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Rotational Properties of Trojan Asteroid 5209 1989 CW1

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Introduction

This is a presentation of VR photometric observations of Trojan asteroid 5209 1989 CW1. Trojan Asteroids are found in orbits near the L4 and L5 stable Lagrange points of Jupiter's orbit. These asteroids are farther away and have a generally lower albedo than main belt asteroids and have received less attention from observers in the past. By plotting the lightcurve of the asteroid, we were able to determine the rotation period and the lightcurve amplitude. The goal of this research is to eventually understand the collision history of the Trojan asteroids and to compare the asteroids to those in the main belt.

Observations

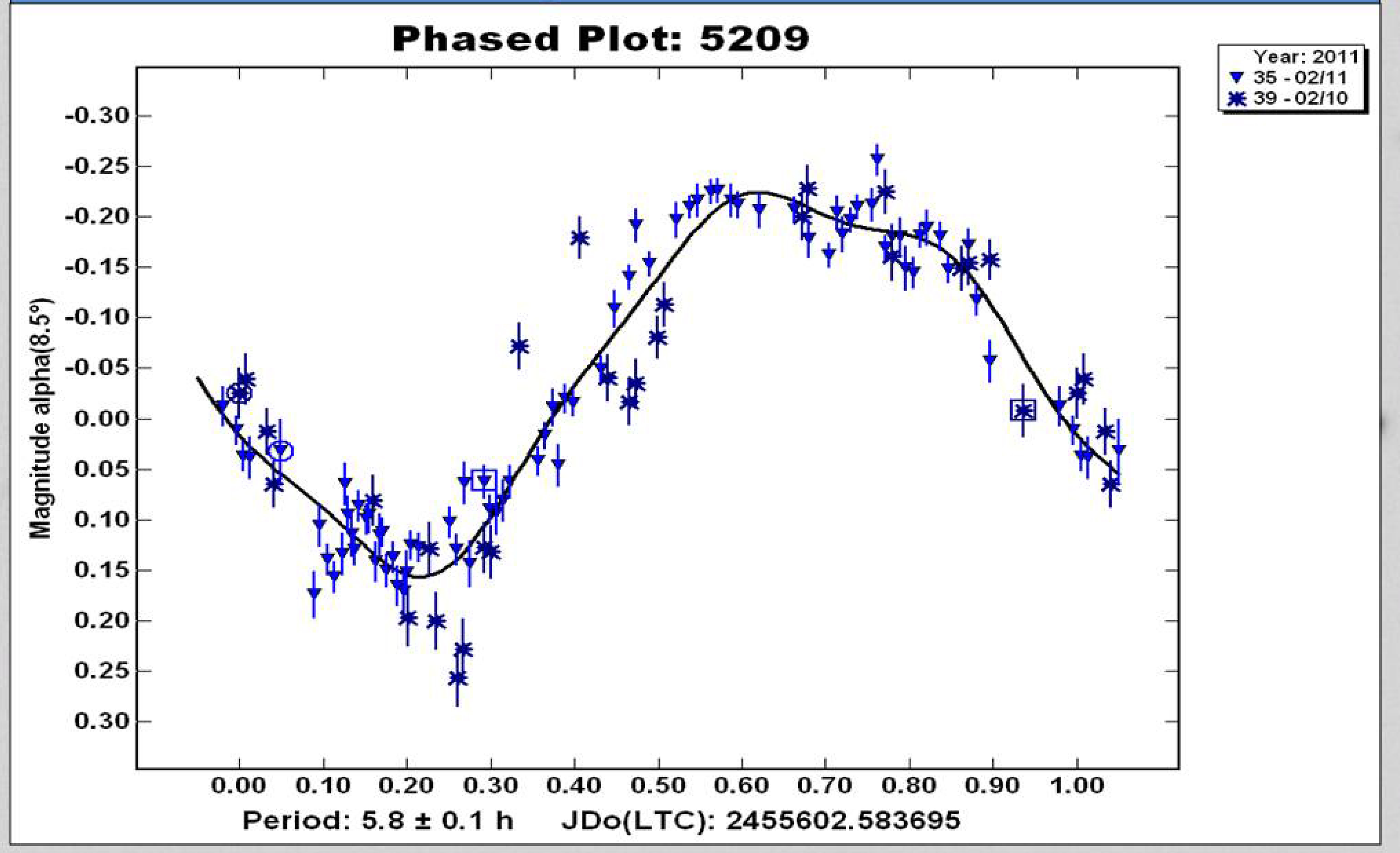
Observations at Lowell Observatory in Flagstaff, Arizona were made using the automated 31-inch telescope during the months of January and February of 2011. V and R filters were used to take the exposures. The images were trimmed and processed using IRAF. Data analysis was done using IRAF and MPO Canopus. Period Analysis was completed using Canopus. Specifications for the telescope were gathered from the Lowell Observatory website in order to set the configuration settings for MPO.

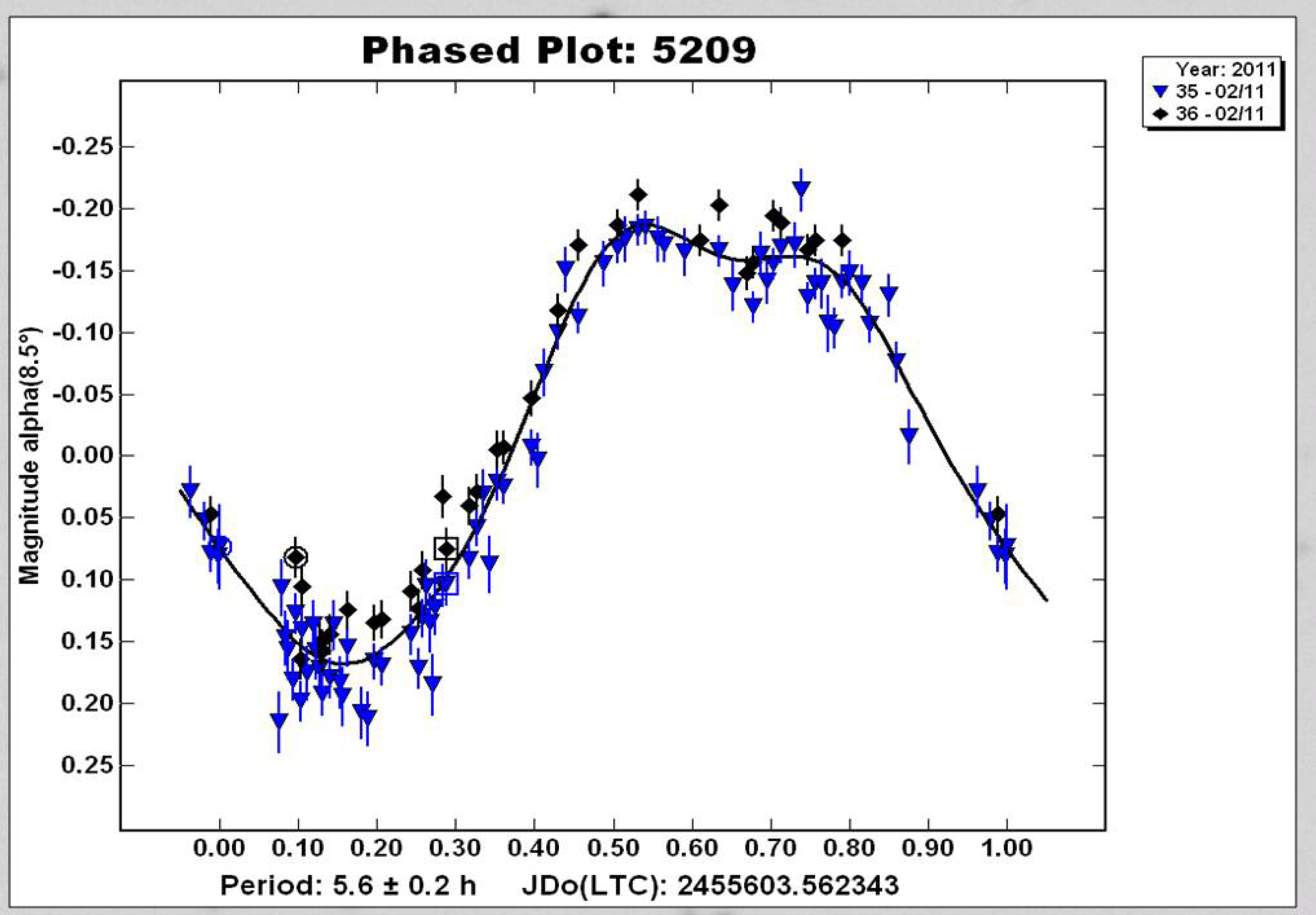
Preliminary Period Analysis

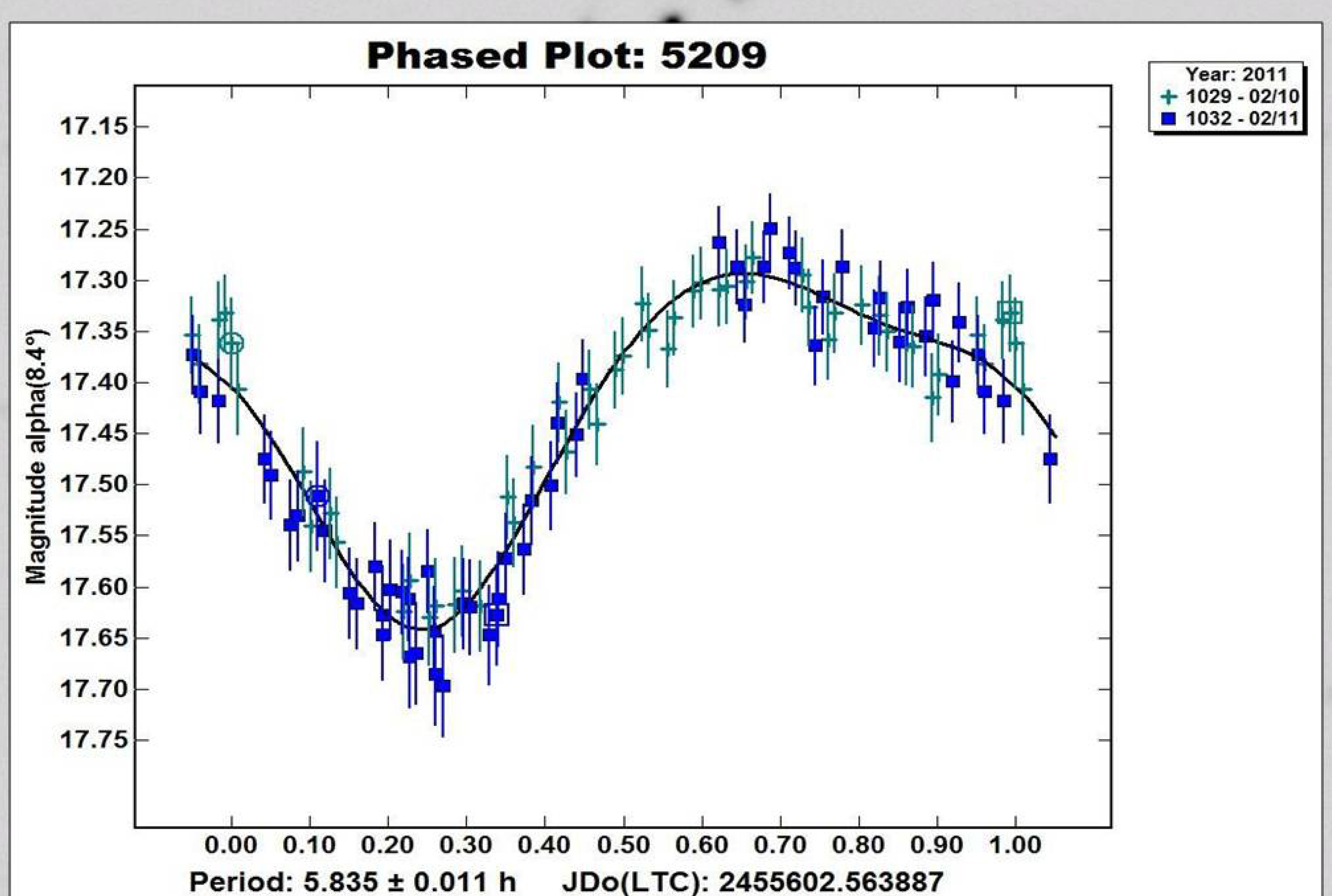
The first of the three figures is a phased plot of the V filtered images of both the tenth and the eleventh. The second figure is the phased plot of both the V and R filtered images of February 11, 2011. The third figure was collaborated by Brian Skiff and Larry Wasserman at Lowell Observatory and is the phased plot of the V filtered images of both nights.

The best fit period was seen to be 5.8 ± 0.1h in figure one, 5.6 ± 0.2 h in figure two and 5.835 ± 0.011h in figure three. The true period, or the time that it takes for an asteroid to rotate a full 360 degrees is calculated as twice that of the measured period. This occurs because of the ellipsoidal shape of asteroids which causes the asteroid to show two broad sides and two relatively narrow sides. Therefore the measured true period of the asteroid would be 11.6 ± 0.2h and 11.2 ± 0.4h for figures one and two respectively. Similarly, our collaborators at Lowell find a true period of 11.670 ± 0.022h. The median value for main belt asteroids of a similar size is 11.5 hours which shows a similarity in this instance (Harris *et al* 2007).

Lightcurves







Collaborators at Lowell are Brian Skiff and Larry Wasserman.

Amplitude Analysis

The amplitude is measured from the minimum to the maximum of the periodic function. In the phased plots shown, we see an amplitude of a little less than 0.4, and although this is slightly large when compared to main belt asteroids, it is not unreasonably large, nor is it uncommon to find a main belt asteroid with an amplitude similar to that of 5209 1989 CW1.

Discussion and Conclusions

Although there is much work to be completed on mapping the rotational period and amplitude of 5209, these results pave the way towards a greater understanding of this particular asteroids in the hopes of creating a better understanding of these bodies with respect to the main belt asteroids. Longer periods and lower albedos have created a long standing bias against observing these asteroids, even though the understanding of Trojan asteroids may prove to be a pivotal point in our understanding of the origins of the solar system.

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