

A SPECTROGRAM OF THE RECURRENT NOVA
U SCORPII

ANTHONY D. MALLAMA
Astronomy Department
Computer Sciences Corporation
Silver Spring, MD 20910

BORIS STAROSTA
Landon High School
Bethesda, MD 20014

Abstract

The spectrum of U Scorpii, observed five days after its outburst in 1979, consists of strong, broad emission lines of hydrogen, helium, carbon, nitrogen, oxygen, and iron superposed on a weak continuum.

* * * * *

We obtained a spectrum of the star U Scorpii after its outburst in 1979, the fourth outburst since its discovery in 1863. Our observation was made five days after the re-discovery reported by Kozai and Mattei (1979), by which time U Sco had faded from its maximum magnitude of 8.8 to visual magnitude 11.3. At quiescence the star is fainter than 17th magnitude.

The thirty minute exposure with the 91-cm reflector at Goddard Space Flight Center began at 02:35 U.T. on 28 June 1979. The Cassegrain spectrograph equipped with an RCA C33011 image intensifier (S-20 photocathode) recorded the spectrum at a reciprocal dispersion of 113 Å/mm with approximately 5 Å resolution.

The spectrogram shows strong, broad emission lines superposed on a weak continuum. This is characteristic of a nova, where bright emission lines arise in the rarified gas shell blown off the star's surface during its outburst. The great width of the lines is due to Doppler broadening from the high velocity gases in the shell moving toward and away from the observer.

A tracing of the spectrogram which was recorded on a Joyce-Loebl microdensitometer is shown in Figure 1. The first four Balmer lines are all strong and wide. The Doppler broadening, measured full-width at zero intensity, corresponds to 10,000 km/sec, \pm 1000, which agrees with the results from Hill, Pringle, and Whelan (1979) from data obtained 5 days later. There is also evidence for helium, carbon, nitrogen, oxygen, and iron in the spectrum, as shown in Table I. There may also be narrow absorption lines of H α and H β superposed on the corresponding broad emission components and blue shifted from the central wavelengths.

We wish to thank Drs. R. J. Panek and A. V. Holm, and Mr. L. W. Brown for some helpful discussions. We further acknowledge the Laboratory for Astronomy and Solar Physics at Goddard Space Flight Center for the use of the telescope and microdensitometer.

REFERENCES

- Hill, P. W., Pringle, J. E., and Whelan, J. A. J. 1979,
I. A. U. Circ., No. 3378.
- Kozai, Y. and Mattei, J. 1979, I. A. U. Circ., No. 3373.

TABLE 1
Line Identifications

Measured Wavelength (Å)	Strength	Ion	Rest Wavelength (Å)
3758	medium	OIII	3760
3913	weak	-	-
3980	weak	H 7	3970
4113	strong	H _δ	4101
4342	strong	Hγ	4340
4495	medium	HeI	4471
4652	strong	CIV, NIII	4658, 4640
4857	strong	H _ε	4861
4977	strong	[OIII]	4959, 5007
5140	weak	[FeIII]	5151
5675	medium	NII	5680
6502:	strong	H _α	6563

Figure 1. The spectrum of U Scorpii obtained on 28 June 1979. The prominent broad emission lines due to the nova are described in the text. The narrow emission lines marked by vertical bars are due to sky pollution by mercury vapor lights.

