Non-adiabatic study of Kepler subgiants

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Abstract

Thanks to the precision of CoRoT and Kepler observations, it becomes possible to have access to the detailed structure of solar-like oscillations power spectrum in evolved stars. Comparisons between the theoretical predictions of our non-adiabatic code with observations give important constraint on red-giants models. Lifetimes and amplitudes of modes trapped in the envelope (e.g. radial modes) constrain the characteristics of the convective envelope and its time-dependent interaction with oscillations. Lifetimes and amplitudes of mixed-modes (mainly dipole modes) strongly depend on mode trapping, allowing us to probe the core of red-giants.
Benomar et al. (2013) have recently measured the linewidth and amplitude of individual modes (including mixed modes) in several Kepler subgiants. We first model these stars based on surface properties and observed frequencies. For the first time, we perform non-adiabatic computations for particular observed subgiants. These computations include a time-dependant treatment of convection and give the theoretical lifetimes of radial and non-radial modes (including mixed-modes). Next, combining the lifetimes and inertias with a stochastic excitation model gives us the theoretical amplitudes of the modes.

We can now directly compare theoretical and observed linewidths and amplitudes of mixed-modes for some specific stars. This allows us to test the accuracy of our present damping and excitation models in evolved stars and especially the interaction between convection and oscillations.

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