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Emission Line Profiles from BeXRBs

R.W. Hanuschik[1]

Astronomisches Institut, Ruhr-Universität, D-44780 Bochum, Germany

M. Maisack

IAA, Universität Tübingen, D-72076 Tübingen, Germany

H. Cao

Beijing Astronomical Observatory, Beijing 1000 080, P.R. China

W. Hummel

Universitätssternwarte, Scheinerstr. 1, D-81679 München, Germany

Abstract. We have measured optical spectra of several BeXRBs. Their Be disks apparently do not differ significantly from those in single Be's.

1. Introduction

BeXRBs are massive interacting binaries with a compact component (neutron star or white dwarf) and a Be star (Waters 1989). The compact object (C.O.) accretes matter on its passage through the Be disk, leading to hard X-ray outbursts with luminosity L_X up to 10^{38} erg/s.

Hitherto main attention has been focussing on X-ray properties of BeXRBs. We have measured optical emission lines in BeXRBs, in order to study kinematics, both in the Be disk and in the interaction zone between C.O. and Be disk. We have obtained Coudé spectra at Calar Alto/Spain, Xinglong/P.R. China, and OHP/France. We have measured Hα, He I λ6678, and Fe II λ5317. We present some of the most interesting examples in Fig. 1.

2. Results

γ Cas. In 1993–96 we find a line shape both in Hα and Fe II which is very typical of so-called class 2 profiles in classical Be stars (Hanuschik et al. 1995). These are asymmetric, with a cyclic change of asymmetry. The cycle period is 8–10 years. The cyclic pattern is attributed to a precessing density wave.

HDE 245 770 = A 0535+26. Hα emission in 1994 is moderately strong and slightly asymmetrical. The He I λ6678 emission is inversely asymmetric. Such

[1]Email address: rwh@astro.ruhr-uni-bochum.de

behaviour suggests a disk distortion by a density wave (see γ Cas), rather than tidal distortion or outflow. The kinematics are rotationally dominated.

LSI 61° 235. The emission line profiles in 1994 look very different from the other objects studied here. Hα is extremely asymmetric, with $V/R \approx 3$, much higher than in ordinary Be disks. Comparison with literature shows that the V/R asymmetry is cyclically variable, with a cycle duration of about 3 years. This system clearly is, from the optical point of view, the most interesting and least understood object in our sample.

3. Conclusions

We have found in our survey of BeXRBs that their optical emission line profiles all are rotationally dominated, i.e. resemble those in single Be disks (Hanuschik et al. 1996). If emission lines are found to be asymmetric, the distortions are either V/R variable on long timescales (several years), which indicates the presence of a density wave, or maybe on the much shorter orbital timescale if induced by tidal interaction.

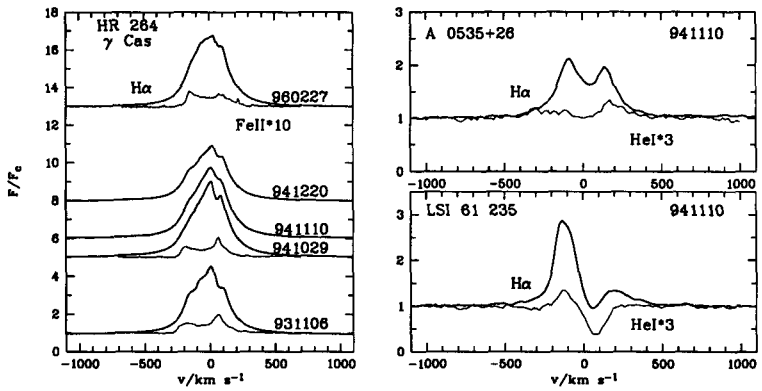

Figure 1. Selected emission line profiles (the low-intensity profiles are those of Fe II λ5317 and He I λ6678, scaled by the factor indicated)

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