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BLUE EDGE OF THE δ SCUTI STARS VERSUS RED EDGE OF THE SPB STARS. HOW WILL COROT DATA HELP ?

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Abstract. This work is intended to illustrate the possibilities offered by the CoRoT satellite observations to study the different instability strips (IS), and through them, physical processes and specific features of stellar interiors. The CoRoT space mission, launched on December 27^{th} 2006, has been developped and is operated by CNES, with the contribution of Austria, Belgium, Brasil , ESA, Germany and Spain. It enabled us to observe oscillations from stars down to a noise level of less than a ppm, much lower than the limit usually obtained from the ground. The number of available targets will have more than tripled by the end of the mission and these data might help testing the "purity" of the IS (i.e. the presence/absence of photometrically constant stars within) and lead to the discovery of new classes of pulsating stars (Degroote et al. 2008). We address this problem in the frame of the B and A main sequence stars.

Observations and discussion

The CoRoT mission has 2 main scientific programs : *stellar seismology* and *search for extrasolar planets*. Figure 1 represents HR diagrams realized thanks to the CoRoT *seismofield* and *exofield* observations. They both have their own importance as the former offers data with a very low noise level while the latter offers more statistics.

B stars : SPB stars and Be stars

Slowly pulsating B stars are variable mid-B-type wich pulsate in the range of 3-20 μHz and later types of Be stars have pulsational characteristics similar to that of SPB stars. The red edge of the SPB instability strip is essentially sensitive to the accumulation of elements of the iron group at a certain depth in the star (Miglio et al. 2007). All the studied stars in these classes clearly show variability in the expected frequency range. Among them are low amplitude (less than 100 ppm) pulsators that could be detected thanks to the low noise-level of the seismology field.

A stars : δ Scuti stars

δ Scuti stars usually pulsate within the 50 to 600 μHz frequency range. The red edge (RE) of the δ Scuti IS can be attributed to the coupling between oscillations and convection. The position of the blue edge (BE), however, is dependant on the abundance of Helium inside the star. This small sample (8 stars) revealed a few stars with no identified variability down to the *ppm level* within the δ Scuti theoretical IS. Firm values of $T_{\rm eff}$ and M_V, along with determination of their *vsini* and chemical abundancies will help answering the questions about the occurrence of variability in the IS and physical parameters ruling it.

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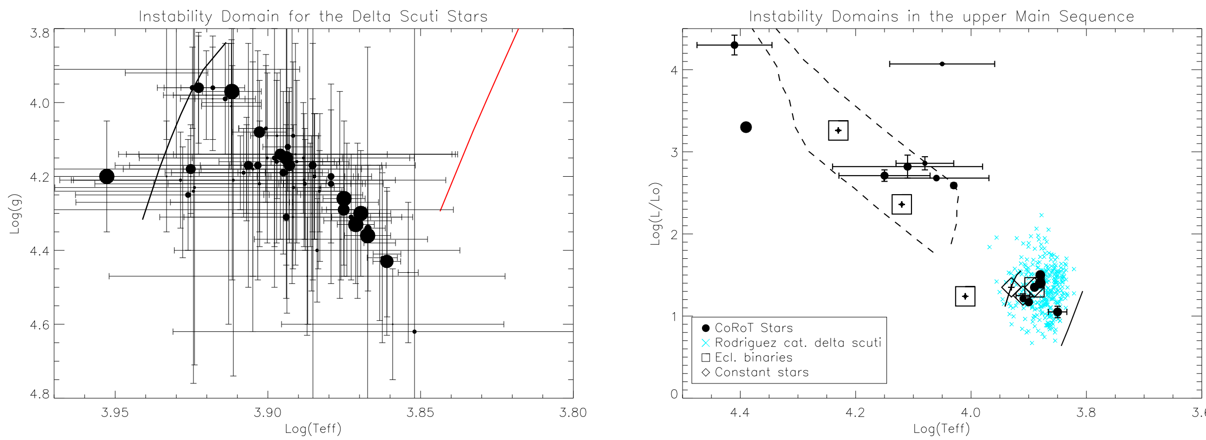

Fig. 1. Left : δ Scuti-like pulsators from the IRa01 for the exofield. The diagram shows the empirical RE and BE (Dupret et al. 2004). The size of the symbols is scaled to the amplitude of the most prominent frequency (300 to 30000 ppm: Kaiser, A., Priv. Com.). **Right** : HR Diagram with A and B stars observed from IR01 to LRa01 for the seismofield. The parameters were retrieved from various sources, i.e. Frémat et al. (2006), Poretti et al. (2007), Morel & Aerts (2007) and Miglio et al. (in prep.). The dashed lines represent the BE and RE of the IS for SPB stars (Miglio et al. 2007) and the solid lines represent the BE and RE of the δ Scuti IS. Symbol size also scales with amplitude (350 to 37000 ppm). Squares represent eclipsing binary stars and diamonds are overplotted on "non-variable" stars.

Conclusions

This preliminary work is intended to stress the potential of the CoRoT satellite to probe the existing limits between the different types of excitations and variations. To this purpose, the *exofield* is of utter importance as it contains the greater numbers of stars. The *seismofield*, however, with very low detection limits and precise individual stellar parameters will bring valuable complementary information. On one hand, our results show that all the B-stars considered here are found variable. If confirmed, these results would suggest that the pulsation mechanisms in these stars can be apprehended with a limited amount of parameters. On the other hand, we found A-stars that are constant down to the *ppm* level. This will help assessing which parameters are needed to understand the pulsational instability in this domain of the HR diagram.

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