

LINE PROFILE VARIATIONS IN THE SPECTRA OF THE γ DOR STAR HR 2740

E. PORETTI AND L. MANTEGAZZA

*Osservatorio Astronomico di Brera
Via E. Bianchi 46, 22055 Merate, Italy*

AND

C. KOEN, P. MARTINEZ, F. BREUER, D. DE ALWIS AND H. HAUPT

*South African Astronomical Observatory
P.O. Box 9, Observatory 7935, Cape Town, South Africa*

1. Photometric results

HR 2740 was a target for a photometric campaign carried out at La Silla (ESO) and Sutherland (SAAO) from 1997 January 14 to 1997 February 11 (Poretti *et al.*, 1997). The campaign revealed that HR 2740 is one of the brightest γ Dor stars, a class of variable stars located near the cool border of the instability strip, and in which gravity pulsation modes are excited. Four frequencies were identified ($f_1=1.0434$, $f_2=0.9951$, $f_3=1.1088$, $f_4=0.9019$ c d⁻¹), which together yield a satisfactory solution to the observed light curve. The frequency analysis was not simple, but thanks to the large coverage in longitude we could separate the effect of aliasing on the two terms $f_3=1.1088$ c d⁻¹ and $f_4=0.9019$ c d⁻¹, linked by the relationship $f_4 = 2 - f_3$. Moreover, only the long time baseline allowed us to resolve the two close terms $f_1=1.0434$ c d⁻¹ and $f_2=0.9951$ c d⁻¹. See Poretti *et al.* (1997) for a detailed discussion.

2. Spectroscopic observations

HR 2740 is also reported by Slettebak *et al.* (1975) as a standard for rotational velocity measurements; we used it for this purpose in two observing runs on the 1.4-m Coudé Auxiliary Telescope (CAT; ESO, La Silla) in 1992 November and 1994 October. Inspection of the normalized spectra revealed clear line profile variations. This prompted us to monitor HR 2740 photometrically, obtaining the results described in the previous section. Figure 1 shows a good example of the line profile variations we observed. In the bottom spectrum the line minima are shifted redward; in the middle spectrum the lines are not as deep as in the other two cases; in the top spectrum the asymmetry is again well marked, but this time towards the bluer wavelengths. A $v \sin i$ value of 60 ± 5 km s⁻¹ was also obtained, which renders the rotational splitting again less suitable to match the observed frequency spectra of HR 2740 (see par. 5.5

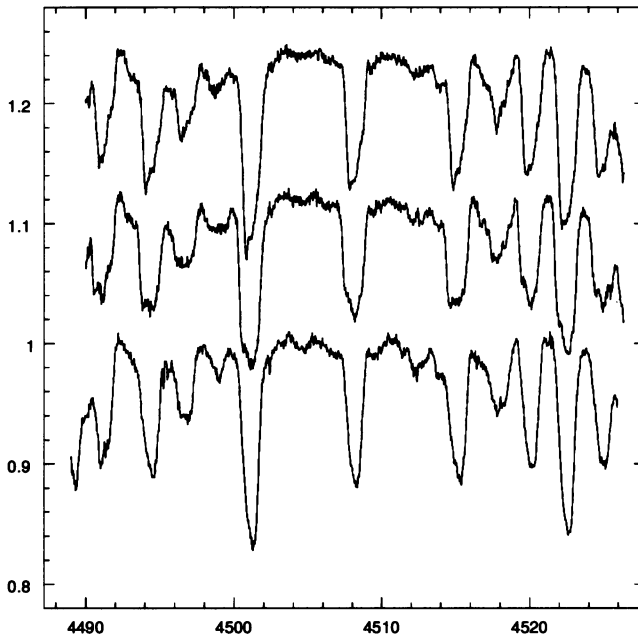


Figure 1. Three high-resolution spectra of HR 2740 (Bottom: JD 2448955.84; middle: JD 2449651.83; top: 2449654.84). The star was originally observed as a standard for rotational velocity measurements, but it exhibits line profile variations indicative of pulsation.

in Poretti *et al.*, 1997). At present, the photometric variability of γ Dor variables has been well studied in a number of cases, but a spectroscopic survey is still lacking (Krisciunas 1997). A combined photometric and spectroscopic approach to the study of the γ Dor stars should produce the same synergistic benefits noted from the combined applications of these techniques to the δ Sct stars (Mantegazza *et al.*, 1997).

References

- Krisciunas, K. (1997), The discovery of non-radial gravity mode pulsations in γ Doradus-type stars, this volume
- Mantegazza, L., Poretti, E., Bossi, M., Nunez, N.S., Zerbi, F. (1997), Photometry and spectroscopy as a synergic approach to sound the interiors of δ Scuti stars, in *A half century of stellar pulsations interpretations*, Los Alamos, 1997 June, in press
- Poretti, E., Koen, C., Martinez, P., Breuer, F., de Alwis, D., Haupt, H. (1997), Discovery and analysis of Gamma Doradus type pulsations in the F0 IV star HR 2740 \equiv QW Pup, *Monthly Notices Royal Astron. Soc.*, in press
- Slettebak, A., Collins, G.W., Boyce, P.B., White, N.M., Parkinson, T.D. (1978), A system of standard stars for rotational velocity determinations, *Astrophys. J. Suppl.*, Vol. no. 29, pp. 137–159