LIGHTCURVE ANALYSIS OF 932 HOOVERIA

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(Received: 26 March)

CCD observations of the main-belt asteroid 932 Hooveria in 2010 February and March led to a lightcurve with a synodic period of P = 39.15 ± 0.05 h. This contradicted a period of 30 h (Sada, 2004). Re-analysis of the Sada data set gives P = 39.23 ± 0.02 h, putting the two periods in fairly close agreement.

Initial observations of 952 Hooveria were made at the Palmer Divide Observatory in early 2010 February. See Warner (2010) for a general description of PDO equipment and analysis methods. See Warner (2007) and Stephens (2008) for details on data set calibration and linking using 2MASS (Skrutskie et al., 2006) to BVRI conversions. In order to obtain more data a quickly as possible and from a slightly different longitude, assistance was requested from Pollock et al. using the PROMPT 0.45-m telescope in Chile. The final data set of 900 data points spanned 30 days. Analysis of the lightcurve determined a synodic period of *P* = 39.15 ± 0.05 h and amplitude of *A* = 0.20 ± 0.01 mag (Fig. 1).

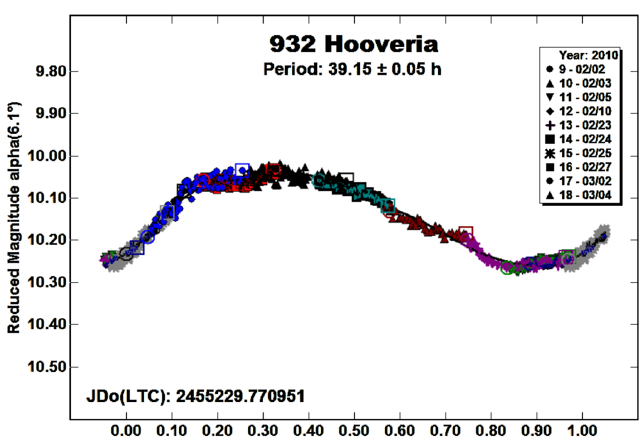

Figure 1. Lightcurve of 932 Hooveria from 2010 data set.

This period did not agree with the *P* = 30 h found by Sada (2004), who observed the asteroid in 2001 October and 2002 January. As a result of the PDO campaign, Sada remeasured his images, linking the sessions to one another by using the same comparisons whenever possible and calibrating to a nearby LONEOS (Skiff, 2010) field. The revised data set was sent to Warner for analysis, who found a revised period of *P* = 39.23 ± 0.02 h. This did require, however, shifting one of the calibrated sessions (Oct 20) by 0.16 mag in order to match it with the others.

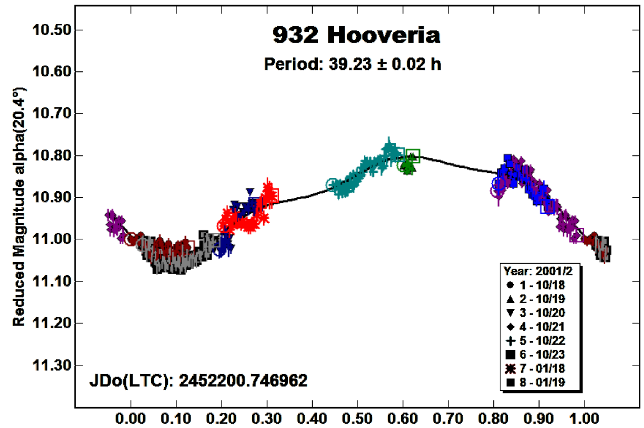

Figure 2. Lightcurve of 932 Hooveria from revised 2001/2 data.

Acknowledgements

Funding for observations at the Palmer Divide Observatory is provided by NASA grant NNX 09AB48G, by National Science Foundation grant AST-0907650, and by a 2007 Gene Shoemaker NEO Grant from the Planetary Society. Support for PROMPT has been provided by the National Science Foundation under awards CAREER-0449001, AAG-0707634, and MRI-0836187. This publication makes use of data products from the Two Micron All Sky Survey, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by NASA and NSF.

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OCCULTATIONS BY 81 TERPSICHORE AND 694 EKARD IN 2009 AT DIFFERENT ROTATIONAL PHASE ANGLES

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(Received: 25 May Revised: 8 June)

During 2009, IOTA observers in North America reported about 250 positive observations for 94 asteroidal occultation events. For two asteroids this included observations of multiple chords on two different dates which allowed well-defined profiles to be obtained at different rotational phase angles. Occultations by 81 Terpsichore on 2009 November 19 and 2009 December 25 yielded best-fit ellipses of 134.0 x 108.9 km and 123.6 x 112.2 km, respectively. Observations of 694 Ekard on 2009 September 23 and 2009 November 8 yielded fitted ellipses of 124.9 x 88.0 km and 88.5 x 104.0 km, respectively.

Introduction

The history of asteroidal occultation observations was reviewed in a previous *Minor Planet Bulletin* article (Timerson et al. 2009).

Successful predictions (Preston, 2009) and observations have increased dramatically, especially since 1997, aided by high-accuracy star catalogs and asteroid ephemerides (Dunham, et al, 2002). The techniques and equipment needed to make these observations are outlined in the IOTA manual (Nugent, 2007). Observations are reported to a regional coordinator who gathers these observations and uses a program called *Occult4* (Herald, 2008) to produce a profile of the asteroid at the time of the event. These asteroidal occultation data are officially deposited and archived, and made available to the astronomical community through the NASA Planetary Data System (Dunham, et. al., 2008). Additional tools such as asteroidal lightcurves (Pilcher) and asteroidal models derived from inversion techniques (Durech) can be combined with occultation results to yield high resolution profiles. The asteroid lightcurve inversion method is described by Kaasalainen and Torppa (2001) and Kaasalainen et al. (2001). It enables one to derive asteroid shape, spin axis direction, and rotation period from its lightcurves observed over several apparitions. The shape is usually modeled as a convex polyhedron. When the shape model and its spin state are known, its orientation with respect to an observer (sky plane projection) can be easily computed. Such a predicted silhouette can then be compared with the occultation chords and scaled to give the best fit. Finally, planning software called *OccultWatcher* allows observers to space themselves across the predicted path of the occultation to gather as many unique chords as conditions allow (Pavlov, 2008).

Occultation Results

81 Terpsichore. North American observers captured Terpsichore occulting stars on two occasions late in 2009. During these events, multiple chords were obtained allowing for the creation of a well-defined profile at different rotational phase angles. On 2009 November 19 at 10:31 UT asteroid 81 Terpsichore occulted the V magnitude 9.0 star TYC 2342-00278-1 (SAO 56567) in Perseus over a long path which included VT and NH. Maximum duration was predicted to be 13.8 seconds. For this event, 3 observers at 6 sites recorded 5 chords across the profile of the asteroid. Three sites used video to record the event while three stations used visual techniques. One station reported no occultation. D. Dunham set up 4 stations, all of which recorded positive events. The resulting chords and least squares ellipse from *Occult4* are shown in Figure 1. These chords produce a smooth ellipse with dimensions of 134.0 ± 4.0 x 108.9 ± 0.7 km. The maximum occultation duration of 12.86 seconds occurred at station 6 and is 7% shorter than predicted, likely because of the orientation of the asteroid at the time of the occultation. The observed path was quite close to the prediction.

About 106 rotational periods later, on 2009 December 25 at 5:00 UT, 81 Terpsichore occulted the V magnitude 8.5 star TYC 1795-00251-1 (SAO 75766) in Aries over a path that included areas from central Canada, through MT and to the coast of central CA. Maximum duration was predicted to be 43.7 seconds. Twelve observers at 12 sites recorded 10 positive occultations and 2 misses. Nine stations used video recording techniques while 3 used visual. The maximum observed duration was 41.36 seconds at station 8, 5% shorter than predicted. The observed path was

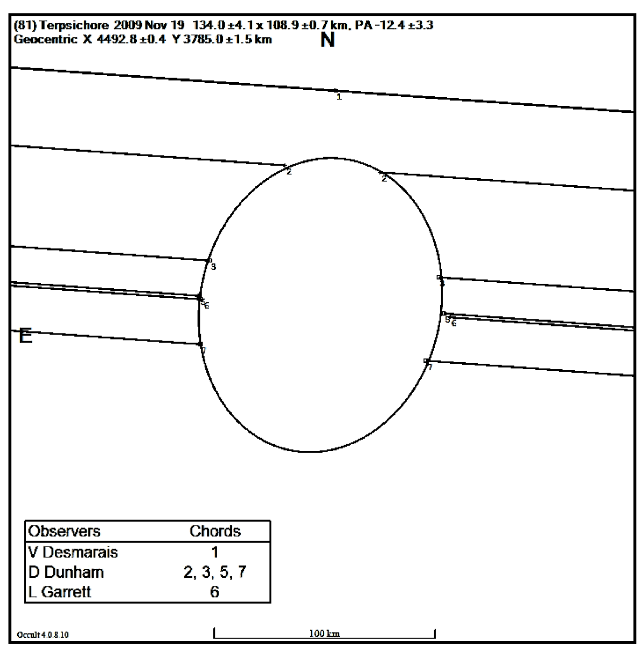

Figure 1. Observed occultation outline for 81 Terpsichore on 2009 November 19 UT with least squares ellipse.