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Observations of 23 EC 14026-type pulsating subdwarf B stars

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Abstract

Since the discovery of pulsating subdwarf (sdB) stars in 1997 (the EC 14026 class), nearly 40 members have been discovered. After nearly a decade, many of these have had significant follow-up observations to resolve their pulsation spectra and to discern their pulsation properties. In this work we compare and contrast the frequency content in terms of richness and range and the amplitudes and phases for 23 sdB pulsators. We draw no conclusions but merely show the incredible variety of pulsations emanating from seemingly similar stars.

Pulsation properties

Figure 1 shows some of the tests we have applied to the resolved pulsators. Panel A compares the ratio of high-amplitude (with $A \geq A_{max}/5$) to total frequencies for individual pulsators with gravity. Note that this ratio is lowest for stars with lower gravity (i.e. less even-amplitudes) while all of the H/T=1 values (roughly equal amplitude pulsations) occur for higher gravity, though there are exceptions. Panel B compares the summed pulsation amplitudes (solid lines with the top line representing the lowest-amplitude 90% of frequencies, and subsequent lines indicating the fractional amplitudes of the lowest 70%, 50%, and 10%, respectively) while the dashed line indicates the fractional amplitude of the highest-amplitude frequency. The stars are ordered by, but not scaled with gravity. Like panel A, this indicates a general trend for lower gravity stars to have relatively few pulsation frequencies that contain nearly all of the pulsation power. But it also indicates the large variety observed as stars near $\log g \sim 5.7$ have a complete range of values. Panel C shows the frequency density compared to gravity with the dotted line indicating the limit for $\ell \leq 2$, $m = 0$ and the dashed line indicating the limit for $\ell \leq 2$, all possible m values. For several stars, $\ell \geq 3$ values are required to explain the observed density. Panel D shows the amplitude deviations divided by the average amplitude as a measure of pulsation stability. The open circles indicate frequencies known to be phase-stable over time, filled triangles indicate non-phase-stable frequencies, and squares indicate frequencies for which the stability of phases is unknown. The dashed line is $\sigma_A/\langle A \rangle = 0.52$, a value indicative of stochastic oscillations and the horizontal bar is the average error. For the full comparison, see our paper in MNRAS, which is coming soon.

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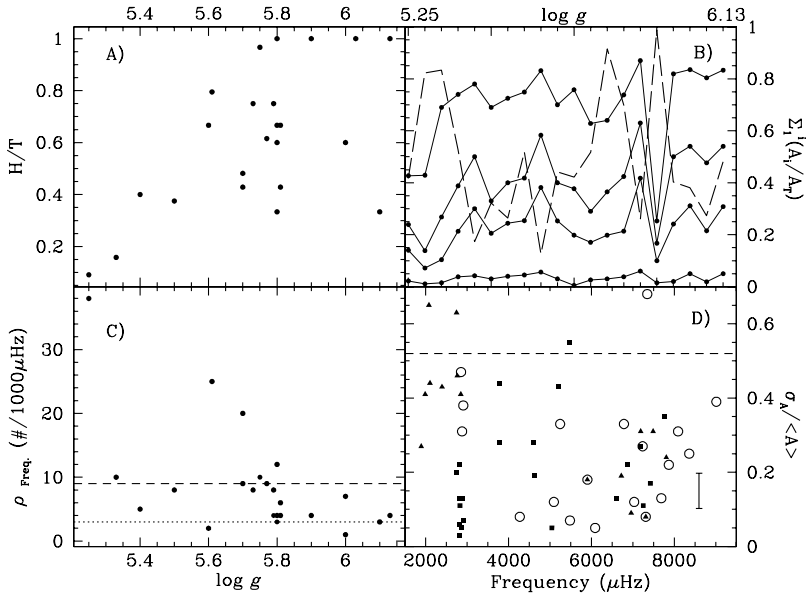

Figure 1: Group properties of sdBV pulsators.

Mike Reed and Dave Kilkenny finding some time to relax.