

A H α FLARE ON UV PISCUM

UV Psc (=HD 7700, $m_v=9^m2$, $P=0.86$ days) is an eclipsing spectroscopic system classified with the short-period group of RS CVns. This system has been studied in several papers, but its properties are still not well-established: e.g. for the spectral types of the components Barden (1985) determined G2/K0IV, while Popper (1991) suggested G5V/K2V. The spectroscopic observations of UV Psc made by Popper (1976, 1991) indicate that the system is a double-line binary with emissions from both components in the H and K lines of CaII, though the cooler component contributes only weakly to the spectrum (the contribution from the hotter component is $L_1/(L_1+L_2)=0.80$ in V). The presence of a prominence in UV Psc was revealed by spectral subtraction in the H α order (Hall and Ramsey, 1992).

We observed UV Psc in the H α region during November, 1993 with the aim of studying the rotational modulation at chromospheric levels. The observations were carried out with the All-Fiber-Coupler grating spectrograph of the 2.16 m telescope at Beijing Observatory. The reciprocal linear dispersion was 50 Å/mm at H α , and the detector was a CCD array with 512×512 pixels. The pixel-to-pixel resolution of the detector comes to 1.15Å. A signal-to-noise ratio (S/N) of about 100-150 in the H α continuum was reached with typical exposure times of 15 minutes. The spectra, extracted from the CCD images with a standard reduction procedure, and calibrated in wavelength using a comparison neon lamp, were normalized to the continuum through a polynomial fit.

We have measured the net H α equivalent width (WH) after subtracting an average spectrum of the single non-active star ζ Cas A from our spectra. The reference spectrum was appropriately shifted in wavelength in order to account for orbital Doppler shifts of the visible component in the spectrum. This method allows us to get a better estimate of the emission equivalent width, even when the observed line profile is only marginally filled-in by emission.

UV Psc has been observed for five nights, from November 17 to 22, 1993 when 76 spectra were obtained. These cover most of the orbital phase except an interval of the phase from 0.31 to 0.54. The phases were computed according to the ephemeris given by Jassur and Kermani (1994):

$$T=2444932.2985 + 0.86104771 \times E$$

Figure 1 shows the secondary order spectra around H α for UV Psc and the reference star, which were obtained on the 22nd Nov. The net H α emission equivalent width computed from the observations obtained on the 22nd are plotted against the orbital phases in Figure 2.

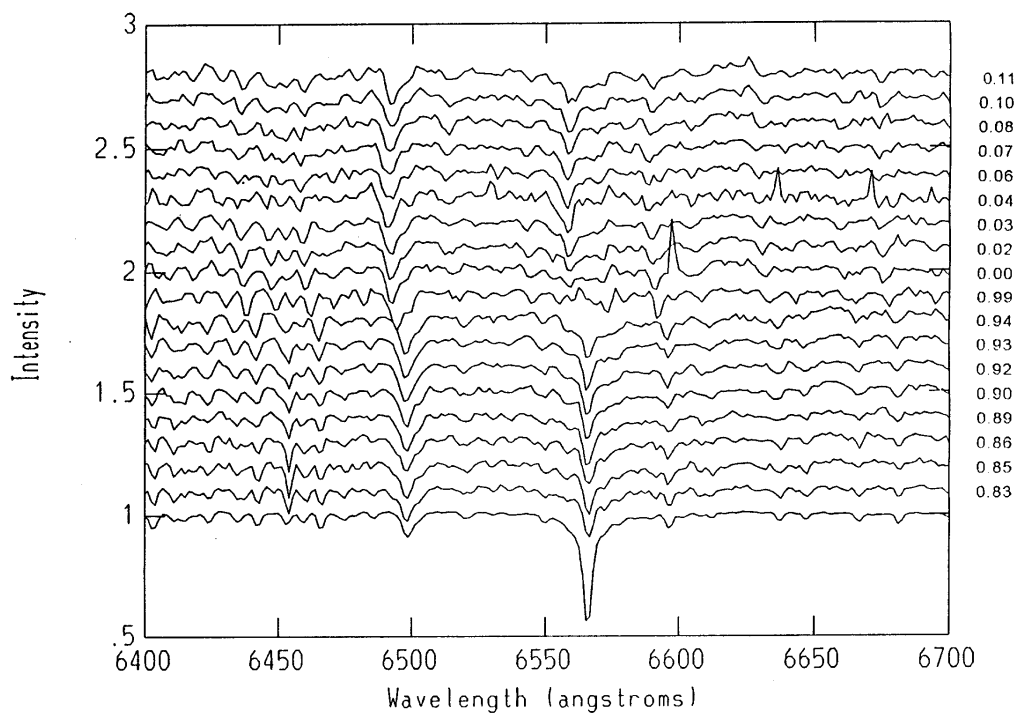


Figure 1. H α spectra of UV Psc obtained on 22nd Nov. 1993. The spectrum of the reference star ζ Cas A is presented in the bottom of the plot.

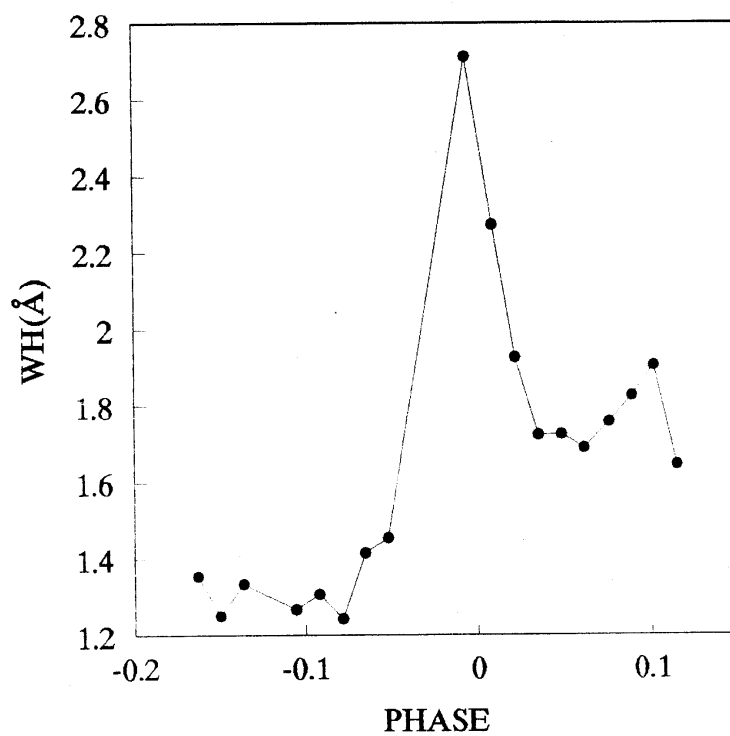


Figure 2. H α emission equivalent width as a function of the orbital phase.

In our observations, $H\alpha$ line appears to be an absorption feature filled-in by some emission, but remarkable variations in the $H\alpha$ profile are clearly displayed in the plots. Especially, it is possible that such variations in the $H\alpha$ profile and the net emission equivalent width values suggest a complete development of a $H\alpha$ flare in UV Psc. The flare curve is characterized by a fast rising phase lasting about 1.1 hours and a slow decay phase lasting about 2.4 hours. Before rising, a small concave seems to occur near the phase 0.9 and after the first decay, a small hump clearly occurred near the phase 0.1. This behaviour indicates that the flare is composed of at least two events. Multiple events are often seen in other RS CVn systems as well as in UV Cet type stars. This long duration (3.5 hours) is shorter than the typical duration of single flare in RS CVn stars (15-17 hours), and may be compared with the solar two ribbon flare duration (5-7 hours).

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