

This allowed us to find a solution sooner than might otherwise be possible for a single station. Warner used 0.35-m Schmidt-Cassegrain (SCT) with FLI-1001E CCD camera working at a scale of ~ 1.2 arcsec/pixel. Exposures were guided, unfiltered, and 240 s. Pray used a 0.5-m f/4 Newtonian reflector and SBIG ST-10XME camera, yielding a scale of ~ 2.0 arcsec/pixel. Exposures were

130 s, unfiltered, and unguided. We both used *MPO Canopus* to perform differential photometry on the reduced images. All data were light-time corrected. The merged data set was then used for period analysis, again in *Canopus*, which employs the FALC Fourier analysis algorithm by Harris (1989). The resulting lightcurve, shown below, has a synodic period of 9.403 ± 0.001 h and amplitude of 0.67 ± 0.02 mag.

Given the large amplitude and period, it was very unlikely that the asteroid was an asynchronous binary and so it was tempting to stop work once the period could be established. However, in order to maintain the integrity of the Survey, Pravec urged additional observations until the entire curve had been covered at least twice. This is an important point: in order to assure that biases in the asteroid lightcurve database (Warner et al., 2009) are kept to minimum, an asteroid's lightcurve should be completed as much as possible, whether in a survey or not. This includes staying with targets that don't present a quick and/or easy solution.

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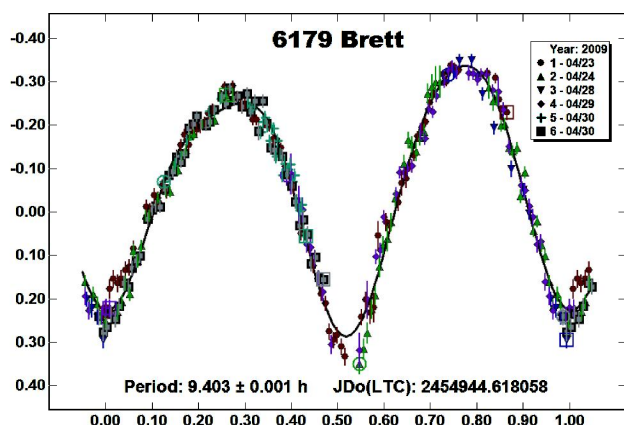


Figure 1. Lightcurve for 6179 Brett. The solid line is a fourth-order Fourier fit of the data.

PERIOD DETERMINATION OF 780 ARMENIA: AN INTER-LONGITUDE COLLABORATION

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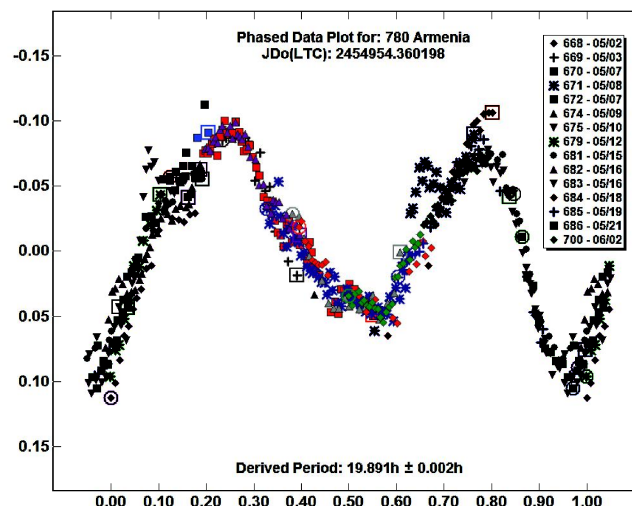
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We report the result of a collaborative effort to determine the lightcurve parameters for the main-belt asteroid 780 Armenia from two widely-separated geographic longitudes. The synodic rotation period and amplitude were found to be 19.891 ± 0.002 h and 0.18 ± 0.03 mag, respectively.

780 Armenia is a main-belt asteroid discovered in 1914 by G. N. Neujmin at Simeis. The only previously reported parameters were those by Behrend (2009) with a period (P) of ~ 13 h and amplitude (A) of ~ 0.1 mag. The asteroid was also listed as a potential observing target on the CALL website for 2009 April-June (Warner and Harris, 2009) and marked with an uncertainty flag of $U = 1$, which indicates preliminary and very likely incorrect parameters. Assuming that the period might be much longer than previously reported, the authors agreed to undertake a joint observational effort to determine a secure set of parameters. The observations started on 2009 May 2, when the apparent magnitude of the target was 14.1, and continued until June 2. Pilcher at Organ Mesa Observatory used a Meade 0.35-m LX200 GPS f/11 Schmidt-Cassegrain (SCT) and SBIG STL-1001E CCD. Benishek at Belgrade Observatory used a Meade 0.4-m LX200 GPS f/10 SCT and Apogee AP47p CCD. All observations were unfiltered. Instrumental magnitudes were found and used for period analysis with *MPO Canopus* software.

Even after the first observing runs it was clear that the period was considerably longer than 13 h. Initially, it was difficult to resolve the ambiguity between a bimodal solution with $P \sim 20$ h and a more favorable RMS error versus a trimodal solution with $P = 29.86$ h that was still very likely. However, a deep narrow



minimum observed on May 16 showed for the first time the overlapping of this minimum with one of the shallow minima for the trimodal solution, or namely, a significant misfit. This greatly improved confidence in the bimodal solution, which was confirmed by subsequent observations. Once the secure period was found, it was gradually improved by adding new observations. The final result is composed of 15 independent segments (8 by Pilcher and 7 by Benishek, many of which are overlapping), that provide dense coverage of the complete bimodal lightcurve with $P = 19.891 \pm 0.002$ h and $A = 0.18 \pm 0.03$ mag. In conclusion, we point to this case as underlining the value and

efficiency of inter-longitude collaborations among observers in asteroid period determination work.

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LIGHTCURVE ANALYSIS OF MINOR PLANETS 427 GALENE AND 5489 OBERKOCHEN

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Minor planet 427 Ganele was observed over six nights in 2009 April and May and 5489 Oberkochen was observed over eight nights in 2008 August and September. Rotational periods of 3.705 h with $A = 0.6$ mag and 5.625 h with $A = 0.4$ mag, respectively, were determined. A is the peak-to-peak magnitude change.

Equipment and imaging techniques employed at BDI Observatory are as described in Caspari (2008). The resulting images were measured using *MPO Canopus* (Warner, 2009a), which uses differential aperture photometry to determine the values used for analysis.

427 Galene This is a main-belt object with a diameter of 33.8 ± 2.0 km based on an albedo of 0.26 ± 0.03 (Gray, 2008). It was selected since it had no known period and was in a favourable location for BDI Observatory considering light pollution and obstructions. The lightcurve exhibits a typical bimodal curve. Analysis found a synodic period of 3.705 ± 0.005 h and $A = 0.6$ mag.

5489 Oberkochen This is a main-belt object with an assumed diameter of 33 km based on an assumed albedo of 0.04 (Gray, 2008). This target was selected from the CALL's lightcurve targets page (Warner, 2009b) since it was relatively bright and in a favourable location for BDI Observatory. The target had no known period. The lightcurve exhibits a typical bimodal curve. The derived synodic period is 5.625 ± 0.005 h and $A = 0.4$ mag.

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