

Preliminary seismic study of the γ Doradus COROT target HD 49434

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Individual Objects: HD 49434

HD 49434, a new challenge for asteroseismology

HD 49434 is a hot F1V γ Doradus star, selected as a primary target of the CoRoT Nov. 2007/Mar. 2008 long run. This star has been the subject of an extensive ground-based photometric and spectroscopic campaign before and during the space run (Uytterhoeven et al. 2008).

Strömgren indices from GAUDI database and TEMPLOGG package (Napiwotzki et al. 1992, Künzli et al. 1996) give $T_{\text{eff}} = 7300 \pm 200$ K, $\log g = 4.21 \pm 0.20$, $[Fe/H] = 0.01 \pm 0.20$. Bruntt et al. (2004) by using 2MASS photometry and H_{α} line profile obtain the same T_{eff} , a higher $\log g$ (4.40 ± 0.45) and a slightly lower metallicity $[Fe/H] = -0.04 \pm 0.21$. On the other hand, a spectroscopic analysis by Gillon & Magain (2006) gives a similar $\log g$ (4.43 ± 0.20) but a value of T_{eff} (7632 ± 126 K) 1σ higher than previous determinations. Given the location of HD 49434 near the blue border of the γ Dor instability strip (IS), an accurate determination of T_{eff} is crucial and further investigations are hence required.

Stellar models and stability computation

Ground-based observations of HD 49434 allowed Uytterhoeven et al. (2008) to classify HD 49434 as a hybrid pulsator, since it shows four frequencies (from 0.2 to 1.7 d^{-1}) in the typical domain of g-modes in γ Dor pulsators, as well as six frequencies (from 5 to 12 d^{-1}) with values in the range of δ Scuti p-modes. The simultaneous presence of both p- and g-modes makes this star an extremely interesting target for asteroseismic modelling.

The evolutionary tracks and instability strips we used were computed with the stellar evolution code CLES (Code Liégeois d'Evolution Stellaire - Scuflaire et al. 2008a), the adiabatic oscillation code LOSC (Scuflaire et al. 2008b) and the version of the non-adiabatic oscillation code MAD including the convection-pulsation interaction (Grigahcène et al. 2005). Figure 1 shows that, according to the chosen error box in a $(\log L, \log T_{\text{eff}})$ diagram, HD 49434 is located either at the blue border of the γ Dor IS or outside the IS. Taking all these observational constraints (global parameters, seismic frequencies) into account, we shall attempt to obtain

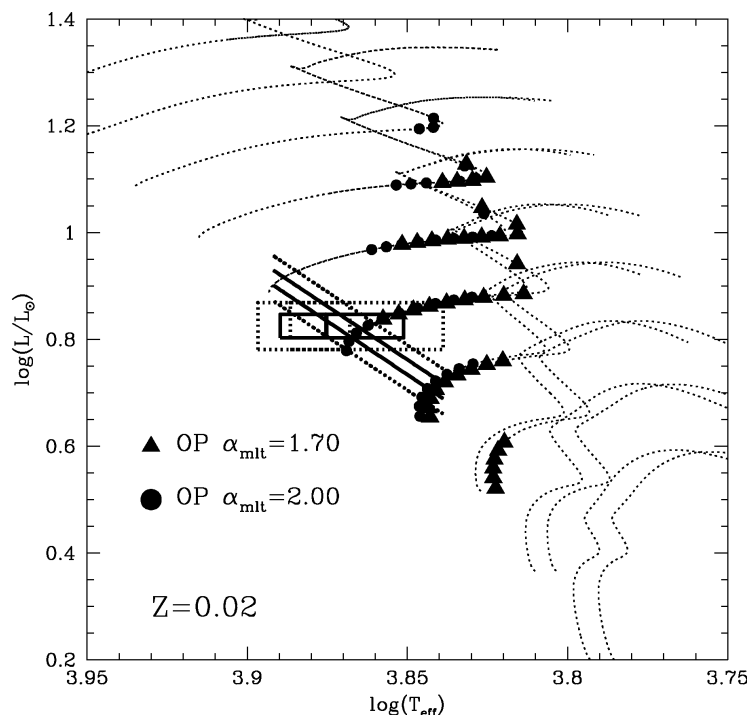


Figure 1: Location of HD 49434 in the ($\log L$, $\log T_{\text{eff}}$) diagram. 1σ (full lines) and 2σ (dotted lines) error boxes of HD 49434: left/black box for Gillon & Magain (2006) and right/grey one for Bruntt et al. (2004). The diagonal lines show the constraints on the radius of this star (Masana et al. 2006). Points and triangles show the γ Dor IS derived from the Liège Grid of Models.

a best fit for HD 49434 and discuss the uncertainties affecting the models together with their effects on the stability results. Results of this modelling will be presented in a future paper.

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