



2013

## LIGHTCURVE ANALYSIS OF FOUR ASTEROIDS

Bin Li

Haibin Zhao

Xianming Han

*Butler University, xhan@butler.edu*

Lina R. Annable

Eli M. Finkel

*See next page for additional authors*

Follow this and additional works at: [https://digitalcommons.butler.edu/facsch\\_papers](https://digitalcommons.butler.edu/facsch_papers)



Part of the [Astrophysics and Astronomy Commons](#)

---

### Recommended Citation

Li, Bin; Zhao, Haibin; Han, Xianming; Annable, Lina R.; Finkel, Eli M.; Heffner, Orry R.; Kidd, Adam W.; Magnetta, Bradley J.; Ramires, Tiffany M.; Rastede, Frederick W.; and Sproston, Sean G., "LIGHTCURVE ANALYSIS OF FOUR ASTEROIDS" *Minor Planet Bulletin* / (2013): 62-63.

Available at [https://digitalcommons.butler.edu/facsch\\_papers/742](https://digitalcommons.butler.edu/facsch_papers/742)

This Article is brought to you for free and open access by the College of Liberal Arts & Sciences at Digital Commons @ Butler University. It has been accepted for inclusion in Scholarship and Professional Work - LAS by an authorized administrator of Digital Commons @ Butler University. For more information, please contact [digitalscholarship@butler.edu](mailto:digitalscholarship@butler.edu).

---

**Authors**

Bin Li, Haibin Zhao, Xianming Han, Lina R. Annable, Eli M. Finkel, Orry R. Heffner, Adam W. Kidd, Bradley J. Magnetta, Tiffany M. Ramires, Frederick W. Rastede, and Sean G. Sproston

## LIGHTCURVE AND ROTATIONAL PERIOD DETERMINATION FOR 5275 ZDISLAVA

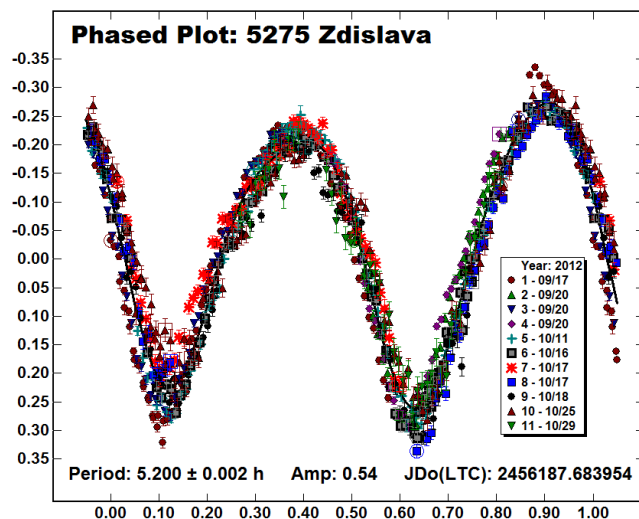
Janek Nathaniel Turk  
 Etscorn Campus Observatory  
 New Mexico Institute of Mining and Technology  
 101 East Road  
 Socorro, NM 87801 USA  
 jturk@nmt.edu

(Received: 21 November)

Observations of the minor planet 5275 Zdislava were made between 2012 August 17 and October 29. Analysis of the lightcurve determined that the asteroid has a synodic period of  $5.200 \pm 0.002$  h and lightcurve amplitude of  $0.54 \pm 0.03$  mag.

Named after Czech saint Zdislava Berka, 5275 Zdislava is a Mars-crossing asteroid. This minor planet was discovered on 1986 October 28 by Z. Vavrova at the Kelt Observatory (JPL, 2012). Observations of 5275 were made at Etscorn Campus Observatory on the campus of New Mexico Institute of Mining and Technology. The images were taken through a clear filter with a 0.35-m *f*/11 Schmidt Cassegrain mounted on a Paramount ME and SBIG STL-1001E CCD camera. Exposures were 180 seconds. The image size was 1024x1024 24-micron pixels, providing a scale of 1.25 arcsec per pixel. The CCD was cooled to either  $-20^\circ$  C or  $-25^\circ$  C, depending on the night-time temperature. Once the images were taken, they were flat-corrected, dark-subtracted, and aligned with *CCDSOFT 5* (Software Bisque, 2012). *MPO Canopus* (Warner, 2012) was used to generate the lightcurve and rotational period of the minor planet.

The period determined by *MPO Canopus* was  $5.200 \pm 0.002$  h. Data from the nights of the Sep 20 and Oct 17 had to be split due to weather and focus issues.



### Acknowledgements

Special thanks go to Dr. Daniel A. KlingleSmith III for his guidance and help in processing and collecting the data. I would also like to acknowledge my fellow team members: Angelica Vargas, Ethan Risley, and Curtis Warren for the number of nights we've spent at the observatory. I would like to give thanks to Dr.

Frank T. Etscorn for providing the Etscorn Observatory. The Research and Economic Development Office of New Mexico Institute of Mining and Technology deserves recognition for the up-keep of the Etscorn Campus Observatory. Lastly, the NASA EPSCOR for grant NNX11AQ35A that allows the students in our team to participate in this research.

### References

- JPL Small Bodies Database Browser (2012). <http://ssd.jpl.nasa.gov/sbdb.cgi#top>
- Software Bisque (2012). <http://www.bisque.com/sc/>
- Warner, B.D. (2012). *MPO Canopus* version 10.4.1.0 Bdw Publishing, Colorado Springs.

## LIGHTCURVE ANALYSIS OF FOUR ASTEROIDS

Bin Li, Haibin Zhao  
 Purple Mountain Observatory, Chinese Academy of Sciences  
 Nanjing 210008. P.R. CHINA  
 meteorzh@pmo.ac.cn

Xianming L. Han, Lina R. Annable, Eli M. Finkel,  
 Orry R. Heffner, Adam W. Kidd, Bradley J. Magnetta,  
 Tiffany M. Ramirez, Frederick W. Rastede, Sean G. Sproston  
 Dept. of Physics and Astronomy  
 Butler University, Indianapolis IN USA

(Received: 30 August)

From June 2011 through May 2012 May, photometric data for four asteroids were obtained using the Southeastern Association for Research in Astronomy (SARA) telescope located at the Kitt Peak National Observatory. The following synodic periods were found: 4808 Ballaero,  $P = 8.8976 \pm 0.0007$  h; 7750 McEwen,  $P = 27.82 \pm 0.01$  h; 11941 Archinal,  $P = 2.717 \pm 0.006$  h; and (47035) 1998WS,  $P = 7.996 \pm 0.001$  h.

All observational data reported here were obtained using the 0.91-m SARA telescope located at the Kitt Peak National Observatory. The telescope has a Cassegrain design with an effective focal ratio of *f*/7.5. Coupled to an Apogee U42 CCD camera, this results in a resolution of 0.77 arcsec/pixel (binned 2x2) and field of view (FOV) = 13.1x13.1 arcminutes. Bessell R or IR blocking (clear) filters were used when taking images. The camera temperatures were set to between  $-25^\circ$ C and  $-35^\circ$ C. Image acquisition was done with *MaxIm DL*. All images were reduced with master bias, dark, and flat frames. All calibration frames were created using *IDL*. *MPO Canopus* was used for analyzing the processed images and extracting the periods from the lightcurves. The asteroids were selected from the list of asteroid photometry opportunities published on the Collaborative Asteroid Lightcurve Link (CALL) website (Warner *et al.*, 2008)

4808 Ballaero. Observations of this asteroid were made from 2011 Oct 15 to 2012 Jan 14. Our analysis of the lightcurve gives  $P = 8.8976 \pm 0.0007$  h and  $A = 0.36 \pm 0.01$  mag.

7750 McEwen. Several groups studied this asteroid during the same observational season and reported their results: Skiff, (2011,

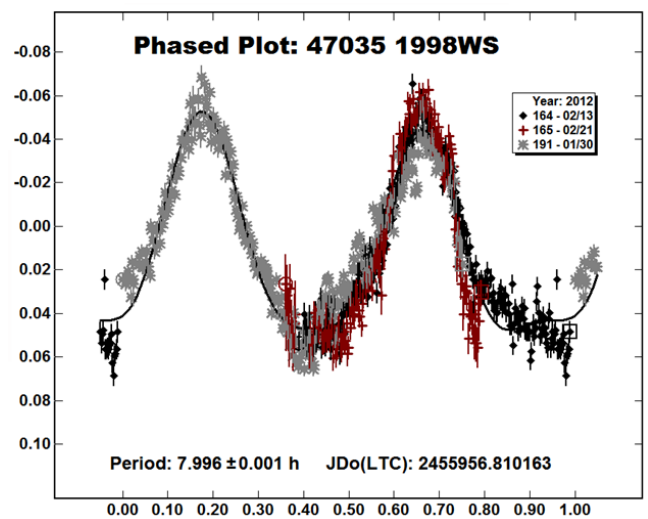
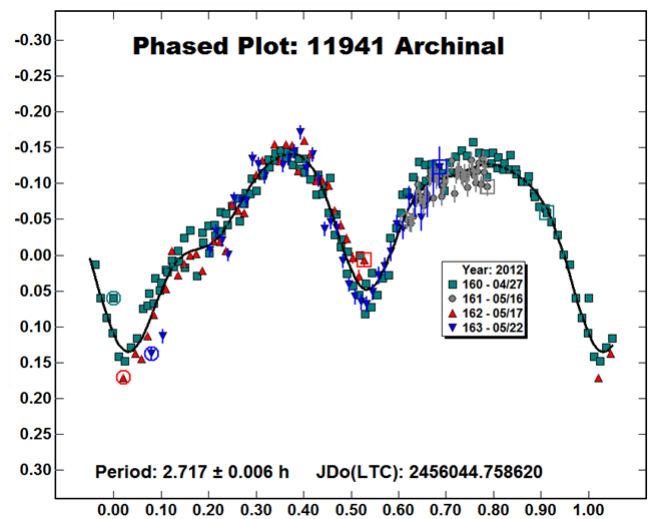
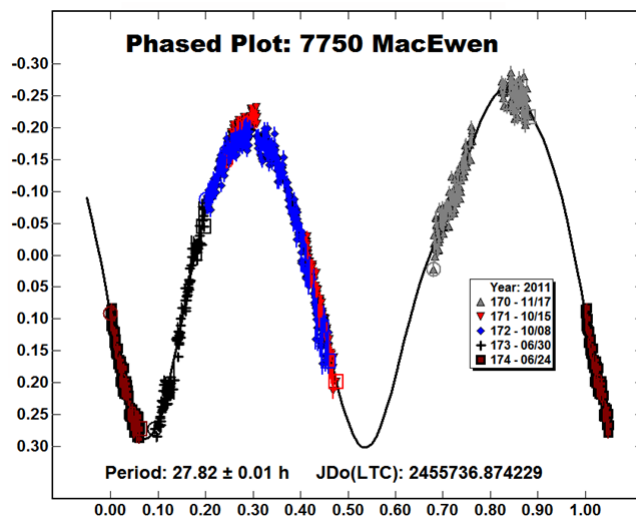
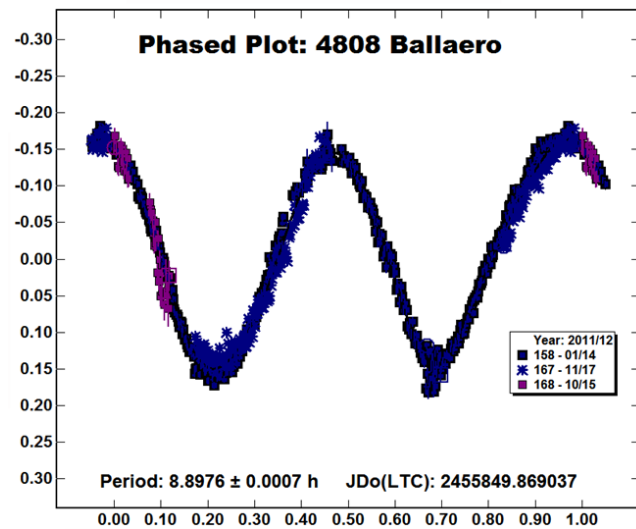
27.807 h), Owings (2012, 27.8182 h), Clark (2012, 27.8124 h), and Ferrero (2012, 27.80 h). We obtained our data from 5 different sessions from 2011 June 26 to Nov 17 and found the period to be  $P = 27.82 \pm 0.01$  h and amplitude  $A = 0.55 \pm 0.05$  mag. Our results agree with these previously reported periods and amplitudes.

**11941 Archinal.** Data were collected on the nights of 2012 Apr 27, May 16, 17, and 22. A synodic period of  $2.717 \pm 0.006$  h and amplitude of  $0.30 \pm 0.01$  mag were obtained.

**(47035) 1998WS.** Data were collected on the nights of 2012 Jan 30, Feb 13 and 21. A synodic period of  $P = 7.996 \pm 0.001$  h and amplitude of  $0.12 \pm 0.01$  mag were obtained.

#### Acknowledgements

We would like to thank F. Levinson for a generous gift enabling Butler University's membership in the SARA consortium. We would also like to thank the support by the National Natural Science Foundation of China (Grant Nos. 11178025 and 10933004), and the Minor Planet Foundation of Purple Mountain Observatory.



#### References

- Clark, M. (2012). "Asteroid Lightcurves from the Preston Gott Observatory." *Minor Planet Bul.* **39**, 63–65.
- Ferrero, A. (2012). "Lightcurve Determination at the Bigmuskie Observatory from 2011 July-December." *Minor Planet Bul.* **39**, 65–67.
- Harris, A.W., Young, J.W., Bowell, E., Martin, L.J., Millis, R.L., Poutanen, M., Scaltriti, F., Zappala, V., Schober, H.J., Debehogne, H., and Zeigler, K. (1989). "Photoelectric Observations of Asteroids 3, 24, 60, 261, and 863." *Icarus* **77**, 171–186.
- Owings, L.E. (2012). "Lightcurves for 2567 Elba, 2573 Hannu Olavi, 2731 Cucula, 4930 Rephiltim 6952 Niccolo, and 7750 McEwen." *Minor Planet Bul.* **39**, 22–23.
- Skiff, B.A. (2011). Posting on CALL web site. <http://www.minorplanet.info/call.html>
- Warner, B.D., Harris, A.W., and Pravec, P. (2008). Asteroid Lightcurve Parameters. <http://www.minorplanet.info/call.html>