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THE SHORT ORBITAL PERIOD CV Hα0242-28

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RESUMEN

Presento resultados preliminares de espectroscopía VLT+FORS2 con resolución temporal de la variable cataclísmica recientemente descubierta (CV) Hα0242-28.

ABSTRACT

I present preliminary results from the VLT+FORS2 time resolved spectroscopy of the newly discovered cataclysmic variable (CV) Hα0242-28.

Key Words: **NOVAE, CATACLYSMIC VARIABLES — STARS: INDIVIDUAL (Hα0242-28)**

1. OBSERVATIONS, ANALYSIS, AND PRELIMINARY RESULTS

Hα0242-28 was selected as candidate CV in the UKST survey (Davenhall et al. 2002), and subsequently observed in spectroscopic mode by Howell et al. (2002), who confirmed its CV nature. Hα0242-28 spectrum strongly resemble WZ Sge one, thus time resolved spectroscopy has been performed to both determine the orbital period (OP) and compare WZ Sge and Hα0242-28 line forming region. The obtained spectra cover the wavelength range 4270-5555 Å, and have a dispersion of 0.63 Å/pix. The observed emission lines are the Balmer lines Hβ and Hγ, the FeII multiplet 42, the HeI 4472 Å, and the (very weak) HeII 4685 Å. Line profiles are double peaked with very deep V-shaped central absorption (Howell et al. 2002, and Mason & Howell in prep.).

I determined an OP of 108±5 min by averaging OPs found from measurements of different emission line components (e.g. peak position, central absorption position, etc). I also determined the radial velocity curve through the double Gaussian fit method (Shafter 1983), and the best fit is $K_1 = 99 \pm 8$ km/sec, $\gamma = 53 \pm 6$ km/sec, and $\varphi_{R/B} = 0.06 \pm 0.01$ (Hβ emission line). The phase of the red-to-blue crossing, $\varphi_{R/B}$, differs from zero because spectra have been phased according to the photometric secondary inferior conjunction (see below. See also Mason et al. 2000 for discussion about the offset between spectroscopic and photometric secondary inferior conjunction).

Fig. 1 shows the continuum light curve at λ=5500 Å. Hα0242-28 light curve is characterized by a very deep eclipse of ~2 mag, which is comparable to that observed in OY Car and Z Cha (e.g. Ritter & Kolb 1998). Both OY Car and Z Cha are high orbital inclination systems with $i \sim$82-83^o, thus, to a first approximation, I assume a similar orbital inclination for Hα0242-28 in the computation further below. Outside eclipse the light curve appears quite scattered though there might be evidence for a pre-eclipse hump, which is signature of the hot spot contribution. I also observed partial eclipse of the Balmer emission lines (eclipse depth $\leq$1 mag), but just strong flickering and no modulation outside eclipse. The different characteristics of the continuum and emission lines light curves imply that the hot spot is a relatively strong light source in the continuum but not in the emission lines.

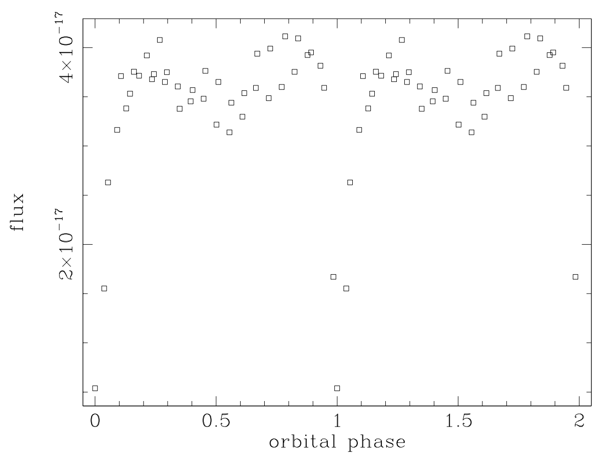

Fig. 1. Hα0242-28 continuum light curve determined measuring the continuum at 5500 Å.

Trailed spectrograms of the Balmer lines confirm a weak hot spot fractional contribution in the emission lines (see Fig. 2). Trailed spectra show hints of hot spot emission only in the phase ranges 0.2-0.25 and 0.8-0.9. Fig. 2 shows, for comparison, also

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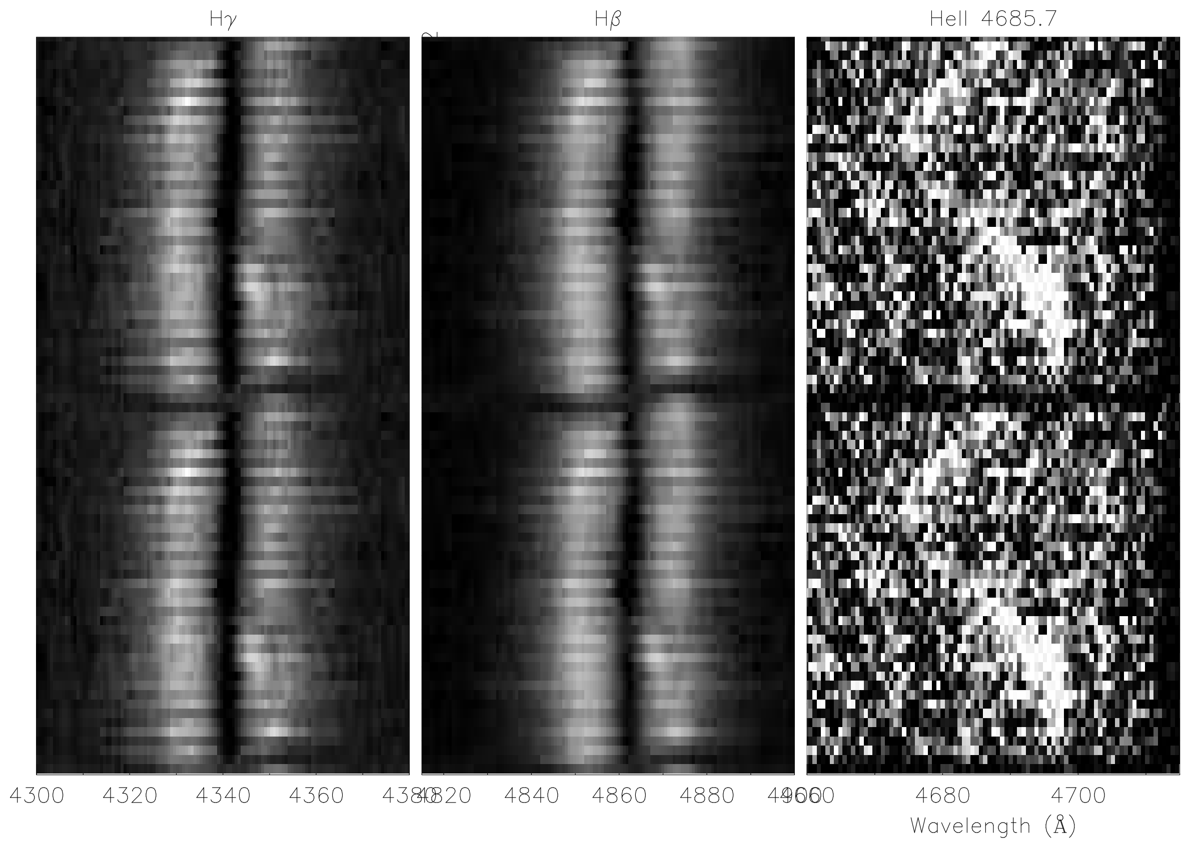

Fig. 2. Trailed spectrograms. From left to right: Hγ, Hβ, and HeII 4686. In each trailed spectrogram data are repeated over two orbital cycles for clarity and to better show the emission line eclipse.

the trailed spectrum of HeII 4686 Å emission, which clearly arises just from the hot spot. Similar conclusions can be driven also from the analysis of the Doppler maps (Mason & Howell in prep.).

The preliminary analysis of the Balmer lines shows that Hα0242-28 closely resembles SU UMa type objects rather than WZ Sge (see Mason et al. 2000 and Skidmore et al. 2000 for comparison). Furthermore, the system geometry seems to be consistent with a short orbital period systems not yet evolved past the orbital period minimum. Using Howell & Skidmore (2000) M_2-P relation I derived a secondary star mass of 0.17 $M_\odot$, thus (solving for M_1 the secondary star mass function with our derived OP, K_1, and i in input) a white dwarf mass of $M_1 = 0.64 M_\odot$. If past orbital period minimum, Hα0242-28 should have $M_2 \simeq M_1 = 0.03 M_\odot$, which does not appear to be realistic.

I conclude arguing on the uniqueness of WZ Sge and its line forming region. Should the latter be signature of the fact that WZ Sge is a post OP minimum CV, then WZ Sge appears to be the only one of such systems (i.e. the oldest ever observed CV), rather than the prototype of the most populous CV subclass (see e.g. Howell et al. 2001). I believe that time resolved spectroscopy of other WZ Sge like objects is urgent, and I have shown this is feasible at VLT+FORS.

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