ULTRAVIOLET VARIABILITY OF AX PERSEI

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Recent photometric and spectroscopic observations suggest AX Per might be an eclipsing binary with a period of about 682 days (Kenyon 1986 and references therein). The analysis of optical spectra taken during 1979-1986 has shown periodic minima in all observed permitted lines and a lack of any periodicity in the forbidden lines (Mikolajewska 1987; Mikolajewska & Iijima 1987). A comparison of the available radial velocities with these intensity variations shows that the behaviour of emission lines is consistent with the eclipse interpretation, however the minima (especially in HI and HeI) are too broad to be consistent with eclipses even by a Roche lobe filling red giant. In the following, the UV behaviour of AX Per is analysed using *IUE* spectra collected during the period 1979-1984.

As in other symbiotic stars, numerous emission lines belonging to many different ionization stages can be identified in the *IUE* spectra, from OI, MgII and FeII to HeII, NV and MgV. The emission lines appear narrow at high resolution.

Fig.1 displays the composite light curves of the ultraviolet emission lines (intergrated flux), ultraviolet continuum (monochromatic flux), and the SiIII] 1982/CIII] 1908 ratio as a function of orbital phase. The data corresponding to different orbital cycles are marked with different characters. The continuum and all emission lines except OIII 3133 (the Bowen fluoresced line) show minima at the same time as do the optical emission lines and *UBV* magnitudes. The deepest minimum is observed in the continuum (λ3000 Å) and OIII] 1660-6, the depth is comparable with that observed in the optical Balmer lines. In addition, hydrogen free-bound recombinations are responsible for most of the long wavelenth *IUE* continuum, because the 3000Å flux is correlated with the Balmer line intensities. Unfortunately, the continuum fluxes in the shortwavelength *IUE* range were unmeasurable in the spectra taken during minima, so any conclusion about the amplitude and shape of the minimum in this spectral range cannot be derived. However, the total IUE flux ($\lambda\lambda$1200-3200Å) at minimum was at least about 5 times lower than that observed at maximum. Another interesting feature of the variability is that minima in the intercombination lines and in HeII 1640 seem to be narrower than those in the Balmer lines and continuum. The OIII 3133 line, which is probably fluorescently pumped by HeII 304 photons, does not show any variation, suggesting the presence of extended material surrounding AX Persei. The lack of eclipses in optical forbidden lines also indicates the presence of such circumstellar matter.

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In order to get some knowledge of the physical conditions in the nebula and their changes with time, the electron temperature, the electron density as well as the degree of ionization were analysed. The measured line ratios were corrected for reddening using the average interstellar extinction curve by Seaton (1979) with E(B−V)=0.27 (Kenyon 1986).

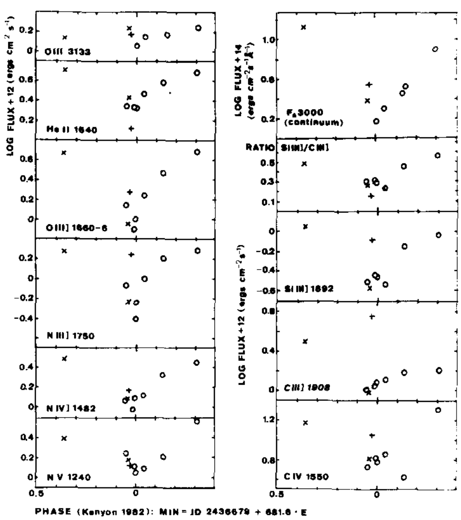

Figure 1

The NV 1240/NIV 1718, NIV 1486/NIII 2064 and CIV 1550/CIII 2297 ratios of fluxes in lines produced by collisional excitation to those produced by dielectronic recombination (Nussbaumer & Storey 1984) give the following values of electron temperature: T_e(NV) ≃ 13000 K, T_e(NIV) ≃ 11000 K, and T_e(CIV) ≃ 11000 K. These temperatures suggest a photoionized region. No variation with time was found. The observed flux ratio NV 1240/CIV 1550 indicated T_{ion} ≃ 120000 K and remained almost constant during the period studied, within the measurement errors, suggesting that the ionization temperature did not vary significantly.

Fig.1 also presents the phase dependence of the electron density sensitive ratio of SiIII] 1892/CIII] 1908 (Nussbaumer & Stencel 1987). The corresponding values of density are 2×10^{10} cm^{-3} at maximum and 4×10^{9} cm^{-3} at minimum (cosmic relative abundance of Si/C was assumed). The [NeIV] 1601/2423 line ratio remained constant within the measurement errors and implied $n_e \simeq 10^8$ cm^{-3} for $T_e \simeq 13000$ K (Nussbaumer 1982) close to the value derived from the optical forbidden lines.

More detailed results of this study will be published elsewhere.

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