a monomodal of 93.5 h, which is also possible, although it has a significantly higher RMS residual. The relatively insufficient lightcurve coverage affected the period accuracy, which resulted in adopting the coarse result of 187.0 ± 0.1 hours. A more precise and accurate result would require denser lightcurve data coverage and better zero point linkage among the individual data sets.

The asteroid 3345 Tarkovskij will have another favorable opposition in late 2017, which could be a great opportunity for a broader collaboration between observers in order to improve the rotation period.

References

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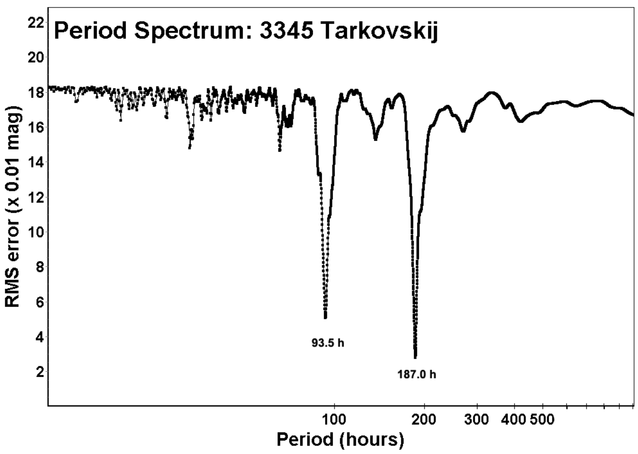

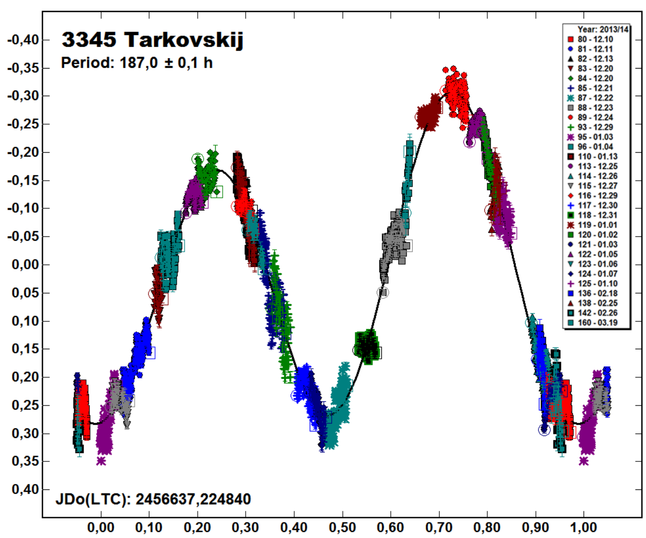

ROTATION PERIOD DETERMINATION FOR 671 CARNEGIA

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Analysis of photometric observations of the main-belt asteroid 671 Carnegia from 2014 January-March revealed a bimodal lightcurve with a period of 8.332 ± 0.001 hours as the most likely solution. However, a trimodal solution of 12.50 hours still could not be formally ruled out.

The main-belt asteroid 671 Carnegia was discovered by Austrian astronomer Johann Palisa on 1908 September 21 in Vienna. The asteroid was listed as a potential lightcurve target in February 2014 on the CALL website (2014). No previous rotation period determination results have been published.

In order to determine its synodic rotation period, the initial photometric observations were started by Benishek on 2014 January 13, slightly more than a month before the opposition date on 2014 February 15. Benishek used a 0.35-m Meade LX200 GPS Schmidt-Cassegrain (SCT) operating at *f*/6.3 and SBIG ST-8XME CCD camera in 2x2 binning mode. With the exactly same goal, Papini independently began photometric observations on 2014 February 23 using a 0.25-m *f*/10 SCT and SBIG ST-9XE CCD camera. Soon afterwards, Papini kindly made his data available to Benishek and the collaboration between two authors was successfully established. The exposures were unfiltered for both authors, unguided (Benishek) and guided by employing a built-in TC-237H guiding CCD (Papini).

As of 2014 March 20 the collaborative observations resulted in 9 sessions with a total of 1061 data points, of which 6 were obtained by Benishek and 3 by Papini. Over the time interval of more than two months, the data covered a range of phase angles ranging from 11.6 degrees before to 12.7 degrees after the opposition.

Data sharing between the authors, as well as data processing and period analysis were performed using *MPO Canopus* software by BDW Publishing (2012). Differential photometry measurements were performed using the Comparison Star Selector (CSS) procedure in *MPO Canopus* that allows selecting of up to five comparison stars of near-solar color. Subsequently, the additional adjustments of the magnitude zero-points for the particular data sets were carried out in order to achieve the best alignment between them, i.e., to reach the minimum Fourier RMS residual.

The period analysis yielded several possible solutions that clearly stand out in the period spectrum with nearly comparable RMS residuals, but only some have a valid physical justification. The complex lightcurve solutions with multiple minima and maxima phased to periods of over 20 hours were immediately ruled out as physically unreasonable and the three remaining solutions were taken into further consideration: the bimodal lightcurve phased to 8.332 hours, the double value of this period, i.e., a quadramodal solution of 16.664 hours, and a trimodal lightcurve phased to 12.50 hours. A closer examination of the Fourier series coefficients favors the period of 8.332 hours over its double value due to larger values for the even term coefficients with respect to the odd term coefficients in the longer period case. The bimodal solution shows significantly better uniformity between the even and odd term coefficients, which is an indication of its greater adequacy. The trimodal solution might not be formally rejected due to the considerable comparability of its RMS error value with that of the bimodal solution.

We conclude that the most likely value of the synodic period for 671 Carnegia is associated with the established bimodal lightcurve phased to 8.332 ± 0.001 hours with amplitude of 0.24 ± 0.01 mag. The possibility of trimodal lightcurve and period of 12.50 hours could be definitely confirmed or rejected by a more thorough analysis of additional data that would be collected at some future apparitions. Therefore, we strongly recommend further photometric monitoring of this asteroid in the future.

References

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