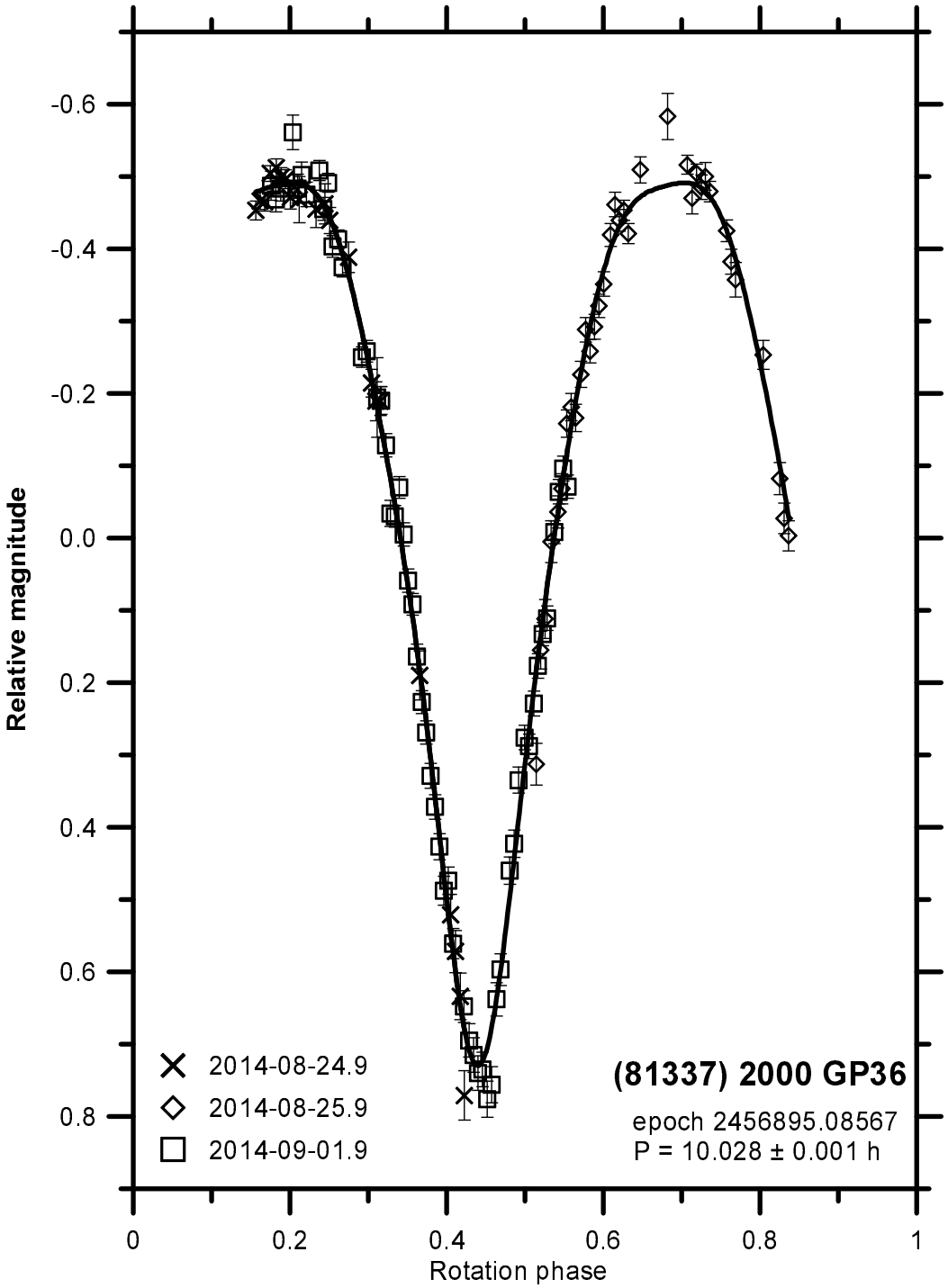
Suppl. Fig. 21. Rotational lightcurve of (66583) 1999 RL156.

(66583) 1999 RL156

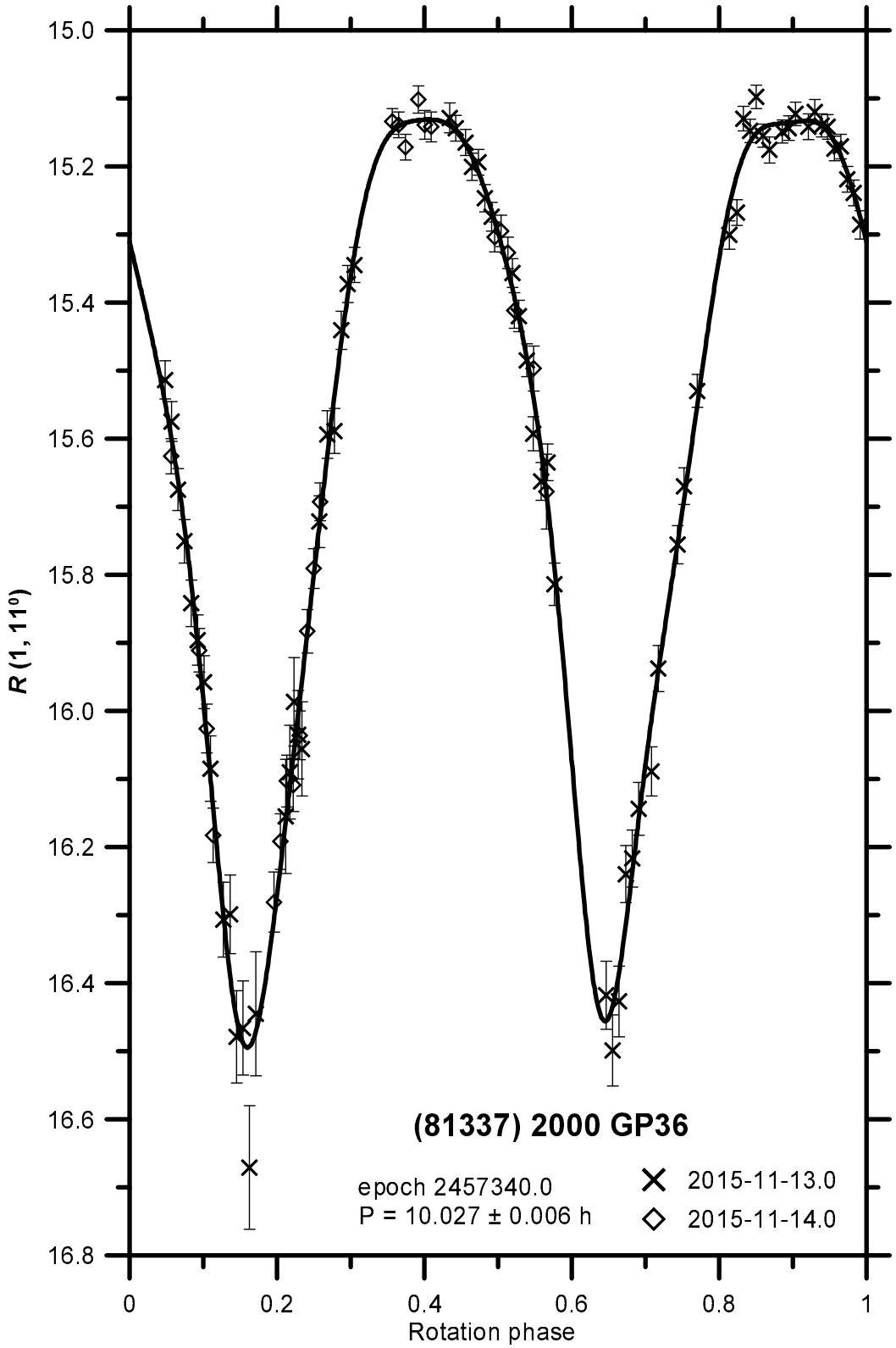
We observed this asteroid from La Silla on 5 nights during 2016-09-23 to 10-08. The observations were absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01 mag. We derived a period of 6.457 ± 0.001 h with a lightcurve amplitude of 0.07 mag. For the low amplitude, this is an $U = 2$ result; we cannot rule out a period twice as long with twice as many maxima/minima per rotation. On 2016-09-23.1 we measured the color index $(V - R) = 0.355 \pm 0.01$. We derived the asteroid's mean absolute R magnitude $H_R = 14.55 \pm 0.14$ and the slope parameter $G = 0.01 \pm 0.08$. Our lightcurve data are shown in Suppl. Fig. 21.

(81337) 2000 GP36

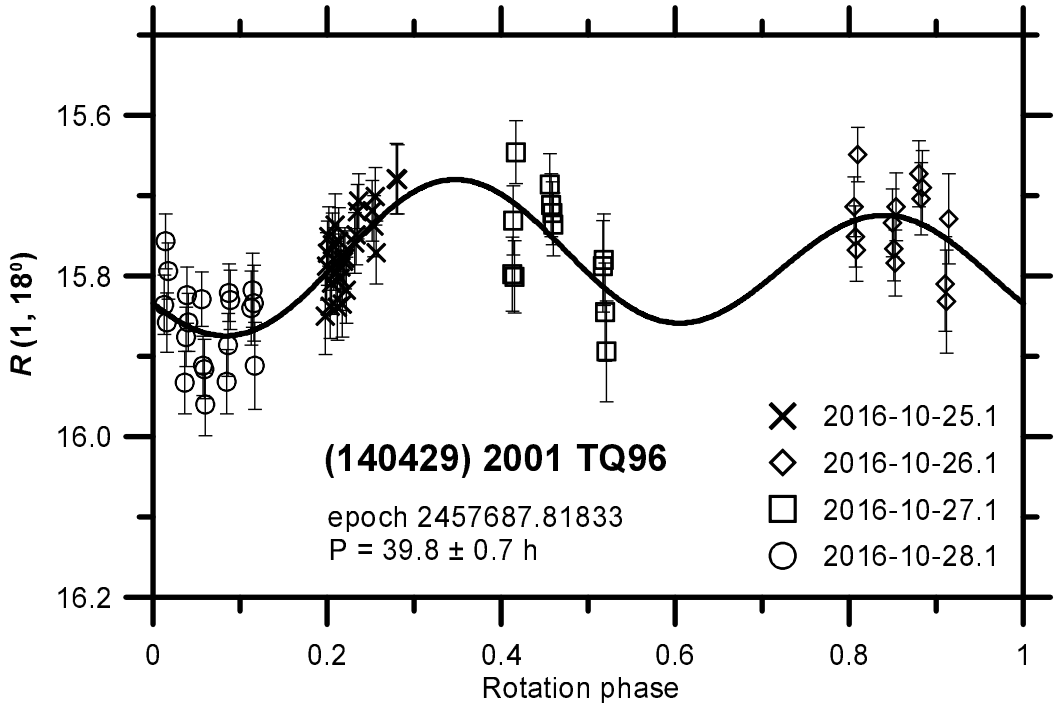
We observed this asteroid from Maidanak on 3 nights 2014-08-24, 25 and 09-01 and from Rozhen on 2 nights 2015-11-13 and 14. The observations from Rozhen were absolutely calibrated in the Cousins R system to an accuracy level of 0.03–0.04 mag, while the Maidanak observations were on relative (differential) magnitude scales. From the 2014 observations we derived a period of 10.028 ± 0.001 h with a lightcurve amplitude of 1.22 mag, assuming zero amplitudes of the odd lightcurve harmonics (that is equivalent to a lightcurve symmetry with $P/2$; a plausible assumption for the high-amplitude lightcurve). From the 2015 observations we derived a period of 10.027 ± 0.006 h with a lightcurve amplitude of 1.36 mag. The mean absolute R magnitude $H_R = 14.90 \pm 0.04$ was derived, assuming the Schulhof's $G = 0.24 \pm 0.02$ (Vokrouhlický et al. 2016a), and it converts to $H = 15.39 \pm 0.06$, assuming $(V - R) = 0.49 \pm 0.05$ (see Vokrouhlický et al. 2016a). Our lightcurve data are shown in Suppl. Figs. 22 to 23.



Suppl. Fig. 22. Rotational lightcurve of (81337) 2000 GP36 in 2014.



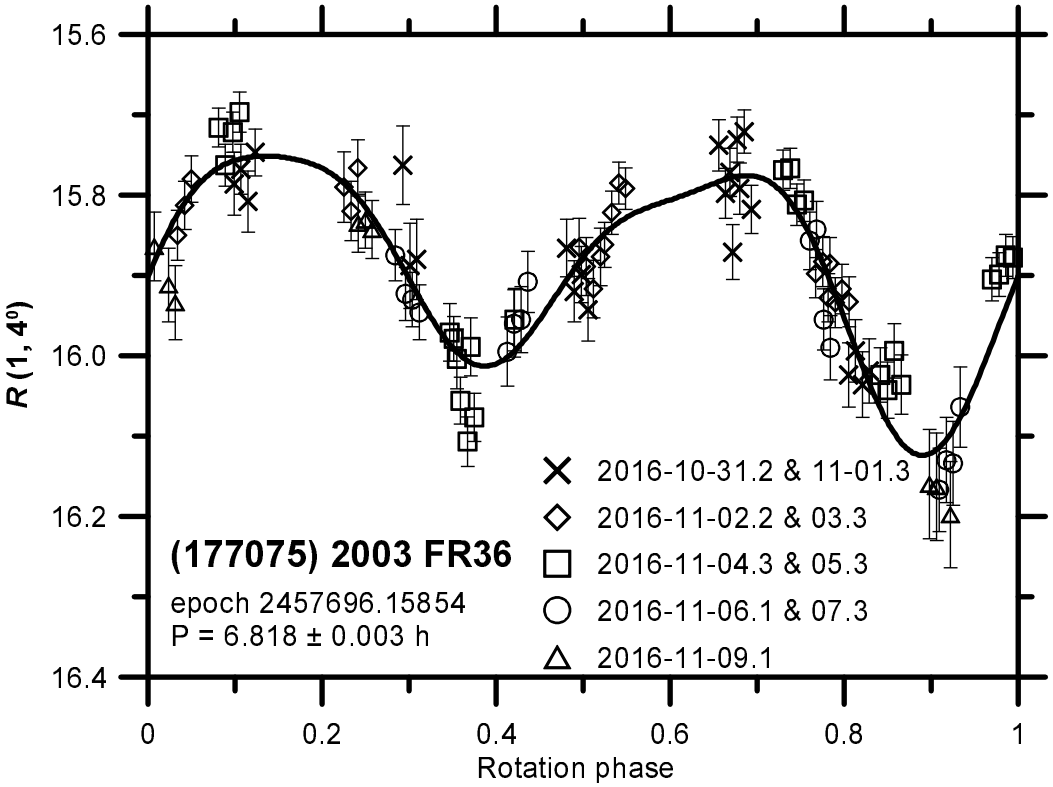
Suppl. Fig. 23. Rotational lightcurve of (81337) 2000 GP36 in 2015.



Suppl. Fig. 24. Rotational lightcurve of (140429) 2001 TQ96.

(140429) 2001 TQ96

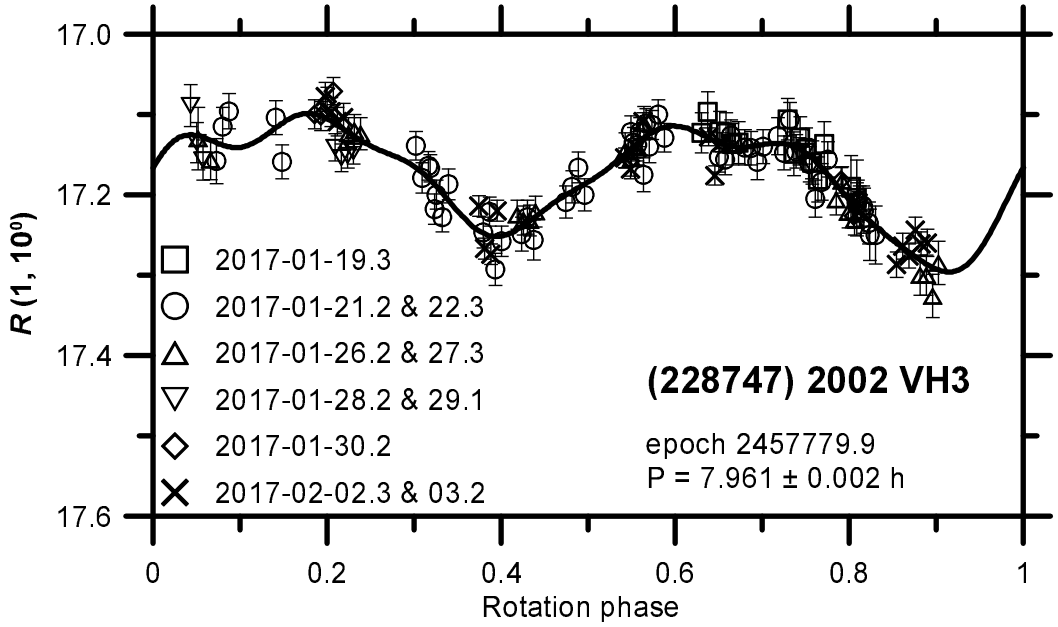
We observed this asteroid from La Silla on 4 nights 2016 October 25 to 28. The observations were absolutely calibrated in the Cousins R system using Landolt (1992) standards to an accuracy level of 0.01 mag. We derived a probable period of 39.8 ± 0.7 h, assuming two pairs of maxima/minima per period, with a lightcurve amplitude of 0.19 mag. We derived the asteroid's mean absolute R magnitude $H_R = 14.81 \pm 0.10$, assuming the slope parameter $G = 0.12 \pm 0.08$. Our lightcurve data are shown in Suppl. Fig. 24.



Suppl. Fig. 25. Rotational lightcurve of (177075) 2003 FR36.

(177075) 2003 FR36

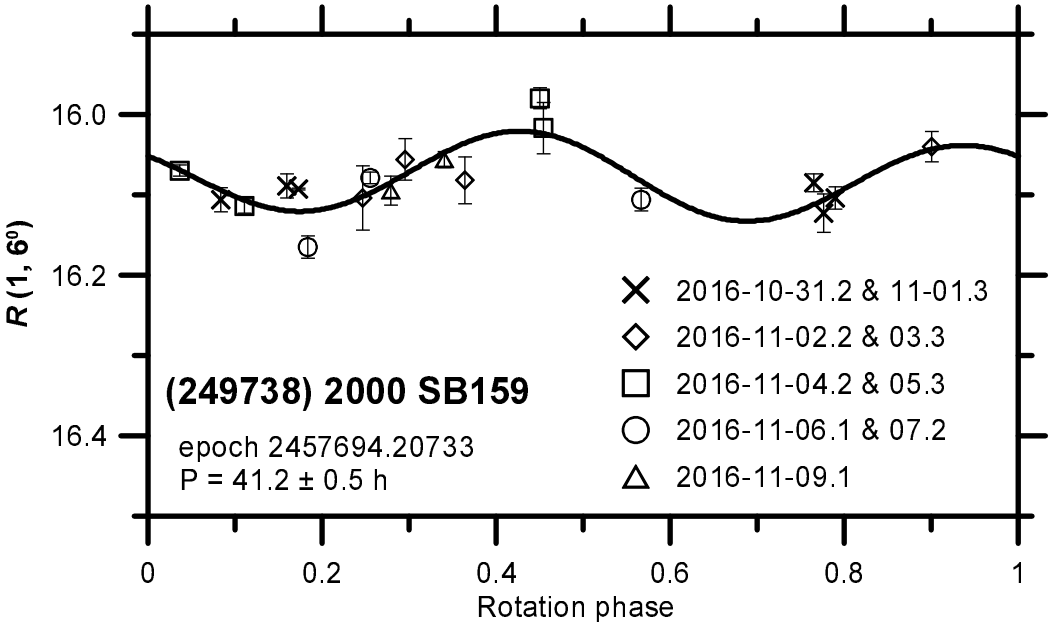
We observed this asteroid from La Silla on 9 nights during 2016 October 31 to November 9. The observations were absolutely calibrated in the Cousins R system using Landolt (1992) standards to an accuracy level of 0.01–0.015 mag. We derived a period of 6.818±0.003 h with a lightcurve amplitude of 0.37 mag. We derived the asteroid's mean absolute R magnitude $H_R = 15.50 \pm 0.03$, assuming the slope parameter $G = 0.12 \pm 0.08$. Our lightcurve data are shown in Suppl. Fig. 25.



Suppl. Fig. 26. Rotational lightcurve of (228747) 2002 VH3.

(228747) 2002 VH3

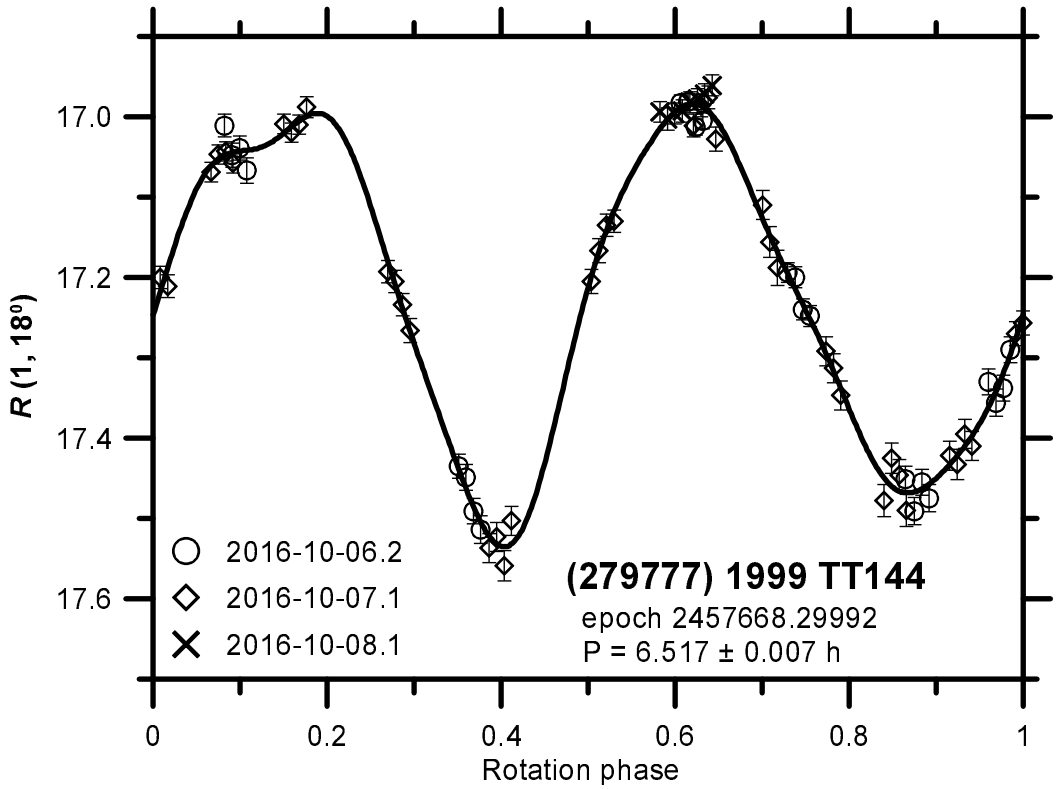
We observed this asteroid from La Silla on 10 nights during 2017 January 19 to February 3. The observations were absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01–0.02 mag. We derived a period of 7.961 ± 0.002 h (U = 3-) with a lightcurve amplitude of 0.20 mag. On 2017-02-02.3 we measured the color index $(V - R) = 0.497 \pm 0.019$. We derived the asteroid's mean absolute R magnitude $H_R = 16.66 \pm 0.04$ and the slope parameter $G = 0.34 \pm 0.06$. Our lightcurve data are shown in Suppl. Fig. 26.



Suppl. Fig. 27. Rotational lightcurve of (249738) 2000 SB159.

(249738) 2000 SB159

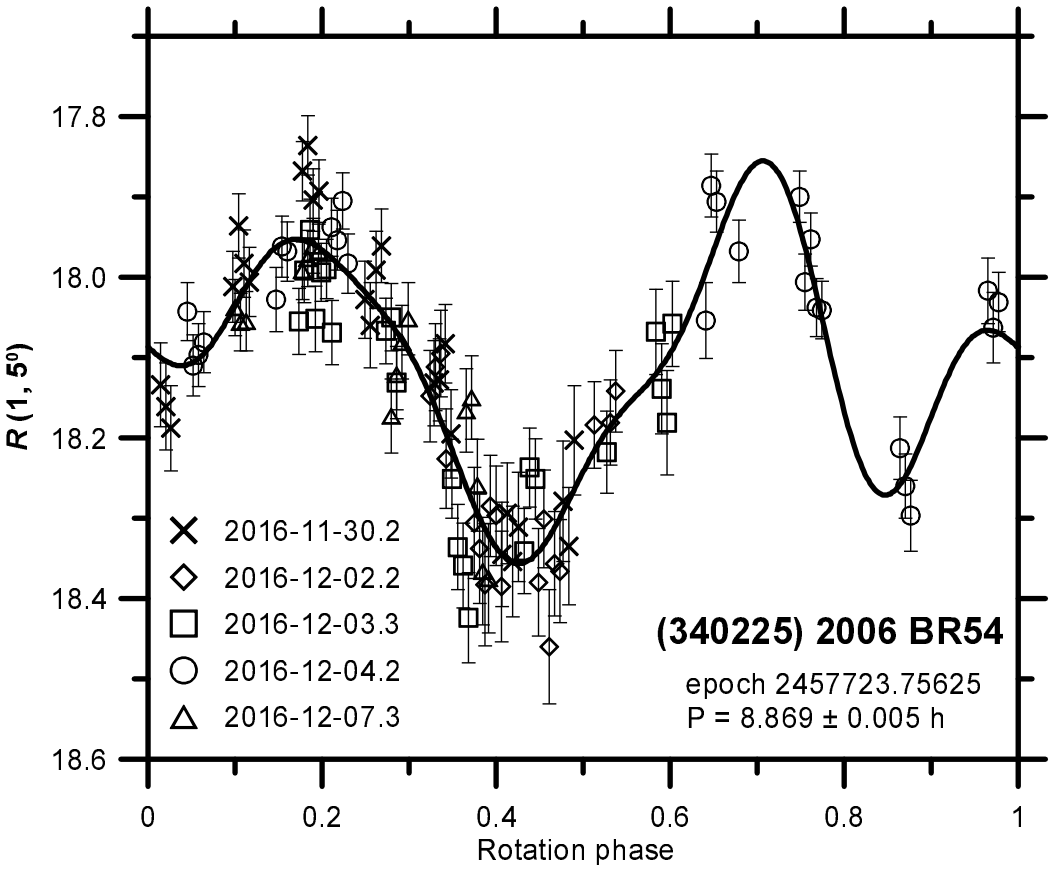
We observed this asteroid from La Silla on 9 nights during 2016 October 31 to November 9. The observations were absolutely calibrated in the Cousins R system using Landolt (1992) standards to an accuracy level of 0.01 mag. We derived a period of 41.2 ± 0.5 h, assuming rotational lightcurve predominated by the 2nd harmonic. The lightcurve amplitude was 0.11 mag. We derived the asteroid's mean absolute R magnitude $H_R = 15.58 \pm 0.04$, assuming the slope parameter $G = 0.12 \pm 0.08$. Our lightcurve data are shown in Suppl. Fig. 27.



Suppl. Fig. 28. Rotational lightcurve of (279777) 1999 TT144.

(279777) 1999 TT144

We observed this asteroid from La Silla on 3 nights 2016-10-06 to 08. The observations were absolutely calibrated in the Johnson-Cousins VR system using Landolt (1992) standards to an accuracy level of 0.01 mag. We derived a period of 6.517 ± 0.007 h with a lightcurve amplitude of 0.55 mag. On 2016-10-08.1 we measured the color index $(V - R) = 0.359 \pm 0.017$. We derived the asteroid's mean absolute R magnitude $H_R = 16.10 \pm 0.11$, assuming the primary's slope parameter $G = 0.01 \pm 0.08$. Our lightcurve data are shown in Suppl. Fig. 28.



Suppl. Fig. 29. Rotational lightcurve of (340225) 2006 BR54.

(340225) 2006 BR54

We observed this asteroid from La Silla on 5 nights 2016-11-30 to 12-07. The observations were absolutely calibrated in the Cousins R system using Landolt (1992) standards to an accuracy level of 0.01–0.015 mag. We derived a period of 8.869 ± 0.005 h with a lightcurve amplitude of 0.50 mag. We derived the asteroid's mean absolute R magnitude $H_R = 17.71 \pm 0.05$, assuming $G = 0.24 \pm 0.11$. Our lightcurve data are shown in Suppl. Fig. 29.

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