THE R AQUARII JET

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ABSTRACT. The X-Ray (EXOSAT) and ultraviolet (IUE) observations of R Aqr and its jet are discussed in the light of a proposed model.

Ultraviolet spectra in the 1200-3200 A wavelength range were obtained of the symbiotic Mira R Aqr and associated jet-like feature over the course of four years with IUE (Kafatos et al. 1986). The spatial extent of the jet has enabled us to isolate it from the central compact HII region surrounding the unresolved binary, with the large 10x20" IUE aperture. The appearance of HeII 1640 A, and particularly NV 1240 A in the jet indicates that excitation in this region has recetly increased, and is now higher than in the central source. A modulation of the intensity of the high ionization lines in the jet with a time scale of about 550 days could be related to the Mira pulsation and the receding velocity of the R Aqr components after the passage at the periastron (Figure 1). In contrast, the UV spectrum of the central HII region remained almost constant over four years, with NV and HeII very weak or absent.

A weak X-Ray flux have been detected with EXOSAT, in the low energy Thin Lexan mode, in June 1985 at the Mira light maximum (Viotti et al. 1985). This is the first positive detection of R Aqr, because the marginal Einstein Observatory detection (Jura and Helfand 1984) is consistent with background fluctuation in the IPC image (Viotti et al. 1986). We have observed R Aqr again with EXOSAT in December 1985, and found no significant change of the X-Ray flux (Viotti et al. 1986), in spite of the large luminosity difference of the Mira.

We can explain the high ionization of the jet in terms of a cone of in-

I. Appenzeller and C. Jordan (eds.), Circumstellar Matter, 469–470.

tense ionizing radiation which escapes mainly perpendicular from a thick accretion disk (Kafatos and Michalitsianos 1982). During episodes of enhanced mass accretion onto the hot subdwarf, X-Ray and UV radiation intensifies at the inner layers of the accretion disk. Ionizing photons emerge primarily normal to the disk plane, in two oppositely directed radiation cones. Parcels of gas that were expelled during previous outbursts, upon being illuminated by the intense ionizing cone of radiation, thermalize and scatter ionizing photons. If the accretion disk is oriented nearly edge-on with respect to our line-of-sight, X-Rays will not escape from the central HII region, because of the high column densities in the disk plane. Thus the weak X-Ray flux recently detected and the high ionization lines are probably emitted by the jet or are produced in the invisible central region and partly scattered in the jet towards us. This latter hypothesis is in agreement with the high near-UV polarization of R Aqr (cf. Serkowski 1970). Future UV and X-Ray polarimetry will certainly be fundamental for the modelling of R Aqr.

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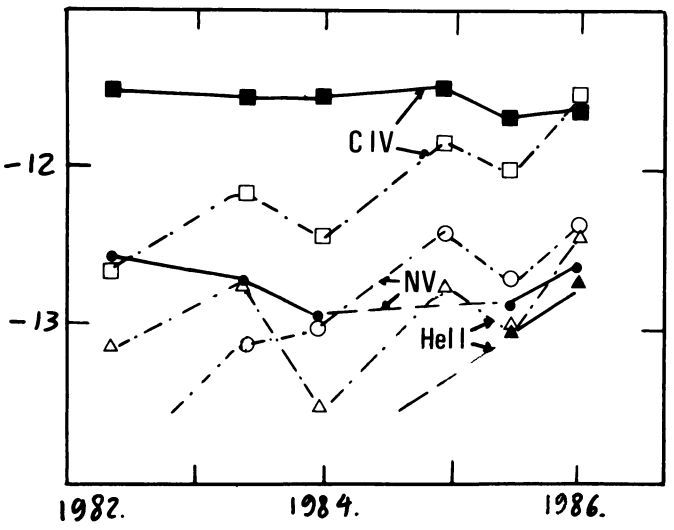

Figure 1. The UV line fluxes of the high ionization lines in R Aqr (filled symbols) and its jet (open symbols). Ordinates are log fluxes in erg s^{-1} cm^{-2}.

https://doi.org/10.1017/S0074180900157055 Published online by Cambridge University Press