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CSS 081231:071126+440405 Observations

May 15, 2009

Introduction

This object is a Cataclysmic Variable which is a star having an accretion disc. The star and disc rotate, and the disc may be warped. This 15mag star exhibits extremely fast periodic brightness changes indicating the likely presence o a bright spot that is being eclipsed by something. AAVSO shows measurements for this object beginning in March 2009. This paper shows several cycles of data taken at our observatory. My own observations were triggered by Gerhard Dangl from his data on his web site at http://www.dangl.at/2009/css081231/css081231.htm. This paper is available on my web site www.menkescientific.com. The original Special Notice from AAVSO is at http://www.aavso.org/publications/specialnotice/142.shtml

Light Curves

At this time, I have data from two nights May 10-11 and May 12-13, 2009. I have three data sets (all data taken unfiltered):

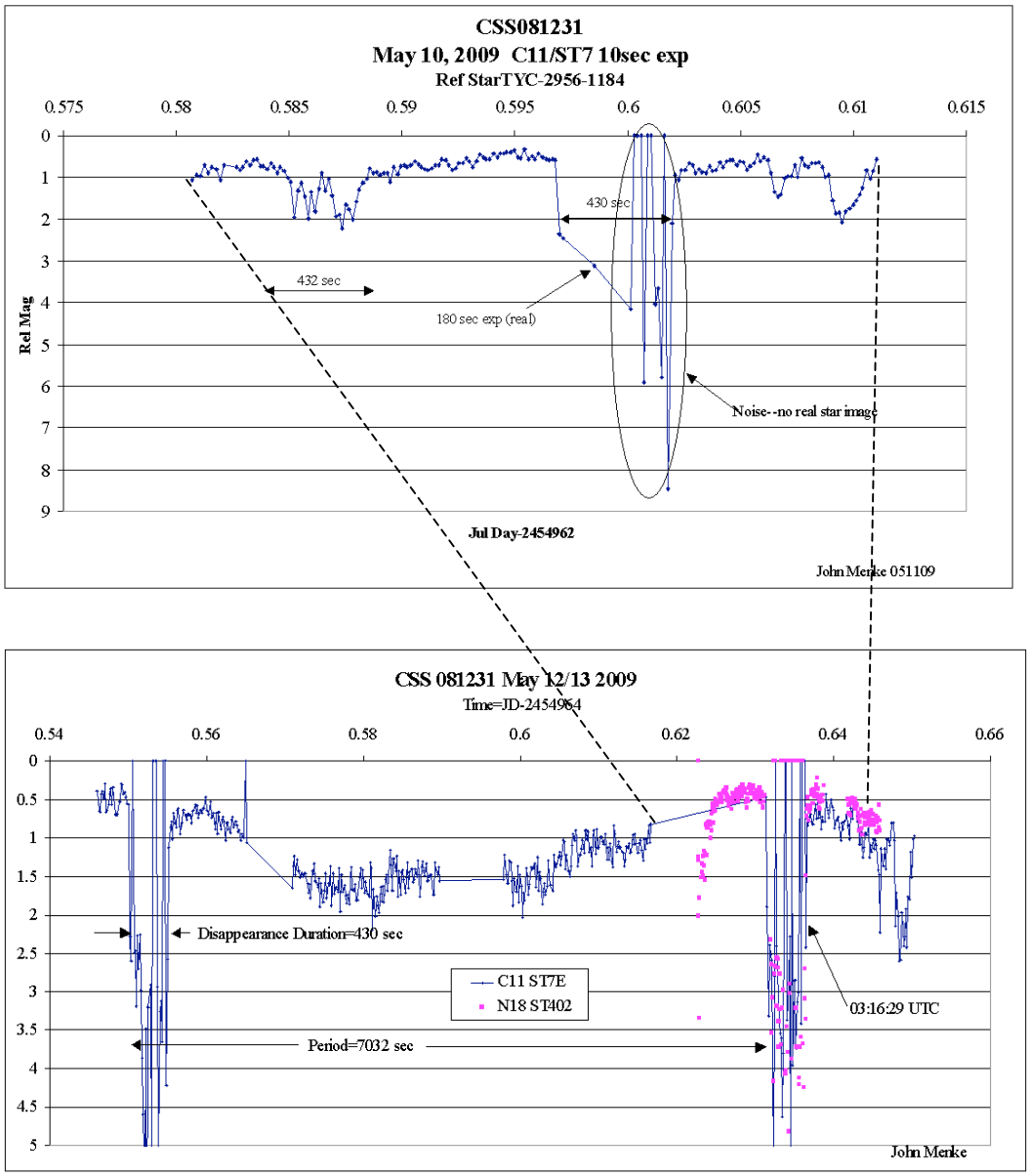
- Set 1: C11 f/6 ST7E subframes. Actual exposure was 10 sec plus 3.8 sec for download/storage. Data bracketed both the secondary and main eclipse on May 10-11
- Set 2: C11 f/6 ST7E subframes. Same exposure as above. Data (with gaps) covered one whole 2 hr. cycle on May 13 approx 01:00 to 03:30 UT
- Set 3: N18 f2.9 ST402 subframes. Exposure was 5 sec plus 0.47 sec download and storage. Data covered main eclipse on May 13 at 03:09 UT. Note, the N18 is a fast 18in. Newtonian. Data sets 2 and 3 were taken in overlapping time.

In all the data shown below, the target star is measured relative to nearby comparison star (2 a-m east) 2UCAC46942545 of 13.87 mag (v). USNO data show that the blue-red color difference of the comp and target stars are 0.8 and 0.5 mag, respectively. This difference is ignored in the measurements below, and no photometric calibration has been made on the data. Data points shown as mag=0 are artifacts of the photometry program, and are in fact measurements equal to background.

The photocurve shows a 2 hour periodicity (7032 sec) with a slow sinusoidal variation of about 1.2 mag amplitude. Superimposed are two apparent eclipses. The first secondary or pre-eclipse is about 1 mag deep with a duration of about 10 min. It has relatively slow Disappearance and Reappearance durations of about 5 min each. The major eclipse is

spectacularly fast. It begins about ten minutes after the secondary eclipse and has a duration of about 430 sec. My data show D and R durations of less than 5 sec. The depth is approximately 2.7 mag, and has a downward trend (increasingly dim). About ten minutes after the main eclipse, there are smaller (1 mag) faster (100 sec) dips in the light curve. Note that the second graph shows the exact UT time of the R so that you can easily estimate the future times of the eclipses.

Gerhard has used two sec. integrations on a video camera to show that the D and R durations of the main eclipse are less than one second. My own efforts using an integrating video camera have not been successful as the object is too faint (and my skies not sufficiently transparent). My own and other observations show substantial cycle to cycle variability in all components of the photocurve, especially of the pre-eclipse.



I examined the data more closely in the main eclipse as taken from the 5 second N18 system on May 12-13. I relabeled the NA data points shown above as mag=0 as +20 mag (ie, no data) and expanded the scale as shown below. One can see the N18 data gap at the beginning of the eclipse (operator problems). The check star data is of a faint star 1 a-m west of the target and is steady throughout this event. The "empty" data are the net brightness values (aperture minus background annulus) taken at a point midway between the reference star and the target star. Clearly, at the bottom of the eclipse, the target data values are in the range of values dominated by noise. However, it is clear that the trend of the brightness is downward during the eclipse.

The data appear to indicate some fast brightenings during the faint part of the eclipse at about 0.6345 and at 0.6353 and 0.6357; however, this is just barely above the noise. The final Graph shows the 10 second C11 data from the same eclipse event. These data (without a gap at the beginning) also show the downward trend of the eclipse. In the fainter part of the eclipse, the C11 and N18 data seem to show similar groupings of brightening during that part of the eclipse on a time scale of 5-10 sec.