TIME RESOLVED OPTICAL SPECTROSCOPY OF V795 HER

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Abstract. We present high resolution optical spectroscopy of the cataclysmic variable (CV) V795 Her. The time- and phase- dependent behaviour of the emission source is examined using two-dimensional image analysis and Doppler reconstruction techniques on the orbital profiles. A clear S-wave modulation of a weak emission feature in the Hβ and Hγ line wings (extending to $\sim$1800 km s^{-1}) is present, with complex asymmetric properties.

1. Introduction

Preliminary results are presented from an optical spectroscopic study of the CV V795 Her, based on $\sim$1 Å resolution data secured using the 2.5 m *Isaac Newton Telescope* during 6 nights in 1994 June. V795 Her is an important system since (i) it has a mooted orbital period of $\sim$2.6 h which places it inside the CV 'period gap', (ii) its UV spectrum exhibits broad blue-shifted absorption line troughs, indicative of a fast outflow (Prinja, Drew & Rosen 1992) and (iii) its precise classification remains debated.

Our analysis is based on the inspection of 241 individual exposures ($\lambda\lambda$ 4080–4970) and appropriate phase binning. The data provide constraints on localised emission regions residing on the accretion disk of V795 Her.

2. Results

Fourier analysis confirms that the total observed emission strengths of the Balmer lines, and the He I λ4471 absorption equivalent width, modulate

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on the 2.6 h orbital period of V795 Her. The double-peaked emission core of Hβ is variable in strength and width, but does not exhibit any obvious radial velocity modulation. Significant variability is also seen in the shallow extended wings of Hβ.

Phase-folded, trailed spectral images of the binned Hβ profiles were constructed to examine systematic profile changes as a function of the 2.6 h orbital phase. A prominent S-wave modulation is seen extending to $\sim$1800 km s^{-1}, as previously observed by Haswell et al. (1994). Their lower velocity S-wave is not obvious in our data, though an enhancement of the blueward and redward peaks is noted at orbital phase $\sim$0.4 and $\sim$0.9, respectively.

Our higher resolution data also reveal some complex and previously unrecognised properties of the outer S-wave. We identify two possible asymmetries: (i) the blue Hβ wing shows greater enhancement in emission compared to the red wing, and (ii) the motion of the feature on the red side does not represent an obvious continuation of its blue counterpart. A similar analysis carried out on the Hγ profiles reveals the same emission enhancements at phases $\sim$0.4 and $\sim$0.9 and a corresponding, asymmetric outer S-wave.

The Balmer line profiles show a redward absorption feature, extending to $\sim$1000 km s^{-1}, which acts to subdue the redward portion of the S-wave. It is stronger in the first half of the orbit i.e., from phases 0.0...0.5.

Doppler mapping of the Hβ profiles suggests an emission ring from gas circulating near the outer rim of the accretion disk. It has a $\sim$600 km s^{-1} diameter which corresponds to the splitting of the double peaks in the emission line profile, and implies a projected Keplerian velocity of $\sim$300 km s^{-1} at the disk's outer rim. The image has a greater extent in azimuth than the one reported by Haswell et al. (1994). Enhanced Hβ emission is seen at, and downstream from, the point of impact of the gas stream, corresponding to the inner S-wave feature that boosts the blue and red emission peaks at around phases 0.4 and 0.9, respectively. Doppler maps based on data from phases 0.5...1.0 avoid the redward absorption feature in the first half of the orbit, and reveal a pattern corresponding to the outer S-wave.

Our ongoing analysis aims to constrain the accretion stream geometry and the potential roles of inner disk and rim hotspots. We also plan a comparison to *Hubble Space Telescope* (FOS) UV spectra of V795 Her taken during the same week in 1994 June (see Rosen et al. 1996).

References

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