

## INFRARED SPECTRA OF RECENT NOVAE

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We present CCD spectra of novae PW Vul, QS And, Herculis 87 and V1819 Cyg obtained in the wavelength range 680 to 1080 nm at the Cassegrain focus of the 193-cm telescope at the Observatoire de Haute-Provence (CNRS, France). The reciprocal dispersion is 23 nm/mm.

Nova	Date	Day	Table I Comp. star	Exp time (sec)	E(B-V)
PW Vul	Sept 29'85	424	o Peg	7200	0.45
QS And	Sept 9 '87	273	o Peg	8100	0.063
Her 87	June 5 '87	125	109 Vir	5400	0.4
Her 87	Sept 12'87	224	o Peg	900	0.4
V1819 Cyg	Sept 9 '87	398	o Peg	8100	0.7

Table I gives for each nova the date of observation, the number of days elapsed since maximum light in the visible, the comparison star used, the exposure time in seconds and the E(B-V) value adopted in view of their galactic location. These spectra have been used for deriving the emission line fluxes given in table II.

Figures 1 to 5 display the spectra who refer to the nebular phase. The spectral range in the figures has been limited to the portions of the spectrum where the noise is tolerable. It should be noted that these tracings are generally the mean of several spectra taken at short time intervals. The mean fluxes are divided by the continuum in order to obtain a clear presentation of the various features. The ordinates should thus not be used for comparing line intensities. Identifications are reported on the figures where the wavelength scale is given in Angströms.

PW Vul (figures 1 and 2). Spectra of this nova have been published namely by Kenyon and Wade (1986). The present spectra refer to day 424. The spectrum on day 90 is given for comparison (see Andrillat and Houziaux, 1987). Spectral changes are important between these two dates. On day 424, CI, NI, and SI lines have disappeared whereas Paschen lines are reinforced. HeII lines are strong. SIII lines are predominant and the coronal line SVIII at 991.8 nm is present. An unidentified feature at 833.5nm is clearly seen on the red wing of the OI line.

QS Andromedae (figure 3). On our spectrum taken on day 273, Paschen lines are visible from P7 to P12. OI and HeI lines are present, as well as the HeII line at 1012.3 nm (not shown on fig 3). The nebular lines seen in the spectrum belong to OII, AIII, AIV, SIII, and SVIII. The unidentified feature at 833.5nm is a narrow line relatively intense.

Nova Herculis 1987 (figures 4 and 5). We observed this nova at two dates during the nebular phase. Between days 125 and 224, spectra have strongly evolved. S III lines have become quite strong on day 224. S VIII, already visible on day 125 is still there on day 224. At that date, the spectrum exhibits the unidentified structure at 833.5nm; it is a narrow line located on the red wing of the OI+NI blend. The lines of several ions show a double structure.

V 1819 Cygni. Spectra of this nova have already been published and described (Andrillat and Houziaux, 1989). We report in this paper the emission line fluxes for day 398.

The emission line fluxes have been obtained in comparing the novae flux distributions to that of o Peg and 109 Vir, whose monochromatic magnitudes are taken from Cochran

Table II. Emission line fluxes (in units of  $10^{-13}$  erg cm $^{-2}$ s $^{-1}$ )

(nm)	Ion	PW Vul 424	QS And 273	Her 87 125	Her 87 224	V1819 Cyg 398
667.8	He I		2.21		0.234	11.2
700.6	A V					4.4
706.5			1.47	5.76	0.288	2.6
713.5	A III		1.51	2.73	0.485	2.0
723.5	A IV		3.04	4.32	0.297	3.3
733.0	O II		24.8	6.75	2.31	41.4
753.4	He II		0.39		0.124	9.9
772.5	C IV (bl)		2.25	9.08	0.761	
775.1	A III					6.7
789.6	Fe XI	0.80				1.4
822.0	O I		1.96	4.61	0.414	
822.4	He II	2.05				5.3
833.5	?		0.33		0.09	
844.6	O I	0.50	0.73	6.10	0.117	4.4
875.0	H (P12)	0.067			0.096	1.6
886.8	H (P11)	0.08		2.5		1.1
906.9	S III	3.34			0.676	
922.9	H (P9)	2.67		7.18	0.62	4
953.9	P8+S III	4.8			0.96	
954.8				5.4		4.7
991.8	S VIII	0.42		3.84	0.14	1.9

(1980, 1981). Differential atmospheric absorption between the novae and the comparison stars have been taken into account in using the mean atmospheric absorption curve given by Mianes (1963). The fluxes given in table II have been corrected for interstellar extinction in making use of the E(B-V) values of table I and Seaton's mean extinction curve. Because of noise, atmospheric absorption bands, and difficulties in setting the continuum level, the accuracy of these fluxes is around  $\pm 25\%$ .

## REFERENCES

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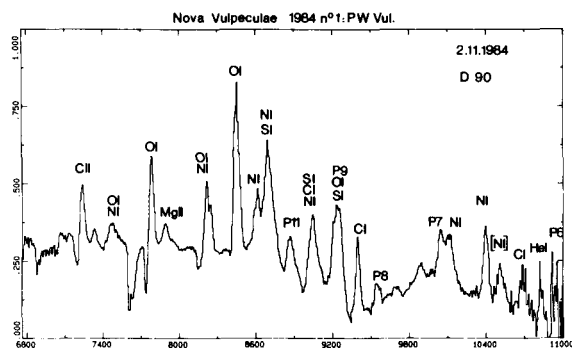


Figure 1

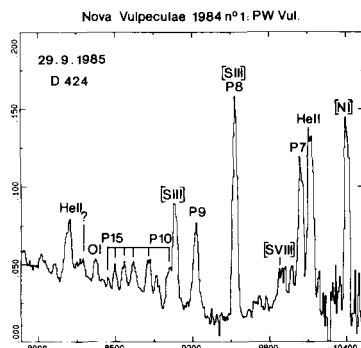


Figure 2

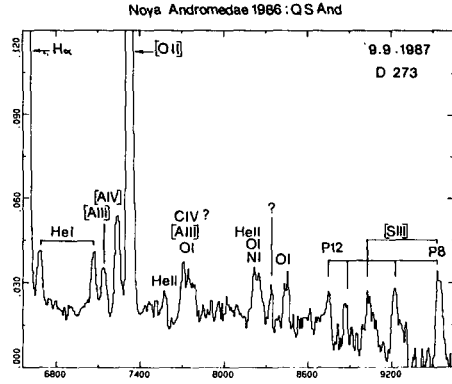


Figure 3

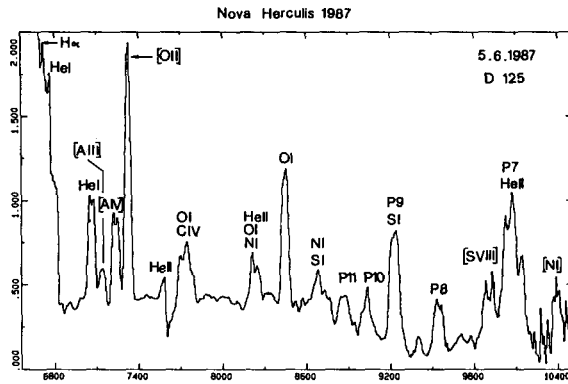


Figure 4

