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ABSTRACTS

had a resolution of 0.6 Å while in the nebular phase the resolution ranged from 2 Å to 4 Å. The nova was observed at DAO on more than 40 nights in 1992.

Our first spectrum was obtained near maximum light on February 22, 1992. It showed weak Hα and Fe II emission lines with P-Cygni absorption components at –910 and –1670 km/s (IAUC 5457). During the early decline, the P-Cygni absorption complex spread blueward, eventually reaching –2900 km/s by the end of March. Observations by IUE showed absorption troughs of UV lines extending to –2800 km/s even before maximum (IAUC 5456). This suggests that the apparent increase in the velocity of the diffuse-enhanced absorption is due to opacity effects, not a physical acceleration of the gas or the changing geometry of the expanding shells.

The transition to the nebular phase occurred in late April, 1992. The emission lines were broad (FWHM of 2200 km/s) and continued as many as 10 velocity components. The temperature and density evolution of the major velocity components are estimated from diagnostic line ratios during the nebular stage.

The similarity between Nova Cygni 1992 and V1500 Cyg suggested that the coronal lines, [Fe II] 6374 Å, might be present in the early nebular phase. The unusual shape and strength of the [O I] line at 603 Å led us to convolve the emission, but the contamination was found to be due to the SII doublet 6347/671 Å. Infrared observations indicated the onset of a coronal phase 200 days after maximum (IAUC 5612), and our data from this period are analyzed for evidence of coronal lines in the optical.

44.04 Prediction of the 26Na and 27Al Production and γ-ray Emission From Nova Cyg 1992 and Nova Her 1991

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We have analyzed the IUE and optical data from the recent outbursts of Nova Her 1991 and Nova Cyg 1992. Both novae show evidence for enhanced neon and are ONeMg novae. Based on outbursts of similar novae, we predict that they will both exhibit abundance enhancements in aluminum and magnesium with respect to solar material. The observational evidence for sodium is more problematical since the line at 2069 Å, previously attributed to Na V, is more likely due to Ne III. A recent theoretical study of such outbursts (Starrfield et al. ApJ, 391, L71, 1992) indicate that a significant amount of 26Na and 27Al are produced during the explosions of ONeMg novae, although the actual amount depends quite critically on the mass of the white dwarf. The calculations also show that the abundances of both oxygen and higher mass nuclei, such as sulfur and phosphorus, depend on the mass of the white dwarf. Another important result of this study is that 27Al should be produced in explosions on lower mass white dwarfs while 26Na will be produced only in explosions on high mass white dwarfs. This implies that the novae which are responsible for 26Al in the galaxy are not the same novae that produce γ-ray emission from 26Na. We will use the observational data that we have gathered for both Nova Her 1991 and Nova Cyg 1992 to predict the nucleosynthesis that occurred during the explosion of each nova. This research was partially supported by NSF, NASA, and DOE.

44.05 Evidence for Asymmetries in Nova Cygni 1992: Don’t Assume a Spherical Nova!


We present spectropolarimetric observations of Nova Cygni 1992 made at the Pine Bluff Observatory of the University of Wisconsin from March through October 1992. The observations cover the wavelength range from 3200 to 7800 Å, with a spectral resolution of about 25 Å. The observations show evidence for depolarization across the spectral lines of hydrogen early in the development of the nova. The overall continuum polarization decreased during the first two months of the observations, then leveled off at its present level of about 1.1% at V. Most of the remaining continuum polarization is likely interstellar. The changes in the polarization show evidence for a preferred direction, which may indicate an asymmetric geometry for the explosion. The spectral data obtained simultaneously are discussed in a separate paper at this meeting, and monitoring of the nova from PBO is continuing.

This research has been supported by NASA contract NASS-26777 to the University of Wisconsin.

44.08 Optical Spectrophotometry and the Physics of Nova Cygni 1992


Optical spectrophotometry covering the 3200-7300 Å wavelength interval has been obtained for Nova Cygni 1992 beginning on March 1, 1992 with a spectropolarimeter on the 0.9-m telescope at the Pine Bluff Observatory. These data record the optical spectral evolution of Nova Cygni from about 1 mag below visual maximum through the development of the nebular spectrum. The observations are analyzed in terms of the energetics of this nova and the evolution of conditions within the ejecta. During the early decline decreasing density is a major factor, and we find a rapid transition in the optical depths of the H-recombination lines occurs 65 days after visual maximum. At this time the nebular spectrum emerged with initially strong [NII] and later [NIV] features which are characteristic of a "novae nova." We discuss these spectra in terms of the electron density, radiation field, and abundances in the nova nebula. Spectropolarimetry of Nova Cygni will be continued from Pine Bluff Observatory through this fall. The polarization properties of Nova Cygni derived from these data are discussed in a separate paper at this meeting.

44.09 Photometric Observations of Nova Cygni 1992


We present B-band photometric observations of the slow ONeMg nova, Nova Cygni 1992. The data were obtained with University of Wisconsin’s 16” Cassegrain telescope at Pine Bluff Observatory and cover the time period between May and October 1992. Each data set has a time resolution of 5 seconds. In addition to the ground-based observations, Nova Cyg 1992 will be observed with the Hubble Space Telescope’s High Speed Photometer (HSP). Ultraviolet observations obtained during the late stages of outburst are particularly interesting because they allow us to probe regions near the central engine of the nova system. Although the HSP observations will be obtained after the common-envelope phase, interesting variations may still be detected which will help us put constraints on post-outburst conditions.

Our preliminary analysis of the ground-based data suggests evidence for variability at the 1% level over timescales of tens of minutes. These variations became apparent only after the system became optically thin and are most likely associated with the binary orbital period or with processes within the nova binary. The shape of the photometric variations resemble those discovered in Nova Muscae 1983 (Diaz and Steiner, 1989, ApJ, 339, L41.). The confirmation of this type of periodic variability in Nova Cyg would be suggestive of the presence of an AM Her type binary in this system.

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