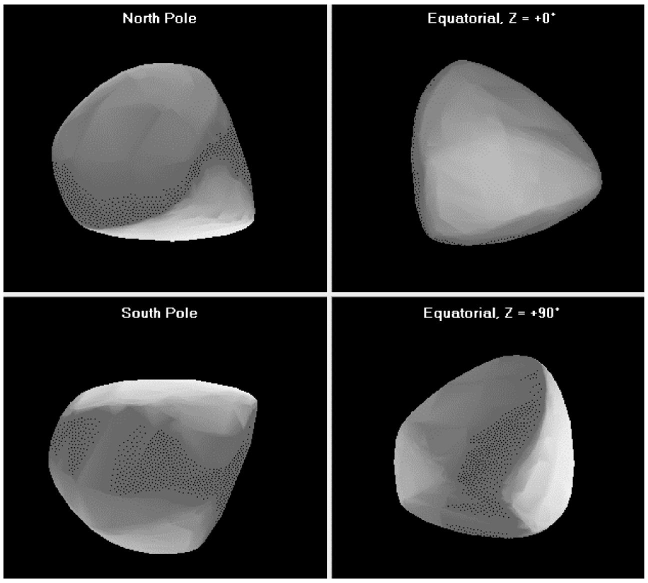

Figure 9. The shape model for 2455 Somville with λ = 224°, β = –68°, and *Ps* = 2.82868 h.

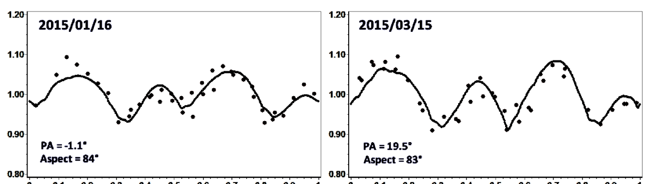

Figure 10. Model fit (black line) versus observed lightcurves (red points).

Acknowledgments

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ASTEROIDS OBSERVED FROM CS3: 2015 JANUARY - MARCH

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(Received: 13 April)

CCD photometric observations of 9 Hungaria asteroids and one NEA were obtained from the Center for Solar System Studies from 2015 January to March.

During this calendar quarter, the Center for Solar System Studies (CS3, MPC U81) was mostly focused on studying Hungaria family asteroids. Some of these Hungarias had previously determined rotational periods and further observations were acquired so that over time pole positions and shape models can be determined.

All images were made with a 0.4-m or a 0.35-m SCT using an FLI-1001E or a SBIG STL-1001E CCD camera. Images were unbinned with no filter and had master flats and darks applied to the science frames prior to measurement. Measurements were made using *MPO Canopus*, which employs differential aperture photometry to produce the raw data. Period analysis was done using *MPO Canopus*, which incorporates the Fourier analysis algorithm (FALC) developed by Harris (Harris *et al*., 1989). Night-to-night calibration of the data (generally < ±0.05 mag) was done using field stars converted to approximate Cousins V magnitudes based on 2MASS J-K colors (Warner 2007). The Comp Star Selector feature in *MPO Canopus* was used to limit the comparison stars to near solar color.

Number	Name	2015 mm\dd	Pts	Phase	L_{PAB}	B_{PAB}	Period	P.E.	Amp	A.E.	Grp
6870	Pauldavies	02/02-02/03	152	16.2,15.7	159	3	4.487	0.004	0.68	0.02	H
7829	Jaroff	02/04-02/05	140	14.9,15.2	125	-19	4.391	0.003	0.67	0.03	H
17083	1999 JB4	02/17-02/21	408	23.3,24.0	127	29	6.147	0.007	0.07	0.02	H
25318	1999 CH12	02/21-02/26	231	0.6,3.9	152	0	15.80	0.03	0.09	0.02	H
34817	2001 SE116	02/02-02/03	135	9.7,9.8	133	-15	6.393	0.005	0.78	0.03	H
39791	Jameshesser	02/22-02/25	228	4.2,6.2	147	0	4.829	0.002	0.71	0.02	H
71765	2000 SU4	02/27-03/22	799	21.4,26.7	140	23	70.72	0.05	0.23	0.03	H
76841	2000 TC33	02/26-02/27	231	3.9,4.6	152	-2	4.895	0.002	0.54	0.03	H
79316	Huangshan	03/04-03/28	199	10.5,7.8,1	171	10	493.00	0.02	0.62	0.03	H
311554	2006 BQ147	02/16-02/18	109	47.1,49.6	116	-12	9.15	0.03	0.31	0.05	NEA

6870 Pauldavies. Pauldavies was previously observed by Warner (Warner 2007) reporting a rotational period of 4.487 h. This result agrees with that period and was obtained at a similar phase angle bisector longitude (L_{PAB}; see Harris *et al.*, 1984).

7829 Jaroff. Jaroff has had results published twice before (Warner *et* al 2009, Warner 2012a). This result is in good agreement with those previously published rotational periods.

(17083) 1999 JB4. No previously reported rotational periods could be found in the Lightcurve Database (LCDB; Warner et al., 2009). With an amplitude of only 0.07 mag., it is possible that the lightcurve could have only a single extrema, or three or more extrema (Harris *et al* 2014). However, the extrema on this high quality lightcurve are not symmetrical favoring the 6.147 h period.

(25318) 1999 CH12. This Hungaria also does not have a previously reported rotational period. Its 0.09 amplitude suffers from the same uncertainties as those of (17083) 1999 JB4. In this case, the lightcurve is symmetrical. The 15.80 h solution is favored because it results in a bimodal solution. A possible 7.93 h solution is also presented for comparison purposes along with a period spectrum.

(34817) 2001 SE116. Warner observed this Hungaria four times in the past (Warner 2012a) finding a rotational period each time of 6.38 h. Since there was a favorable opposition in 2014, more observations were obtained to improve the shape model. This period is in good agreement with the previous results.

(39791) Jameshesser. No previously reported results could be found in the Lightcurve Database (LCDB; Warner et al., 2009).

(71765) 2000 SU4. No previously reported results could be found in the Lightcurve Database (LCDB; Warner et al., 2009). A complete lightcurve could not be obtained because the rotational period appears to be nearly 3 times that of the Earth's rotation.

(76841) 2000 TC33. No previously reported results could be found in the Lightcurve Database (LCDB; Warner et al., 2009).

(79316) Huangshan. Warner (Warner 2012b) previously found a period of 11.7 h. However, He observed it on three consecutive nights showing an amplitude of 0.1 magnitude and an asymmetric lightcurve. At the time, it was assumed that the asymmetry was because the lightcurve was dominated by surface features. Now, with a substantially different $L_{PAB,}$ it was immediately apparent at this opposition that the lightcurve has a much larger amplitude. Over the course of the 3 week observing campaign, a distinct repeating pattern is seen. A raw plot is also presented to better show the repeating feature at the first minimum. Another test of a long rotational period is if nightly trends can be seen. When presenting any lightcurve over ~ 250 h, the nightly trends get squashed on the horizontal scale and can no longer be seen. Here, a raw plot spanning 6 nights is also presented to better illustrate the nightly trends. With a rotational period so long, it is expected that the damping time approaches the age of the solar system and that the asteroid has a strong chance of having non-principle axis rotation (tumbling). It is equally expected that even for a private observatory, an observing campaign cannot be sustained long enough to prove that fact. Eventually, resources were allocated to other targets.

(311554) 2006 BQ147. No previously reported rotational periods for this NEA could be found in the Lightcurve Database (LCDB; Warner et al., 2009).

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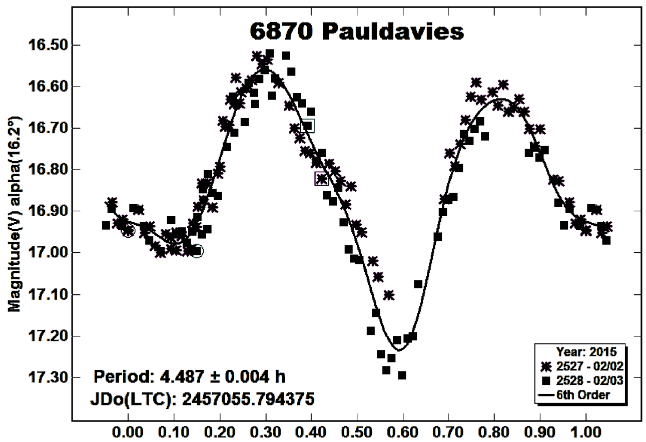

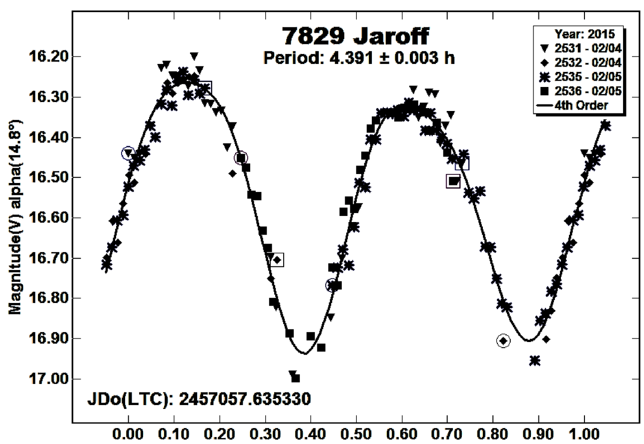

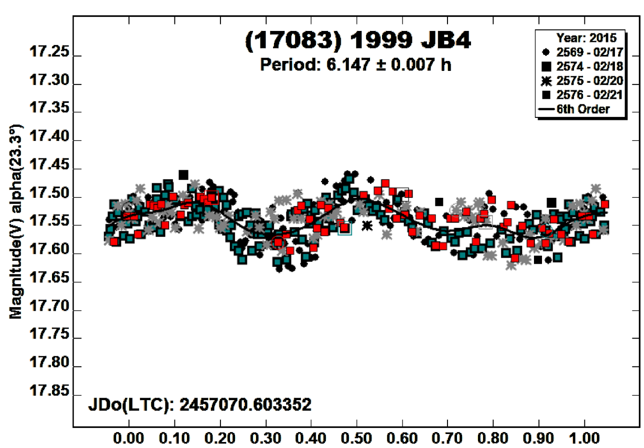

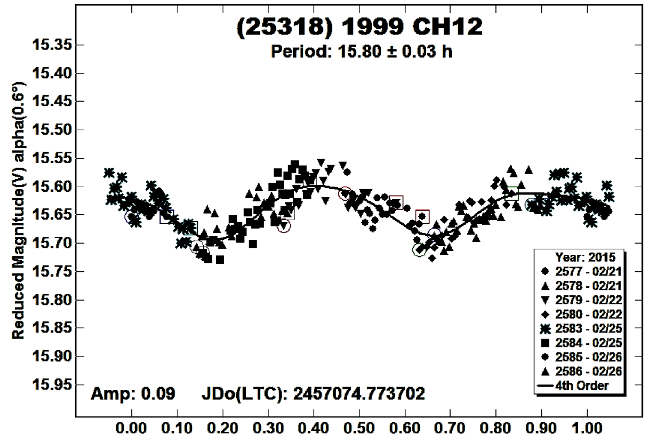

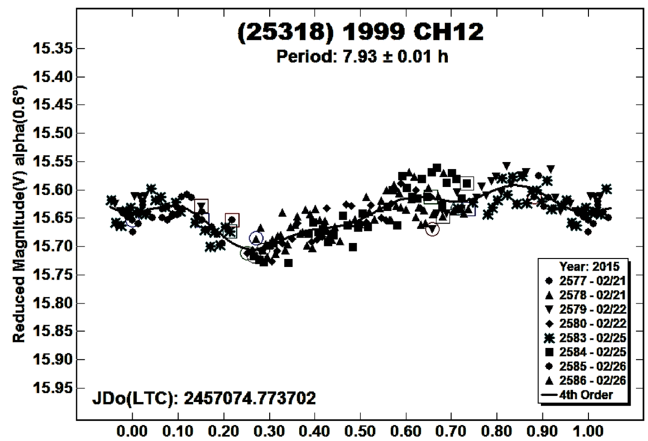

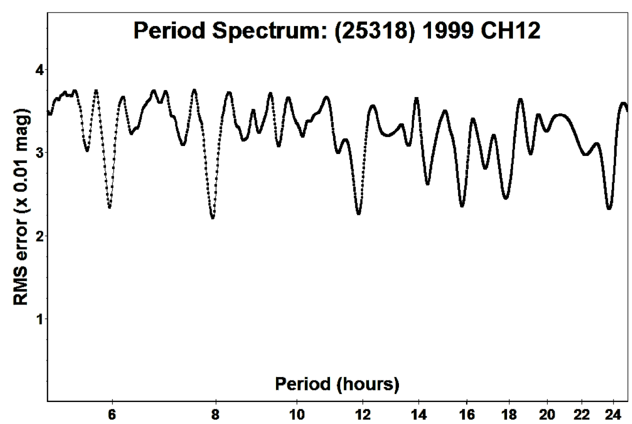

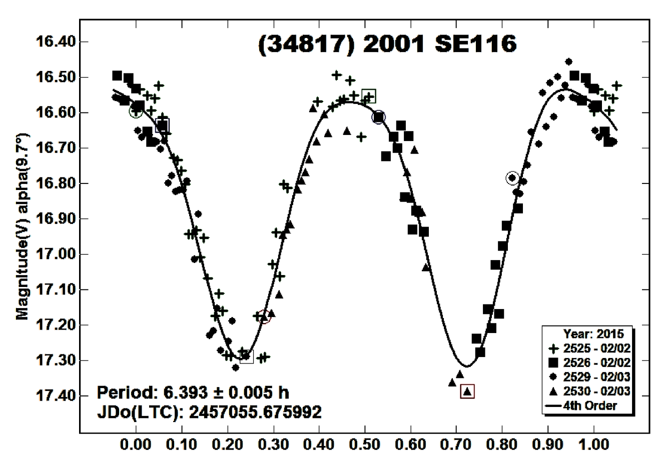

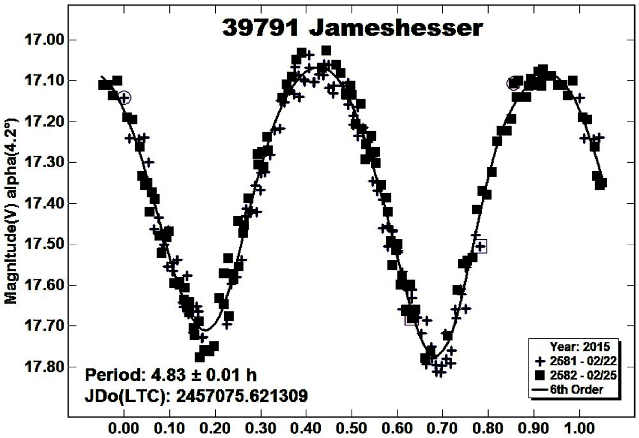
39791 Jameshesser
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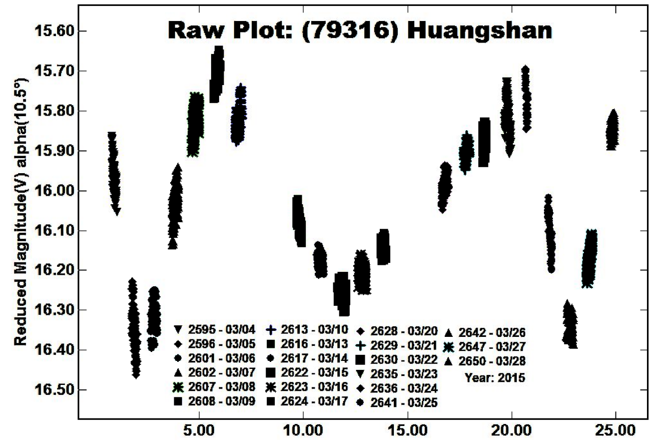
2582 - 02/25
6th Order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Reduced Magnitude(V) alpha(10.5°)
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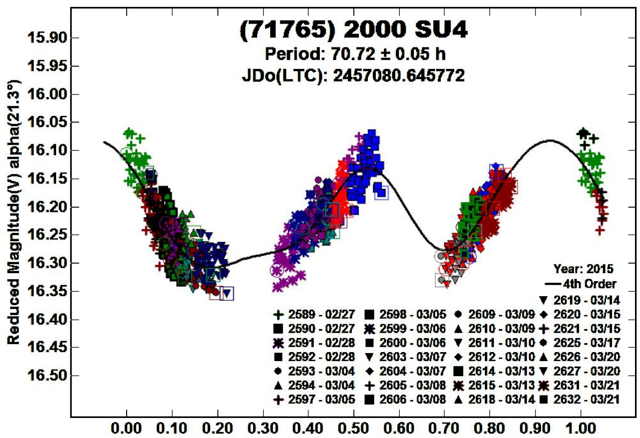
2596 - 03/05
2601 - 03/06
2602 - 03/07
2607 - 03/08
2608 - 03/09
2613 - 03/10
2616 - 03/13
2617 - 03/14
2622 - 03/15
2623 - 03/16
2624 - 03/17
2628 - 03/20
2629 - 03/21
2630 - 03/22
2635 - 03/23
2636 - 03/24
2641 - 03/25
2642 - 03/26
2647 - 03/27
2650 - 03/28
Year: 2015


(71765) 2000 SU4
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Reduced Magnitude(V) alpha(21.3°)
Year: 2015
4th Order
2619 - 03/14
2589 - 02/27
2590 - 02/27
2591 - 02/28
2592 - 02/28
2593 - 03/04
2594 - 03/04
2597 - 03/05
2598 - 03/05
2599 - 03/06
2600 - 03/06
2603 - 03/07
2604 - 03/07
2605 - 03/08
2606 - 03/08
2609 - 03/09
2610 - 03/09
2611 - 03/10
2612 - 03/10
2614 - 03/13
2615 - 03/13
2618 - 03/14
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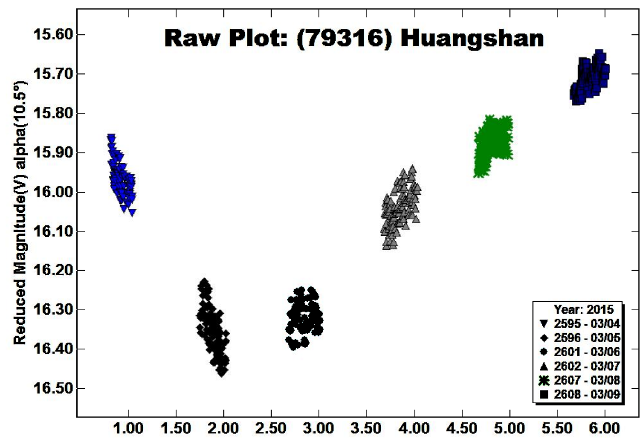
2632 - 03/21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Reduced Magnitude(V) alpha(10.5°)
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2596 - 03/05
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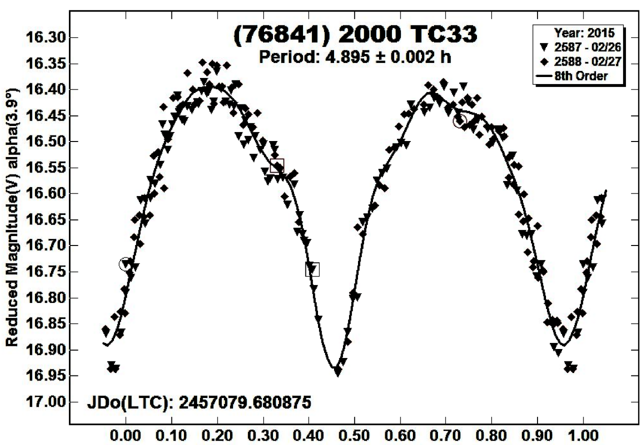
2602 - 03/07
2607 - 03/08
2608 - 03/09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Reduced Magnitude(V) alpha(3.9°)
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2588 - 02/27
8th Order
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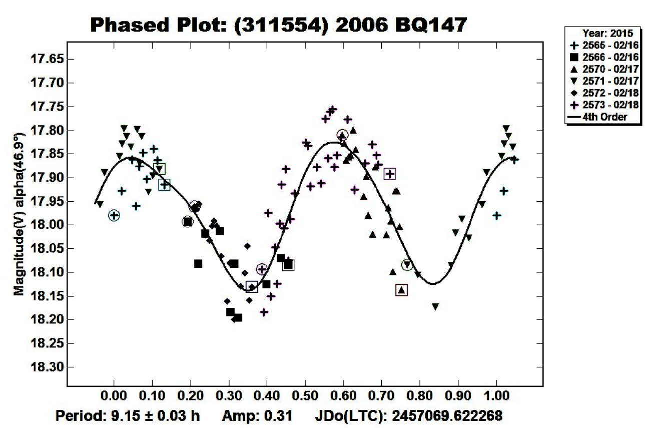
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Year: 2015
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2566 - 02/16
2570 - 02/17
2571 - 02/17
2572 - 02/18
2573 - 02/18
4th Order
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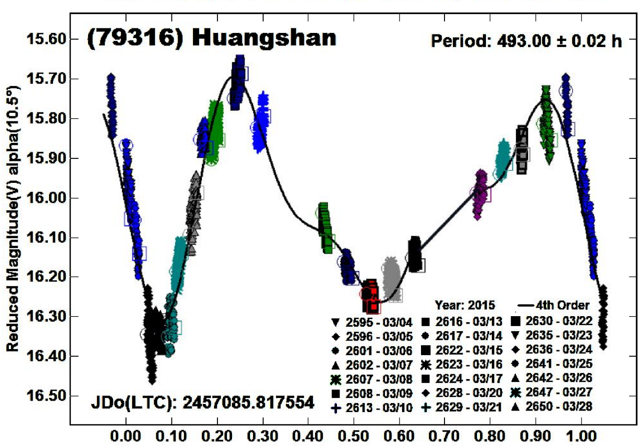
Amp: 0.31
JDo(LTC): 2457069.622268


(79316) Huangshan
Period: 493.00 ± 0.02 h
Reduced Magnitude(V) alpha(10.5°)
Year: 2015
4th Order
2595 - 03/04
2596 - 03/05
2601 - 03/06
2602 - 03/07
2607 - 03/08
2608 - 03/09
2613 - 03/10
2616 - 03/13
2617 - 03/14
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