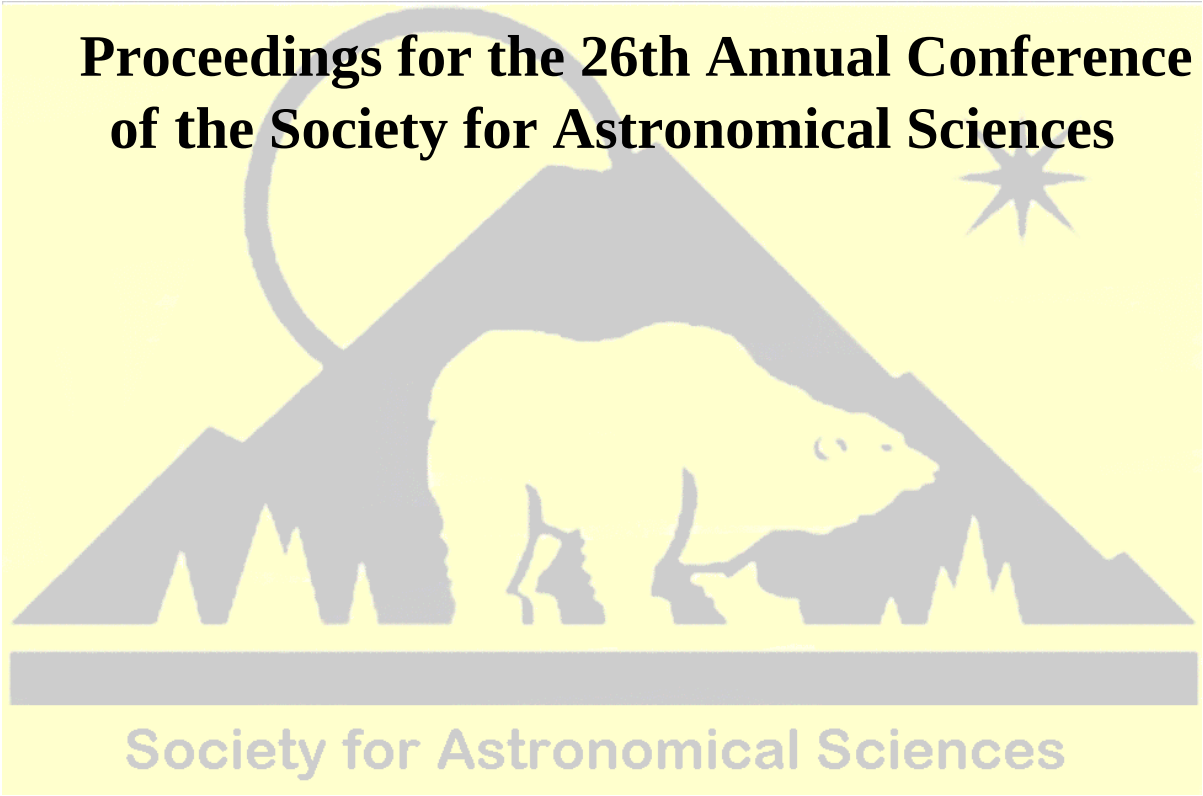
Proceedings for the 26th Annual Conference of the Society for Astronomical Sciences



Symposium on Telescope Science

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May 22-24, 2007
Northwoods Resort, Big Bear Lake, CA

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Published by the Society for Astronomical Sciences, Inc.

First printed: May 2007

ISBN: 0-9714693-6-9

An Amateur Astronomer's Initial Asteroid Lightcurves

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Abstract

At the 2005 Society for Astronomical Sciences Symposium in Big Bear I set a goal to use my equipment and "hobby" time to generate useful asteroid lightcurves. My efforts continue to achieve this goal. Asteroids 916 America, 607 Jenny, 1297 Sonja and 77 Frigga have journeyed by Earth. I will share with you a brief summary of the experience and knowledge I gained from their visit.

1. Introduction

My interest in amateur astronomy goes back many years. A dark sky and ideal observation conditions were my main objectives. Then, with the onset of CCD cameras I realized that a compromise could be made in my hobby to work around light pollution, enjoy astronomy and maintain employment to pay the bills. With a CCD camera and a goto telescope it was even possible to sleep at night and take astronomical images.

Determining the period and amplitude of asteroid lightcurves is a goal I started after my interest was aroused at the 2005 Society for Astronomical Sciences Symposium in Big Bear. At the SAS conference I found affordable software to relieve much of the pain associated with data reduction. Using these programs I decided this endeavor would be the best use of my modest equipment and time.

At first my effort was toward seeking good telescope alignment in my backyard observatory. Then I started learning the basics of how to take darks and flats used for CCD camera calibration. I found that good, reliable data taken from images, even with good software, does not come easy. Finally, I succeeded in taking several series of images that could be used to practice data reduction.

I'm on the path to accomplish by goal, but I still have more work to do. Friends from my local astronomy group are very helpful and always available to offer their suggestions and support.

2. Observatory

A 10" Meade LX200 6.3 with a 6.3 focal reducer is placed on a pier in a 10'dome. The dome is mounted on a trailer. It was purchased at a local military surplus auction. A nearby work shed is used as a control/warm room. The CCD Camera is a SBIG ST-7E. MPO Connections software by Brian Warner, Bdw Publishing is used to control the telescope and the camera.

Future plans include a roll of roof near the shed to house more equipment.

Figure 1. Observatory

3. Observations and Data Reduction

All exposures are 120 seconds with a 600 seconds delay in light/new dark mode at CCD operating temperature –10 degrees C, unfiltered, differential photometry only. At the end of each night 0.5 second dome flats, and 0.5 second flat darks are obtained and respectively median combined for dark and flat correction. Data reduction is performed using MPO Canopus software, Brian Warner, Bdw Publishing.

My first attempt was asteroid 607 Jenny, chosen from the list of potential targets in Vol. 33 no. 2, Minor Planet Bulletin. Only one session 07/16/2006, 26 exposures were taken. Calibration exposures were not taken. No data points were obtained. From the im-

ages I was able to see results for a four hour unguided session and check focus variation.

The second asteroid attempt was 1293 Sonja, chosen from the list of potential targets in Vol. 33 no. 3, Minor Planet Bulletin. A total of 57 exposures were obtained on three nights, 2006 July 30, Aug. 27, 28; however, dark and flat images proved to be problematic and data reduction is still in process.

Up to this stage of my development I had been using a light box to generate my light flats. Images for calibration were improved by taking dome flats.

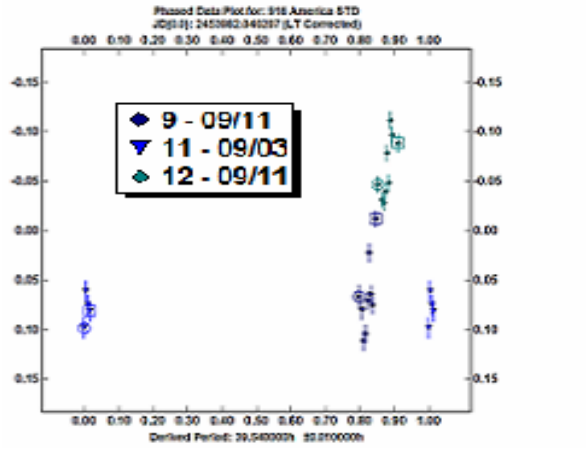

Figure 2. Asteroid 916 America

Asteroid 916 America was my third attempt. It was chosen from the list of potential targets in Volume 33 no. 3, Minor Planet Bulletin. A total of 33 data points from 74 exposures were obtained on three nights, 2006 Sept. 3, 4, 10. After viewing results from three sessions, I realized this was probably a poor choice. The long lightcurve period of 38 hrs would require more observations from different observers in different time zones. The data generated is shown in the phase plot figure 2.

The next asteroid attempt was 77 Frigga, chosen from the list of potential targets in Vol. 33 no. 4, Minor Planet Bulletin. A total of 58 data points from 285 exposures were obtained on four nights, 2006 Sept. 24, 25, 28, 29. A lightcurve was generated which is shown in Figure 3. The phase period 9.012 hours matches published results in Minor Planet Bulletin.

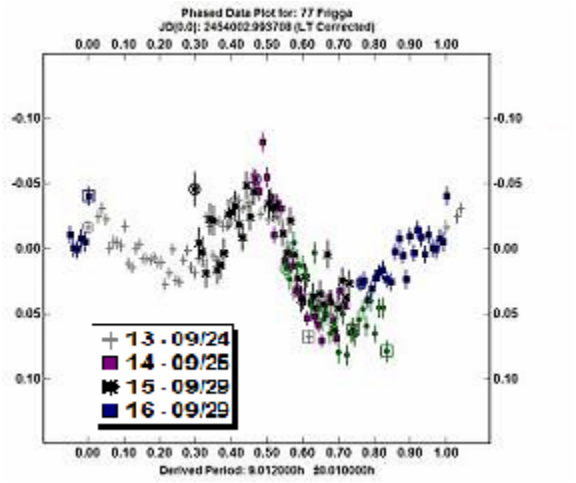

Figure 3. Asteroid 77 Frigga

4. Conclusions

Capturing an asteroid lightcurve period from a backyard observatory is very exciting. Good observing nights at my location are limited, and there are a lot of asteroid opportunities. I plan expansion to two telescopes. Future targets will include asteroids without known lightcurve periods. Determining the period and amplitude of an asteroid is the ultimate goal.

I learned a lot and gained much experience from working with the four asteroids. I plan to continue by efforts and publish useful data for others to use.

5. Acknowledgements

I would like to thank Kurt Fisher, member of the Salt Lake Astronomical Society MPO Study Group, for the help he gave me in understanding MPO Canopus data reduction software.

Thanks to Jerry and Cindy Foote, Vermillion Cliffs Observatory, Kanab, UT. They are always available as a mentor.

A special thanks goes to SAS member Robert Stephens, the guy who sold me the SBIG ST-7E CCD camera with the condition that it was to be use to generate photometry data.

6. References

Kurt Fisher , "A Canopus/PhotoRed Tip Sheet". http://members.csolutions.net/fisherka/astronote/Photometry/PhotoRedStudy/pdf/CanopusPhotoRedProcessStepsTips.pdf

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