Asymptotic Analysis of Mixed Modes in Red Giant Stars

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Abstract

High precision space observations, such as made by the Kepler and CoRoT missions, allow us to detect mixed modes for l = 1 modes in their high signal-to-noise photome- try data. By means of asteroseismology, the inner structure of red giant (RG) stars is revealed the first time with the help of mixed modes. We analyse these mixed modes of a 1.3 M RG model theoretically from the approximate asymptotic descriptions of oscillations. While fitting observed frequencies with the eigenvalue condition for mixed modes, a good estimate of period spacing and coupling strength is also acquired for more evolved models. We show that the behaviour of the mode inertia in a given mode varies dramatically when the coupling is strong. An approximation of period spacings is also obtained from the asymptotic dispersion relation, which provides a good estimate of the coupling strength as well as period spacing when g-mode-like mixed modes are sufficiently dense.

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