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STUDY OF THE SYMBIOTIC STAR AR PAVONIS

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RESUMEN

Se presenta un estudio espectroscópico y polarimétrico de la binaria eclipsante AR Pavonis. Se analizaron algunos espectros reunidos entre los años 1990 y 1998, y datos polarimétricos correspondientes al intervalo 1995 - 1998. A partir de las variaciones espectroscópicas observadas a lo largo del período orbital se estudió la naturaleza del sistema. Estudios polarimétricos indican que AR Pav presenta polarización intrínseca.

ABSTRACT

We present a study of the optical spectra and linear polarization of the eclipsing binary AR Pavonis. The optical spectra were obtained between 1990 and 1998, and polarimetric data between 1995 and 1998. From spectroscopic variations along the orbital motion we analized the nature of the system. Polarimetric studies indicate that AR Pav has intrinsic polarization.

Key Words: **POLARIZATION — SYMBIOTIC STARS**

1. INTRODUCTION.

The symbiotic stars are interacting binary systems composed of a cool giant star and a hot component surrounded by an ionized nebula. AR Pav is an eclipsing symbiotic binary with an orbital period of 604.5 days (Bruch et al. 1994). Thackeray & Hutchings (1974) proposed a model consisting of a red giant filling its Roche lobe losing mass to an evolved hot component, for this star. Kenyon & Webbink (1984) replaced the white dwarf with an accretion disk around a main sequence star.

2. OBSERVATIONS.

Spectroscopic observations were performed with the 2.15 m telescope of CASLEO, San Juan, Argentina. Intermediate resolution spectra were taken with a Boller & Chivens Cassegrain spectrograph, using a Z-Machine detector and a Thomson CCD of 384 × 576 pixels. High resolution spectra were obtained using a REOSC spectrograph and a Tek CCD of 1024 x 1024 pixels. Polarimetric observations were obtained with the photopolarimeter of Torino attached to the 2.15 m telescope of CASLEO. This instrument allows simultaneous measurements of polarization in five colour bands UBVRI.

3. SPECTROSCOPIC FEATURES.

The spectrum of AR Pav shows emission lines of H I, He I, He II λ4686, N III, C III, Fe II, Ti II, [O III], [Fe II], [O I], and [O II] and molecular bands of TiO. The emission lines of Hβ, Hγ, and He II λ4686 have central

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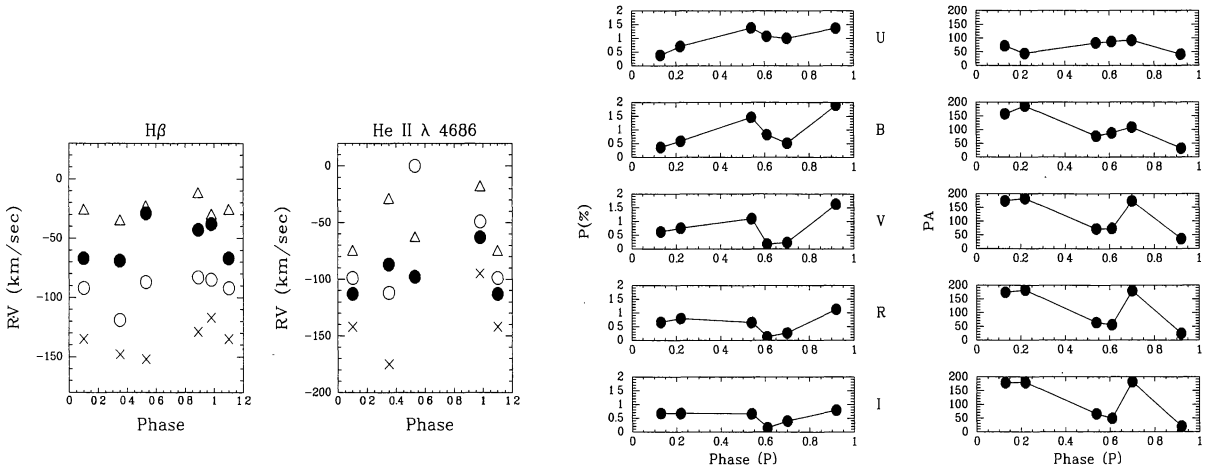

Fig. 1. 1a (*Left*): Radial velocities of Hβ and He II λ4686. Filled circles correspond to radial velocitie of all profile, open triangles, circles and cross correspond to velocitie of red peak, central absoption and blue peak, respectively. 1b (*Right*): Percentage of polarization and position angle as a function of orbital phase for the filters UBVI.

absorption cores, also present in some emission lines of He I and [O III] λ5007. The absence of emission in [Ne V], [Fe VI] and [Fe VII] lines, and of two broad Raman emissions $\lambda\lambda$6825, 7082, indicates a low ionization temperature for AR Pav.

Figure 1a shows the behavior of radial velocities of Hβ and He II λ4686 emission lines with the orbital phase (ephemeris Bruch et al. 1994). Both radial velocities follow the orbital motion of the hot component. The same behavior is observed for the central absorption of Hβ, contrary to the observations of Thackeray & Hutchings (1974), who assume that the central absorption is originated in an expanding shell surrounding the whole system.

4. POLARIMETRY

Figure 1b shows the percentage of polarization and the position angle as a function of orbital phase for each filter UBVRI. The percentage of polarization varies strongly at filters U, B, and V, reaching the maximum at phase 0.54 and 0.93. At these phases the percentage of polarization suggests Mie scattering (λ^{-1} dependence), which is produced by large particles. Large rotations of position angle are observed at phase 0.21 and 0.70 for filters B, V, R, and I.

5. CONCLUSIONS

The emission lines of H I and He II λ4686 in AR Pav follow the orbital motion of the hot component. The central absorption present in these emission lines are most probably formed in a disk surrounding the hot component. The behavior of polarization indicates intrinsic polarization of the system, which is related with the orbital phase.

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