

Research Summary

Presently in my third year of a PhD, I intend to submit in 2013 May, almost a year ahead of the completion deadline. My research can be grouped into three overlapping topics: Fourier analysis techniques; case studies of pulsating A-type stars; and investigating the incidence of chemical peculiarity in A-type stars.

Data from the Kepler Space Telescope are capable of such exquisite precision, with noise levels below 2 μmag in some cases, that truly understanding instrumental artefacts is of paramount importance. To this end, investigations into *Kepler*'s short and long cadence data characteristics, and into the performance of the data processing pipeline, were conducted (Murphy 2012a,b). In addition, *Kepler*'s unique configuration, being in a heliocentric orbit with a fixed field of view, allows one to conduct asteroseismology at frequencies beyond the conventional Nyquist frequency (Murphy et al. 2012b). The low noise levels also allow one to probe stellar rotation velocities from periodicities in the light curves (work in prep.).

With the advent of space-based photometry, small-scale studies of classical pulsators from the ground are obsolete. Now, one must select the most promising targets and analyse those individual targets as deeply as possible. Case studies like these (e.g. Murphy et al. 2012a; 2013 submitted) are fundamental to the progress of stellar astrophysics.

The A-type stars are host to a wide range of chemical peculiarities, and up to 50 per cent are peculiar at spectral type A8. Many types of peculiarity are expected to inhibit pulsation, but *Kepler* observations indicate pulsation in these stars. Understanding of the pulsation mechanisms and extent of the peculiarities hinges on not only case studies of individual chemically peculiar pulsators (Murphy et al. 2012a), but also surveys of chemical peculiarity and pulsation amplitudes (in prep.).

References

Complete articles of the following references can be found at simonmurphy.info/research

[Frequency analysis of the high-amplitude SX Phe star KIC 11754974](#): Murphy et al. (2013), MNRAS (submitted)

[Super-Nyquist asteroseismology with the Kepler Space Telescope](#), Murphy et al. (2012b), (MNRAS), arXiv:1212.5603

[Kepler Fourier concepts: The performance of the Kepler data pipeline](#), Murphy (2012b), (AN), arXiv:1211.5141

[Pulsational amplitude growth of KIC 3420637 \(HD 178875\) in the context of Am and rho Puppi stars](#), Murphy et al. (2012a), MNRAS 427, 1418

[Characteristics of Kepler short- and long-cadence data](#), Murphy (2012a), MNRAS 422, 665