

THE HeI $\lambda 4471$ LINE BEHAVIOUR OF 31 PEG(*)

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Abstract. In this paper we report the spectroscopic behaviour of 31 Peg in the HeI $\lambda 4471$, MgII $\lambda 4481$ and the H γ lines at four observing dates. The behaviour of the HeI line indicates that perhaps there exists a photospheric activity and/or some exophotospheric perturbing effect acting on the stellar photosphere.

1. Introduction

Long-term spectroscopic observations of μ Cen (HD 120324) showed a significant anticorrelation between the equivalent width of the HeI $\lambda 4471$ and MgII $\lambda 4481$ absorption lines (Barrera and Vogt 1987). It was proposed that this could be due to some atmospheric activity, possibly related to non-radial pulsations. In this paper we report observations of 31 Peg (HD 212076), where contrary to μ Cen, the MgII $\lambda 4481$ and H γ lines are in emission.

2. The observations

The spectra were obtained at the ESO (La Silla, Chile) on 27 and 31 Aug. 1991 with the Echelle Spectrograph at the 1.52 m telescope (resolution $\simeq 35000$; S/N = 150) and at the OHP (France) on 3 and 6 Sep. 1992 with the Aurelie Spectrograph (resolution $\simeq 30000$; S/N = 300). The profiles (I_λ/I_c) obtained for the H γ , the HeI $\lambda 4471$ and MgII $\lambda 4481$ lines of 31 Peg at the four observing dates are shown in Fig. 1.

3. The star and the spectroscopic variations

For 31 Peg, a B2 IV-Ve star, the expected equivalent width of the HeI $\lambda 4471$ line is $W_{HeI \lambda 4471}^{Sp. Type} = 1.35 \text{ \AA}$. The equivalent widths obtained from the spectra shown in Fig. 1 are $W_{HeI \lambda 4471}^{Observed} = 0.91$ to 1.1 \AA , which are smaller than $W_{HeI \lambda 4471}^{Sp. Type}$. As in a previous paper (Ballereau et al. BCGZ, this issue), we may argue that the difference between the observed and the expected equivalent widths of the HeI line is due at least to: a) some photospheric activity; b) a veiling produced by the continuum emission excess; c) some emission-like component partially filling the photospheric line. This last effect may be related to the non-radial pulsation phenomenon as suggested by Barrera

and Vogt (1987) and Waelkens (1990), but also to some real emission in the HeI line (BCGZ) or to some velocity field on the stellar surface as reported by Zorec (this issue).

The emission strengths in the H γ and in the MgII λ 4481 lines are well correlated, due perhaps to a growing common formation region in the circumstellar envelope. However, for the HeI λ 4471 line, two behaviours are distinguished: 1) in 1991 (low emission in both H γ and MgII lines) the absorption in the HeI line is smaller when the emission in H γ and MgII lines is stronger; 2) in 1992 (stronger emission in H γ and MgII lines) the absorption in the HeI line is enhanced but always $W_{HeI}^{Observed} < W_{HeI}^{Sp. Type}$.

The behaviour of 31 Peg seem to be different to that described in BCGZ, where a kind of correlation was found between the emission-like feature in the HeI λ 4471 line and the emission in H γ and with the continuum. Both studies show however that even the exospheric perturbation on the photospheric HeI line cannot be denied, the detailed description of the phenomenon needs to take into account the physical characteristics of the circumstellar envelope and the photospheric activity.

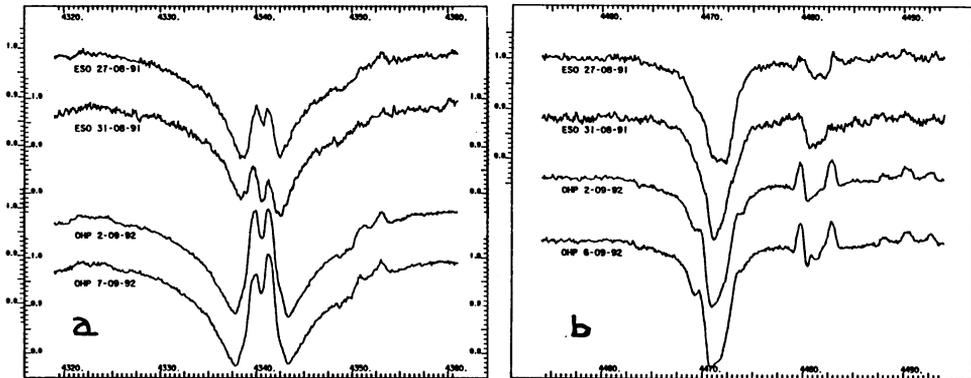


Fig. 1. Line profiles of 31 Peg: a) H γ , b) HeI λ 4471 and MgII λ 4481

(*) Observations obtained at the ESO, Chile and at the OHP, France

References

- Barrera, L.H., Vogt, N.: 1987, *Rev. Mexicana Astron. Astrof.* **14**, 323
 Waelkens, C.: 1990, in L.A. Wilson and R. Stalio, ed(s)., *Angular Momentum and Mass Loss for Hot Stars*, Kluwer Acad. Publ., 235