

## Long Cadence RR Lyrae targets – K2 Campaigns 2 & 3

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RR Lyrae stars are horizontal-branch, large-amplitude pulsators that are used as cosmic distance indicators and tracers of galactic history and dynamics. Continuous, high-precision photometry revealed new, important insights into their pulsation properties. The large number of fundamental-mode stars will allow for a variety of statistical studies as well with larger sample size than any previous space missions. These investigations will also bring us closer to the explanation of the century-old Blazhko enigma. With this proposal we extend the sample of RR Lyrae stars even further.

### Aims

- Fields 2 and 3 contain 6 and 3 known or candidate first-overtone stars, respectively. The sparse distribution of RRc stars per field makes it necessary to observe all candidates to build up a good sample. The first modulated RRc star is yet to be found among the *K2* targets.
- We indentified 49 and 112 known or candidate fundamental-mode (RRab) stars in the two fields. The overall observed or proposed sample of *Kepler* and *K2* RR Lyrae stars are now in the hundreds, making the statistical analysis of various subgroups possible.
- Most RRc and most modulated RRab stars seem to exhibit low-amplitude additional modes but reliable detection and robust statistics require space-based photometry of a large number of targets [1,2].
- Multimode RR Lyrae stars raise several questions about mode selection mechanisms. It is unclear why are some modes excited to high amplitudes but others to only millimagnitude levels. The dynamics between these modes create many different pulsation states that can be untangled by extensive observations only [3]. Mode interactions have the potential to explain the Blazhko effect as well.
- Some stars display very strong amplitude and/or phase variations. Extreme modulation often coincides with irregularly varying modulation amplitudes and periods that can be followed with continuous observations only.

**Targets** Field 2 contains 55 field RR Lyrae stars, members of the globular clusters M4 and M80 are included in a separate proposal. Field 3 contains 117 RR Lyrae stars. Targets are listed with decreasing priority. We request to observe all of them within the K2 Mission to allow for an unprecedented statistical study. Most stars are fainter than 14 magnitudes, therefore require only moderate pixel usage. The target lists include the estimated maximum brightness in *Kp* magnitudes for all stars. A few targets are proposed in a separate short-cadence proposal with more detailed scientific justifications as well.

### References:

- [1] Moskalik et al., 2013, ASSP, 31, P34
- [2] Benkó et al., 2014, ApJS, submitted
- [3] Molnár et al., 2012, AN, 333, 950