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Amplitudes of solar-like oscillations: constraints from red giants in open clusters observed by Kepler

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(Submitted on 3 Jul 2011)

Scaling relations that link asteroseismic quantities to global stellar properties are important for gaining understanding of the intricate physics that underpins stellar pulsation. The common notion that all stars in an open cluster have essentially the same distance, age, and initial composition, implies that the stellar parameters can be measured to much higher precision than what is usually achievable for single stars. This makes clusters ideal for exploring the relation between the mode amplitude of solar-like oscillations and the global stellar properties. We have analyzed data obtained with NASA's Kepler space telescope to study solar-like oscillations in 100 red giant stars located in either of the three open clusters, NGC 6791, NGC 6819, and NGC 6811. By fitting the measured amplitudes to predictions from simple scaling relations that depend on luminosity, mass, and effective temperature, we find that the data cannot be described by any power of the luminosity-to-mass ratio as previously assumed. As a result we provide a new improved empirical relation which treats luminosity and mass separately. This relation turns out to also work remarkably well for main-sequence and subgiant stars. In addition, the measured amplitudes reveal the potential presence of a number of previously unknown unresolved binaries in the red clump in NGC 6791 and NGC 6819, pointing to an interesting new application for asteroseismology as a probe into the formation history of open clusters.

Comments: 6 pages, 4 figures, accepted by ApJL
Subjects: **Solar and Stellar Astrophysics (astro-ph.SR)**
Cite as: **arXiv:1107.0490 [astro-ph.SR]**
(or **arXiv:1107.0490v1 [astro-ph.SR]** for this version)

Submission history

From: Dennis Stello [view email]
[v1] Sun, 3 Jul 2011 20:00:00 GMT (167kb)

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