RevMexAA (Serie de Conferencias), **20**, 194–195 (2004)

FUSE STUDIES OF DWARF NOVAE DURING QUIESCENCE

E. M. Sion,[1] F. H. Cheng,[1] P. Godon,[1] and P. Szkody[2]

RESUMEN

Hemos obtenido espectros de FUSE de varias novas enanas, los cuales revelan las propiedades de sus enanas blancas acrecientes, sus ritmos de acreción durante la etapa de quietud y la naturaleza de las regiones capa borde/disco interior incluyendo la zona de acreción en las enanas blancas. Entre los sistemas de los cuales presentamos resultados preliminares se encuentran BV Cen, WW Ceti, EY Cyg, SS Aur y VW Hyi. La contribución de estos estudios realizados con FUSE a nuestro entendimiento de la física de los discos de acreción se enfatizará dentro del contexto de la enana blaca y de la capa borde.

ABSTRACT

We have obtained FUSE spectra of several dwarf novae which reveal the properties of their accreting white dwarfs, their rates of accretion during quiescence and the nature of their boundary layer/inner disk regions including accretion belts on the white dwarfs. Among the systems for which preliminary results will be presented are BV Cen, WW Ceti, EY Cyg, SS Aur and VW Hyi. The contribution of these FUSE studies to our understanding of disk accretion physics will be emphasized within the context of the white dwarf and boundary layer.

Key Words: **ACCRETION, ACRRETION DISCS — BINARIES: CLOSE — STARS: INDIVIDUAL (WW CETI, SU AUR, BV CEN, EY CYG)**

1. INTRODUCTION

FUSE observations can determine whether or not accretion belts (small area, hot equatorial regions) dominate the white dwarf temperatures we measure since the global T_{eff}s of the WDs measured by HST and IUE may actually be on the Rayleigh-Jeans tail of a much hotter component (the boundary layer which is actually a hot accretion belt) of small area. These small area belts are the only way to make sense of the model fits which require small surface areas in order to yield reasonable distances. The WDs above the gap that we think are hot may really be globally cool because the belt is what dominates the FUV light. This directly impacts timescales and long term accretion heating during CV evolution. Our FUSE observations also test the disk instability model (DIM): if the disk is there anytime during quiescence, then DIM is violated because DIM predicts the quiescent disk should contribute virtually nothing in the FUV (Hameury 2003). The FUSE FUV has to be all WD or Belt or WD+Belt; no FUV emitting disk is allowed by DIM.

If the WD temperatures do in fact correspond to hot accretion belts of small surface area heated by outbursts and ongoing accretion, then the actual temperatures (outside the belts) of the WDs may be much cooler, thus implying greater ages than the FUV-derived temperatures would indicate. This would impact any comparison of the surface temperatures of WDs in CVs above the gap with those below the gap, comparisons between the accretion heating of WDs in magnetic CVs and non-magnetic CVs and also impact the question of whether CVs evolve across the period gap. It is therefore critical to resolve this possible ambiguity system by system.

2. FUSE RESULTS

We have found that the flux from a hot accretion belt on the WD in the SU UMa-type dwarf nova VW Hyi substantial in the FUSE region (Godon et al. 2004) where the belt has a temperature of 50,000K and the white dwarf has $T_{eff} = 24,000$K. Likewise, for the longer period U Gem-type dwarf nova SS Aur (Sion et al. 2004) we find that the white dwarf has $T_{eff} = 27,000$ while the accretion belt has $T_{belt} = 48,000$K. The white dwarf plus accretion belt best-fit to VW Hyi is displayed in figure 1 while the WD plus belt fit to SS Aur is displayed in figure 2. In addition, Sion and Urban (2002) discovered that RU Peg in quiescence could be explained by a fairly cool WD photosphere (20,000K) and an accretion belt at T_{belt} = 50,000K, with the belt producing 82% of the FUV flux.

[1]Department of Astronomy and Astrophysics, Villanova University, Villanova, PA 19085, USA

[2]University of Washington, USA

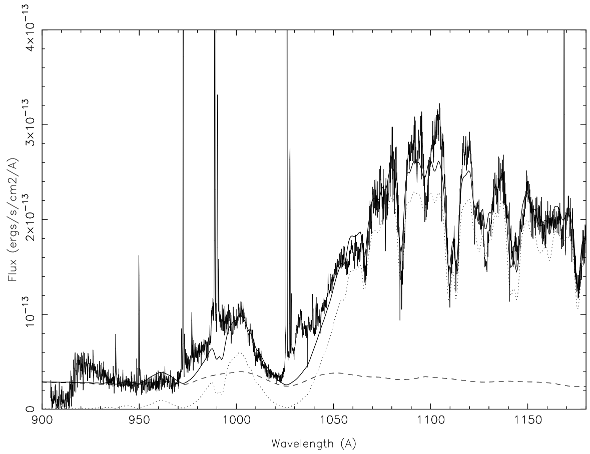

Fig. 1. The best-fitting composite white dwarf plus hot accretion belt model to the FUSE spectrum of VW Hyi. The white dwarf flux is the dotted line, the accretion belt flux is the dashed line and the sum of the two is the solid line.

For the FUSE spectrum of BV Cen, preliminary resuts indicate the best-fitting composite model is that of a white dwarf plus an accretion disk. For EY Cyg, our preliminary fits to its FUSE spectrum yield a white dwarf plus an accretion disk. For WW Ceti, we find a preliminary best-fit to the FUSE spectrum is also a white dwarf plus a disk.

3. CONCLUSIONS

In conclusion, the FUSE spectra of dwarf novae in quiescence we have investigated appear to reveal a mix: some systems reveal single temperature white dwarf-dominatde spectra; some reveal a hot, smaller (than a white dwarf) emitting region (accretion belt + cooler white dwarf) while others reveal a single temperature white dwarf plus an accretion disk or hot inner ring.

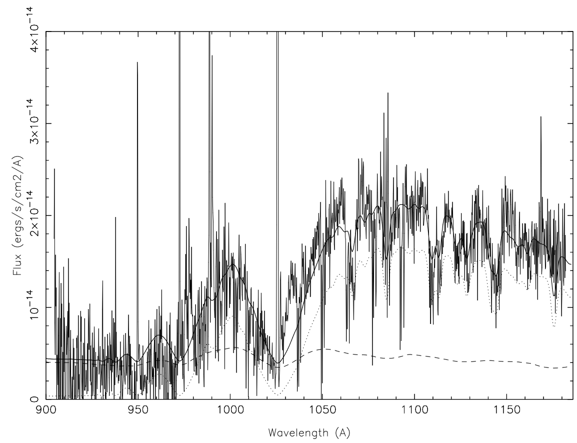

Fig. 2. The best-fitting composite white dwarf plus hot accretion belt model to the FUSE spectrum of SS Aur. The white dwarf flux is the dotted line, the accretion belt flux is the dashed line and the sum of the two is the solid line.

REFERENCES

Godon, P., Sion, E.M., Cheng, F., Szkody, P., Long, K., & Froning 2004, ApJ, in press

Sion, E. & Urban, J.2002, ApJ, 572, 456

Sion, E., Godon, P., Cheng, F., Szkody, P. 2004, AJ, in press

E. Sion, F. H. Cheng, P. Godon: Department of Astronomy and Astrophysics, Villanova University, Villanova, PA 19085, USA. (emsion@ast.vill.edu)

P. Szkody: University of Washington, USA.