Peak Bagging of red giant stars observed by Kepler: first results with a new method based on Bayesian Nested Sampling

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Abstract

The peak bagging analysis, namely the fitting and identification of single oscillation modes in stars' power spectra, coupled to the very high-quality light curves of red giant stars observed by Kepler, can play a crucial role for studying stellar oscillations of different flavor with an unprecedented level of detail. A thorough study of stellar oscillations would thus allow for deeper testing of stellar structure models and new insights in stellar evolution theory.
However, peak bagging inferences are in general very challenging problems due to the large number of observed oscillation modes, hence of free parameters that can be involved in the fitting models. Efficiency and robustness in performing the analysis is what may be needed to proceed further. For this purpose, we developed a new code implementing the Nested Sampling Monte Carlo (NSMC) algorithm, a powerful statistical method well suited for Bayesian analyses of complex problems.
In this talk we show the peak bagging of a sample of high signal-to-noise red giant stars by exploiting recent Kepler datasets and a new criterion for the detection of an oscillatio n mode based on the computation of the Bayesian evidence. Detailed measurements of frequencies, amplitudes and lifetimes for single oscillation modes, together with a discussion on the evolutionary stage of the stars, their acoustic glitches, and possible relations of the asteroseismic parameters to fundamental stellar properties are therefore presented.

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