THE POSSIBLE CONTRIBUTION FROM THE ACCRETION DISK DURING THE QUIESCENCE OF VW HYI

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Abstract. We have re-analyzed UV spectra of the dwarf nova VW Hyi during its quiescence, obtained with the *Faint Object Spectrograph* (FOS) on *Hubble Space Telescope* (HST), by considering the possible contribution from the accretion disk, which was not included in the previous analysis.

1. Introduction

Mateo & Szkody (1984) first pointed out the white dwarf origin of the IUE spectra of VW Hyi during its quiescence by identifying the sharp turnover near 1360 Å as a result of the Lyα absorption from a $18\,000 \pm 2\,000$ K, $\log g = 8.0$ white dwarf atmosphere. Wade, Hubeny & Polidan (1994) confirmed the results of Mateo & Szkody (1984) by comparing the IUE data with synthetic spectra, but also pointed out that a composite model consisting of a white dwarf and an accretion disk in a steady state, with $\dot{M} = 10^{-10}\,\mathrm{M}_{\odot}\,\mathrm{yr}^{-1}$, describes the Ly$\alpha$ absorption equally well. Based on the assumption that the white dwarf is the dominant source of the UV flux during the quiescence of VW Hyi, Sion et al. (1995) analyzed two HST/FOS UV spectra obtained on 1993 November 13, approximately 10 days after its return to optical quiescence following a superoutburst. They used a grid of high surface gravity synthetic models constructed with TLUSTY and SYNSPEC, and concluded that the white dwarf has

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T_{eff} =22 000±1 000 K, $\log g = 8.0 \pm 0.3$, and chemical abundances as follows: $\mathrm{O/O_\odot} = 0.3$, $\mathrm{N/N_\odot} = 5$, $\mathrm{S/S_\odot} = 0.2$, and all other heavy elements 0.15 solar.

In the present work, we consider the possible contribution from the disk in addition to the white dwarf by re-examining the HST/FOS data analyzed by Sion et al. (1995).

2. Re-examination and analysis of the data

Comparing the best fit white dwarf model spectrum from Sion et al. (1995) with the observed spectra in the wavelength range $\lambda > 1400$ Å, we find that the continuum of the former is basically a straight line, while the latter shows two main features that the pure white dwarf model does not reproduce well, namely (i) the curved continuum between absorption features Si IVλ1400 and Si IIλ1530 and (ii) the possible Keplerian broadened emission feature centered at C IVλ1550. We compare the data with LTE, optically thick disk and white dwarf models. The *UV emitting area* of the disk in our best fit model has $\log g = 6.0$, T_{eff}=28 000 K, $r_{\mathrm{in}} = 1.0\,R_{\mathrm{WD}}$, $r_{\mathrm{out}} = 1.1\,R_{\mathrm{WD}}$, with $\mathrm{C/C_\odot} = 20$, $\mathrm{Si/Si_\odot} = 15$, and the abundance of the other elements being solar; the white dwarf has $\log g$=8.0, $T_{\mathrm{eff}} = 19\,000$ K, with $\mathrm{Si/Si_\odot} = 0.5$ and other metals with their solar abundances. The high abundance of C and Si in the disk/belt may be a result of the enrichment on the surface of the secondary star due to possible past nova explosion event(s) (Stahl & Kolb 1994).

We are currently investigating other possible mechanisms, such as the quasi-molecular absorption, which may also contribute to the absorption feature near 1400 Å. The results of these investigations will be reported in due time.

References

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