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Bolometric correction of the roAp star α Cir

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Abstract. For the first time, the bolometric correction of α Cir was determined. Two values, both based on an estimation of the total integrated flux, were obtained. For that purpose spectroscopic and photometric data of α Cir available in the literature was used. The values derived were then used to place α Cir in the HR diagram.

Key words: stars: chemically peculiar – stars: oscillations – stars: fundamental parameters: bolometric correction

1. Introduction

α Cir (HD 128898) is a prototype of the class of Ap stars that oscillate in high frequencies (roAp, rapidly oscillating Ap, Kurtz, 1982). Besides knowing its effective temperature and parallax, to accurately place α Cir in the HR diagram, it is necessary to also know its bolometric correction (BC). To determine the latter, the method proposed by North (1981) was applied.

2. Bolometric correction determination and discussion

The BC is given by the equation,

$$\mathrm{BC} = -2.5 \log \int_0^\infty F(\lambda) \mathrm{d}\lambda - m_V - 11.492, \tag{1}$$

where m_V is the apparent visual magnitude and $F(\lambda)$ is the flux at a given wavelength. Two values for the integrated flux of α Cir were obtained. The first was determined by combining the observed ultraviolet flux of α Cir retrieved from IUE Newly Extracted Spectra (INES) data archive, with the theoretical flux obtained from the Kurucz model (with IDL routine KURGET1) that best fitted the optical photometry (Rufener, 1989) for the star. The second was obtained using the same method, but substituting the Kurucz synthetic spectrum for the mean of two low resolution spectra of α Cir calibrated in flux (Alekseeva *et al.*, 1996; Burnashev, 1985). The two values obtained for the BC were 0.15 ± 0.02 and 0.23 ± 0.02, respectively. To place α Cir in the HR diagram, the results obtained for the bolometric fluxes were combined with the

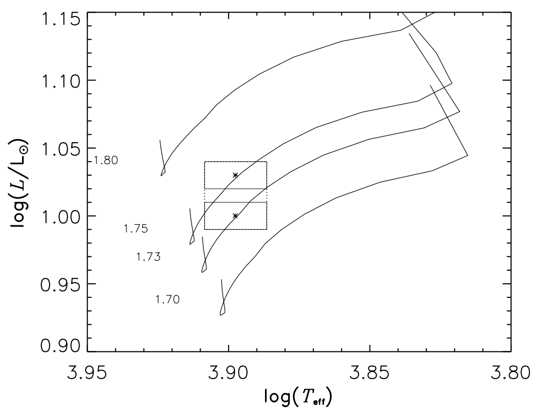

Figure 1. The position of α Cir in the HR diagram with four evolutionary tracks for models with masses of 1.70, 1.73, 1.75 and 1.80 $M_\odot$ for comparison. The two error boxes correspond to two values of the luminosity (and associated error) derived from two different bolometric fluxes (see text for details).

Hipparcos parallax. For the effective temperature we adopted the value from Kupka *et al.* (1996), $T_{\rm eff} = 7900 \pm 200$ K.

Both values derived for the BC have uncertainties that go beyond their formal errors. In the first case, uncertainties are likely associated with the use of Kurucz models which are not apropriate for peculiar stars. In the second case, additional uncertainties are also expected because the errors associated with the calibration in flux of the low resolution spectra were not provided in the catalogues. Hence, we took a conservative approach and considered both values when placing the star in the HR diagram.

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