

ULTRAVIOLET SPECTROPOLARIMETRY OF CLASSICAL NOVAE IN OUTBURST: EVIDENCE FOR ASPHERICAL EJECTA

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Abstract. We used the Wisconsin Ultraviolet Photo-Polarimeter Experiment during the Astro-2 mission aboard the Space Shuttle Endeavour, to obtain ultraviolet spectropolarimetry of three classical novae that had recently gone into outburst. All three novae appear to have intrinsic polarization, with polarization changes across emission lines. This result indicates that, geometrically, the ejecta were quite aspherical.

1. Observations

On 1995 March 2, the Astro-2 mission was launched aboard the Space Shuttle Endeavour. Part of the Astro-2 package was the Wisconsin Ultraviolet Photo-Polarimeter Experiment (WUPPE). WUPPE is a 0.5 m Cassegrain telescope with a spectropolarimeter that covers the wavelength range 1450...3300 Å with spectral resolution 5 Å. One of the many science programs that the WUPPE team had was to observe cataclysmic variables. We were very fortunate to have three bright classical novae go into outburst within a month and a half of launch. These were Nova Cir 1995, Nova Aql 1995, and Nova Cen 1995. They were observed, respectively, 44, 26, and 15 d after discovery.

After we subtracted the polarization due to the interstellar medium, there was still polarization in the continuum as well as variations in the polarization and position angle through the emission lines. In particular we

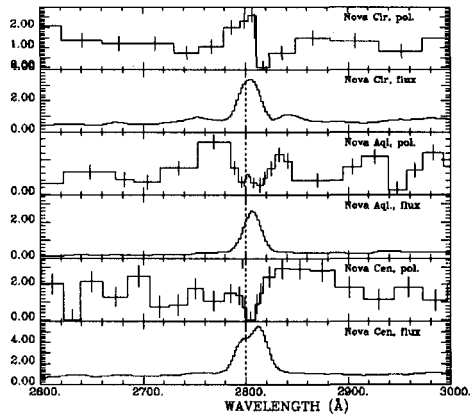


Figure 1. Polarization and flux through the Mg II line

saw that the three novae were all different in their behavior through the Mg II line at 2800 Å. Fig. 1 shows the variation in line shape and polarization behavior through this line. In particular, note how the polarization rises through the emission line in Nova Cir. Since this line is formed via resonance scattering, the implication is that the geometry of the scattering region differs markedly from the geometry of the region producing the continuum polarization and also differs from the geometry of the region producing the other emission lines.

2. Conclusions

Conclusions at this stage are tentative as the analysis of our data has just begun. However, some features are already evident:

- (i) all three novae show evidence of intrinsic polarization which means that there is asymmetry in the ejecta;
- (ii) the lines are formed in a region separate from the source of the polarized light *except* in the case of the Mg II line for Nova Cir, which appears to be formed in yet another aspherical region.

The combination of spectral and polarization analysis will allow us to build up a 3-D 'snapshot' picture of the nova eruption.