Interest of low-frequency modes in helio- and asteroseismology

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Context : Asteroseismology aims at probing the interior of a star thanks to the characterisation of its oscillation modes. Those modes can be of two types : acoustic modes (p-modes) for which the restoring force is pressure and gravity modes (g-modes) for which the restoring force is buoyancy. For main-sequence solar-type (MSST) star, p-modes also correspond to higher frequency regions relatively to g-modes. p-modes are trapped between the stellar surface and an inner turning point while g-modes lay in the stratified radiative zones and become evanescent while crossing the convective zone on their journey to the upper regions. Their surface amplitude is thus very low. For MSST stars, g-modes individual structures in the spectra are hidden by the convective noise.

Aims : Oscillation modes properties are directly linked to the structure of their resonant cavities. Surface effect being more important on p-modes as the frequency increases, the importance of being able to characterise low-frequency modes appears obvious : low-frequency p-modes allow better constraints on the convective zone structure while an hypothetical observation of the individual structure of the g-modes would directly give us access to the properties of the radiative zone and the stellar core. For MSST stars, F-stars with thin convective zones seem to be the better candidates to observe the g-modes. However, as they are fast rotators, the rotation harmonics can lay in the g-mode region of their spectra. A preliminary analysis of their rotation properties is then necessary.

Method : The sample studied here is constituted with 239 F-stars observed in short cadence by the *Kepler* satellite. A machine learning pipeline is used to characterise the rotation of those stars.

Results : 91 stars present rotation signals. 23 of them have a rotation period inferior to 5 days.

Conclusion : As expected, the F-stars short cadence sample presents an important proportion of fast rotators. This will have to be taken into account when studying the low-frequency regions in those stars' spectra.