LIGHTCURVE FOR 7758: A POSSIBLE BINARY?

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Analysis of CCD photometric observations of the Phocaea asteroid 7758 Poulanderson in 2012 found a period of 2.64753 ± 0.00007 h with A = 0.14 mag. Data from two nights showed a possible event due to a satellite. If true, the orbital period would appear to be long, with one solution falling between 59-60 hours and others ranging up to approximately 100 hours.

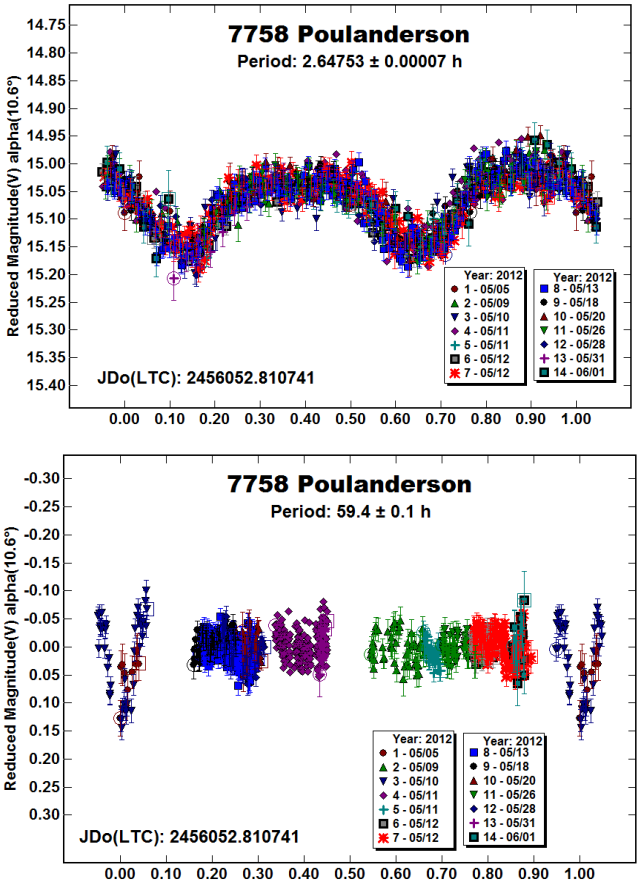
CCD photometric observations of the Phocaea asteroid 7758 Poulanderson were started at the Palmer Divide Observatory on 2012 May 5. That initial data set showed what might have been the end of a mutual event (occultation/eclipse) due to a satellite. Five nights later, a second event appeared to be captured, this time covering the entire duration and with an amplitude of A_1 ~ 0.12 mag. A preliminary solution for an orbital period indicated that P_{orb} > 24 h. If so, a single station could not hope to obtain sufficient data over a reasonable time. A call for assistance was put out to a group of observers in Petr Pravec's binary asteroids program (Pravec et al., 2006), allowing data to be obtained from other parts of the U.S. as well as Europe and Chile. Table I shows the list of observers and equipment used.

The data from PDO, CS3, and SLMO were put onto an internal standard system using V magnitudes derived from the 2MASS catalog (Skrutskie *et al.*, 2006; see Warner, 2007; Stephens, 2008). The data from the other observers were merged to provide the best RMS fit. Warner used the dual-period search feature of *MPO Canopus* to analyze the data set, which included more than 900 observations obtained from 2012 May 5 through June 1, and found a primary period of 2.64752 ± 0.00007 h. Several possible periods could be fit to the two supposed events, one being 59.4 hours, which is shown in the plot below. The several orbital solutions, ranging up to ~100 h, are limited to those that produce the gap at about 0.5 rotational phase. This helps constrain the number of solutions but does not allow finding a unique one. Attempts to observe the opposing event (at 0.5 phase) based on the potential orbital periods failed.

High-precision observations, especially from multiple stations, are encouraged for future apparitions.

Observer	ID	Equipment
Warner	PDO	0.35-m SCT, STL-1001E
Stephens	CS3	0.35-m SCT, STL-1001E
Pray	SLMO	0.50-m Newtonian, ST-10XME
Husárik	SPO	0.61-m Newtonian, ST-10XME
Pollock	PROMPT	0.46-m SCT, Alta U47
Kušnirák Horonoch	Ond	0.60-m Newtonian, MI G2-3200

Table I. List of observers and equipment.



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LIGHTCURVE FOR 205 MARTHA

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CCD photometric observations of the main-belt asteroid 205 Martha were obtained from Santana Observatory (MPC 646) in 2012 May - June. The period of 14.912 ± 0.001 h updates several previously reported results.

The main-belt asteroid 205 Martha was previously observed on two nights in 1995 October by Chiorny (2007), who reported a period of 9.78 h. Those two nights resulted in no overlap of the lightcurve and appears to be an alias of this result. Saylor (2012) observed Martha for two nights in 2010 January, reporting a period of 11.8 h when assuming a monomodal lightcurve with no overlap of data from the two nights. Fome (Behrend, 2012) observed Martha over four nights in 2010 July with scatter in the observations greater than the amplitude of the lightcurve and reported a period of 11.92 h. Warner (2010) observed the asteroid over seven nights and could not match either of the two previous periods, reporting a period of 39.8 h.

The data from the observations at Santana could not be phased to any of the previously reported periods. Aliases of 11.4, 17.1, and 22.4 h were present in the period spectrum. To resolve the conflicts, the lightcurve was binned so that five data points were plotted as one average data point in order to reveal subtle changes in the lightcurve. Also, Warner's 2010 data were replotted at 14.91 h after adjusting the zero points for two sessions to see if they would provide a reasonable fit. The resulting lightcurve does miss a critical maximum at 0.55 rotation phase, but it is a plausible result. The period spectrum from the 2010 data shows a strong preference for the 14.9 h period and rejects the one near 9.8 hours as well as the additional aliases found with the 2012 data.

Given the good fit of the 2012 data to the 14.912 h period, and the 2010 data not excluding it, we prefer this period to all alternatives.

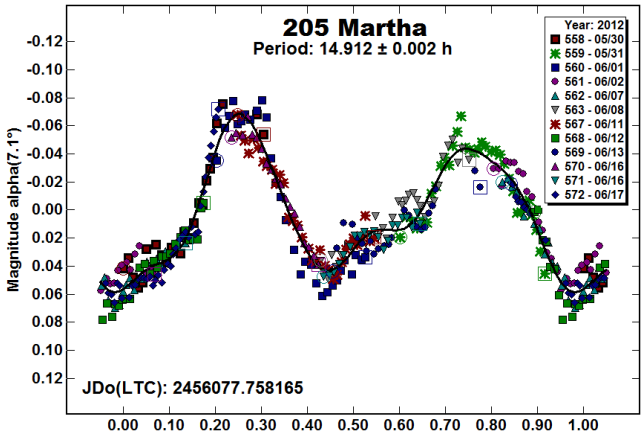

Figure 1: Lightcurve of 205 Martha using 2012 data from Santana.

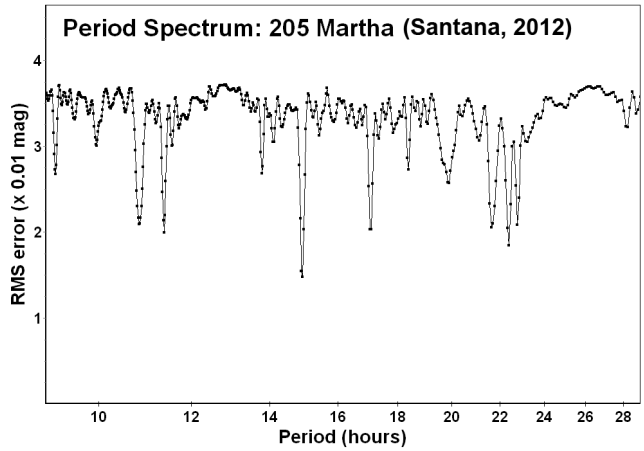

Figure 2: Period spectrum using 2012 data from Santana.