THE Be/X-RAY SYSTEM HDE 245770/A0535+26 IN AN ACTIVE PHASE

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The principal aim is to report on the sudden appearance and disappearance of (mainly) Fe II emission lines in the Be/X-ray system HDE 245770/A0535+26, about 24 days before an X-ray outburst was observed.
The system is characterized as an 09.7 IIIe star of mass 20-25 $M_\odot$, accompanied by a neutron star (X-ray pulse period ≈104 s), with orbital period ≈110 d, eccentricity > 0.3; for a more complete description see Giovannelli et al. (1985) or de Loore et al. (1984). X-ray outbursts have been observed recurrently, obviously connected with periastron passage of the neutron star triggering gas infall onto it.
The observed X-ray outbursts are of varied strength, from barely detectabl to 3 Crab units at peak (Nagase et al. (1982), Giovannelli et al. (1984)).
A weak X-ray event took place on December 13, 1981.
The optical plates relevant to the Nov - Dec 1981 period have been listed by de Loore et al. (1984).
No obvious changes have taken place between November 1 and 14; very much the same line strengths were measured for Hα, Hβ and Hγ emission both on BAO and OHP plates: 300-350% for Hα, 40-55% for Hβ, 17-27% above the local continuum for Hγ. The observations of November 19 show a drastically changed spectrum. Numerous metallic emission lines make their appearance (see below). The Hβ emission increases to 85-90%, the Hγ central emission to ≈40%. Hα emission is only marginally stronger on November 19, increases to ≈500% on November 22 and reaches a peak on December 5 (≈1300%); Hβ and Hγ remain on the November 19 level. A drop in all Balmer emission lines to a minimum value occurs on December 7; they are back to the early November level on December 16.
A unique phenomenon is presented by the appearance of metallic emission lines, mostly Fe II, on November 19. Also the He II 4200 line suddenly appears in emission.
The Balmer lines and He I 5875 do not change position during that night; they are at the laboratory wavelength or slightly shifted towards the blue (≈-50 km/s). The other emission lines change position considerably towards the red. We measured the radial velocities of the metallic emission lines on the November 19 plates. The results are given in the table.
We have looked for the most prominent Fe II emission lines on the high-dispersion OHP plates of November 11-14. The only positive trace we found is on plate V4405 of November 14 for Fe II 4889.7. All metallic emission lines have disappeared on the November 22 plates.

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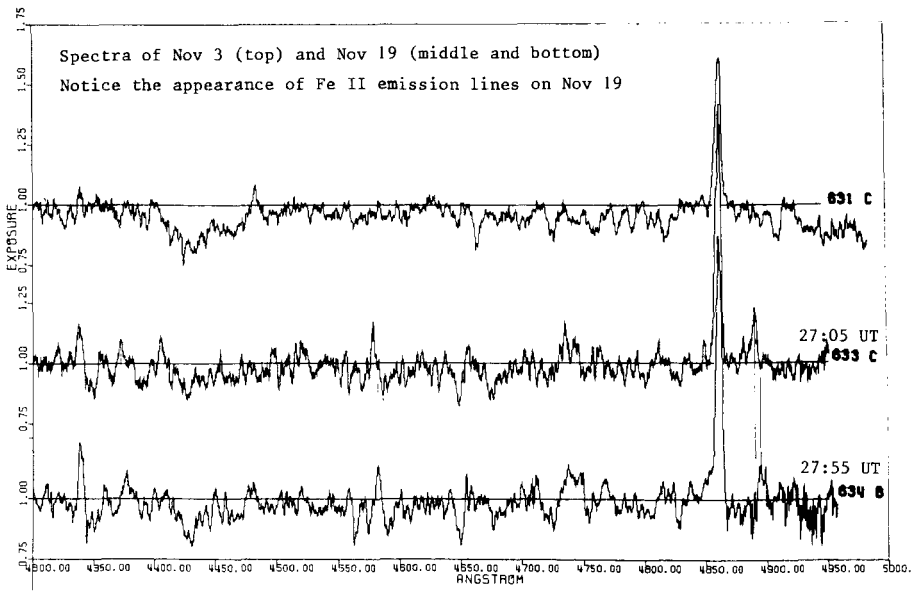
Table 1. Measured radial velocities in km/s. The errors are of the order of 100 km/s

time (UT)	26:25	26:50	27:05	27:20	27:40	27:55	28:10
lambda							
3700-4350	30	15			640		
4300-5000			40			350	
5200-6650				0			290



We draw attention to the peculiar velocities shown by the Fe II lines. Have we had the extraordinary luck of catching a blob of gas moving away from the Be star at the exact time?
The behaviour of the Balmer lines seems to point to a slow build-up of dense regions. Note e.g. that the Hα peak emission comes several days after that of the other lines. Blowing off dense areas of gas, on the contrary, apparently is done in a matter of hours.
We suggest that the Be star lives its life pretty well independently of its neutron star companion, but that the effects of gas transfer to the neutron star are amplified near periastron passage.

REFERENCES

Giovannelli,F. et al.,1984, in "X-ray Astronomy '84", M. Oda and R. Giacconi (eds.), p.205
Giovannelli,F. et al.,1985, in "Multifrequency Behaviour of Galactic Accreting Sources", F. Giovannelli (ed.), p.284
de Loore,C. et al.,1984, Astron.Astrophys. 141,279
Nagase,F. et al.,1982, Astrophys.J. 263,814

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