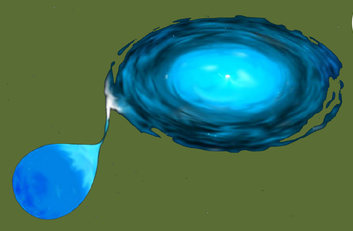

Observations of Cataclysmic Variable Star SS Cygnus

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Abstract

SS Cygnus, characterized as a Dwarf Nova (DN) under the larger umbrella term of Cataclysmic Variable stars (CVs), is a closed binary system. The primary star is a non-magnetic white dwarf (WD) that accretes matter from its red dwarf-like stellar companion. It has an RA of $21^h42^m42.8034^s$, and declination δ of 43°35'9.864", and an apparent magnitude V between 7.7 and 12.4, where it makes this shift for 1-2 days every 7-8 weeks. In this particular binary system, the WD is $0.6M_\odot$, and the red dwarf-type star is $0.4M_\odot$, where there is a combinatory orbital revolution completion in 6.5 hours. SS Cyg is often referred to as the prototype dwarf nova, and the DN class is called SS Cyg Class, as it was the first DN discovered. With an observational study using the 14" telescope at Stony Brook and CCD camera, we intend to perform a photometric analysis of its dimming period, captured over observations in the span of approximately 3 weeks. This data, along with knowing when the last DN outburst occurred, can be used to predict the next outburst. **Our results show the magnitude varying from ~9.6 to ~11.5 over the course of 3.5 weeks, with a standard deviation of 0.0807. The first night was just after a DN outburst. The most recent outburst to date occurred on 10/26/2020.**

Background Information

Cataclysmic Variable Stars:

- Binary system of a WD as the primary and a mass transferring secondary
- Irregularly increases in brightness
- An instability-prone accretion disk of H-rich matter forms, which leads to the Dwarf Nova outburst.

Nova Explosion Mechanism:

- Star fills Roche-lobe by expanding during the later stages of its evolution.
- Distinguishing factor between DN and CN is that DN does not eject a shell of material with the outburst.

To the right shows the **AAVSO light curve data**, which includes the most recent brightening just before our observation. The parts of this graph in which our data lies are highlighted in purple on 9/28, 10/8, 10/19/2020.

Acknowledgements: John Green, Michael Smith

SS Cygnus

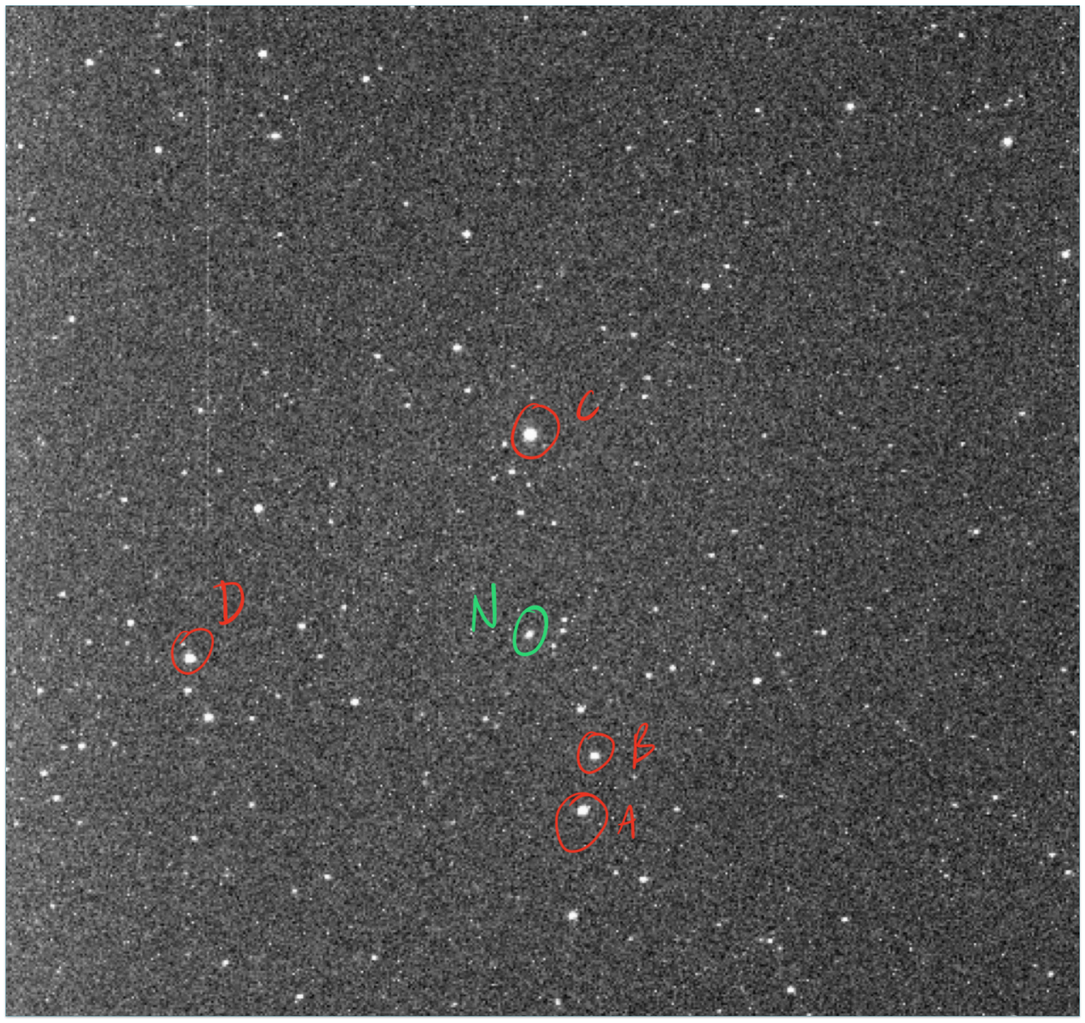
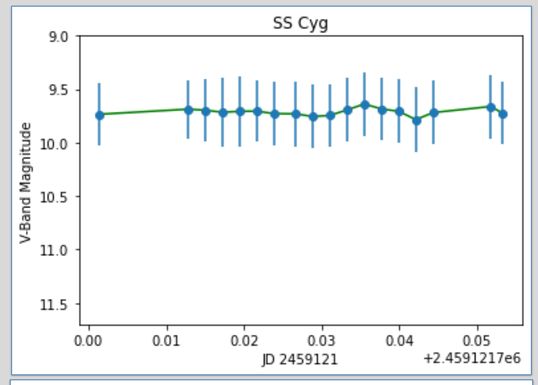
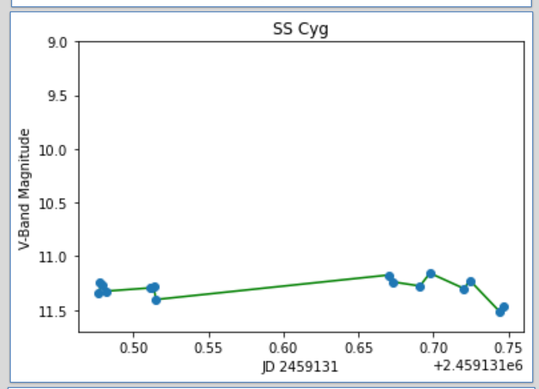
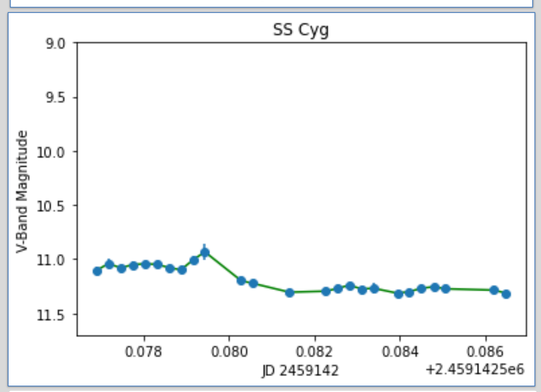


Figure 1: This shows SS Cygnus (N), along with the comparison stars (circled in red) used to detect its location before each observation, and after the meridian flip of the telescope. The image was taken on 10/8/2020, with an exposure time of 6.5s. At an outburst, the magnitude of the nova would match comparison star C, labeled above.







The above graphs show **our data in Python** from the three separate nights, where the first night is just after a brightening, and the second night begins quiescence.