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Hα Spectroscopy of WW Cet

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Abstract. Time-resolved spectroscopic data of the cataclysmic variable WW Cet were taken during quiescence, outburst, and decline from outburst. The profile of the Hα emission line is studied by measuring radial velocities of different parts of the line.

The complete poster is available on the World Wide Web at *http://www.astro.ruhr-uni-bochum.de/cta/paper.html.*

1. Introduction

WW Cet has been originally assigned to the Z Cam subclass, but its long-term behaviour let Warner (1987) and Ringwald et al. (1996) propose it as a possible link between dwarf novae and VY Scl-type nova-like variables. In the context of the hibernation model (Vogt 1982, Shara et al. 1986), WW Cet is therefore an important object to study.

We took time-resolved spectroscopy of WW Cet at the 1.9 m telescope at the South African Astronomical Observatory. In total, 67 measurements have been obtained in 1993 (quiescence) and in 1994 (outburst and decline). The spectra cover the wavelength range 6000–7000 Å at a resolution of 1.5 Å.

2. The Line Profiles

A preliminary calculation of the inclination for WW Cet yields $i \approx 43°$ (Tappert et al. 1996). Although our instrumental resolution should therefore suffice to resolve double peaks which are expected for emission from rotating material in the accretion disk (Horne & Marsh 1986), the spectra clearly show a single-peaked profile. To investigate additional sources which might appear superposed

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onto the pure disk profile, we measured the radial velocities of different parts of the Hα line (the wings supposedly originate closer to the white dwarf (WD) than the line center). A function of the form $v_r = \gamma + K_1 \sin[2\pi(t - T_0)/P]$ was fitted to the radial velocity curve of the different parts. The results are the following:

- The zero phase of the radial velocity curve *increases* ($\approx 30°$ in quiescence) towards the line wings. This is a rather unusual behaviour, as radial velocity curves of sources near the hot spot (which is usually displaced from the WD–secondary axis in direction of the orbital rotation) would yield zero phases which *follow* the WD's one. However, the existence of a phase shift itself gives evidence for an additional, asymmetric emission source, thus excluding line broadening effects as the dominant factor responsible for the single-peaked profile in WW Cet.

- The K_1 values of the line centers show the following behaviour: K_1(quiesc.) $> K_1$(decl.) $> K_1$(outb.). When interpreting this, one should bear in mind that these velocities do not result from Keplerian motion alone, but are combined with the velocities of the infalling material. However, with the zero phase showing approximately the same variations during outburst and quiescence, this might point to a change of the disk radius during outburst.

- The γ value rises towards the wings both in quiescence and outburst by ≈ 35 km/s, but shows the opposite behaviour during decline. The latter is somewhat puzzling, but the variation of the line profile in the decline spectra is probably not only caused by the orbital rotation, but also by changes within the disk. However, the different γ values (which are a common phenomenon in cataclysmic variables) should lead to caution when interpreting γ as the systemic velocity.

The logical next step will be to establish a Doppler map (Marsh & Horne 1988) which will provide more exact information about the emitting regions.

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