K2 Proposal on behalf of KASC WG3

# Asteroseismology and rotation of Am stars

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In Am stars the metal lines indicate a later spectral type than that derived from the Balmer lines. The strength of the metal lines is thought to arise from the interplay between gravitational settling and radiative acceleration in an A star where the magnetic field is weak or absent. The result is the upwards diffusion of metal lines towards the photosphere. The star needs to be rotating more slowly than about $120\,\mathrm{km\,s^{-1}}$ in order for diffusion to compete with meridional circulation. Most Am stars appear to be members of binary systems with periods between 2–10 d.

The diffusion scenario makes predictions about pulsational driving in Am stars which are in contradiction to observations. There appears to be very little difference in the distribution of Am stars and $\delta$ Sct stars in the instability strip (Balona et al., 2011MNRAS.414..792B; Smalley et al., 2011A&A...535A...3S). Recent, unpublished, results from all ten 10 known Am stars in the *Kepler* field show that all these stars have low-amplitude variations characteristic of rotational modulation (Balona, Catanzaro, Ripepi, in preparation). It seems that spots or patches may be present in the photospheres of all Am stars.

The sample of Am stars in the original *Kepler* field is small, so it is conceivable that the ten Am stars with *Kepler* photometry might not be representative of the Am star population. There are 50 known Am stars brighter than 12th magnitude within a radius of 12° of the centre of Field 0. It would be important to determine if the rotational modulation seen in the ten Am stars in the *Kepler* field are unusual or indicate that the spots/patches seen in Am stars are stronger than in normal A stars. Furthermore, at least one Am star observed in short-cadence mode in the *Kepler* field shows a distinct flare. Another Am star shows what seems to be several flares, but since these were seen in long-cadence data, the time resolution makes this conclusion uncertain. The possible presence of flaring in Am stars would also be contrary to the diffusion process and deserves further investigation.

While short-cadence observations of Am stars would, of course, be first prize, the pressure for SC slots needs to be recognized. We are therefore proposing that as many Am stars as possible in Field-0 be observed in long-cadence mode. A list of Am stars in Field-0, derived from the spectroscopic classification catalogue of Skiff (2013yCat....102023S) is given in the attached file.