

A search for solar-type oscillations in K giants in M4

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Abstract

A large CCD photometry campaign has been organized, where more than 6000 frames were collected, to search for solar-like oscillations among K-giants in M4. The results are presented here with the main result being: amplitudes are below predictions.

The setting

Stars up to $60 L_{\odot}$ are known to show a p-mode spectrum (Frandsen et al. 2002) with short lifetimes (Stello et al. 2006). Is this also true for even higher luminosities? If so, could one then make seismic studies along the giant branch in open/globular clusters? This is the question to be addressed here. The observed stars are shown in Fig. 1. The stars with the best time series are indicated with large, filled symbols. p modes with amplitudes A in the interval 600–1200 ppm are predicted in a frequency range 10–50 μHz by Kjeldsen and Bedding (1995), where $A \propto L/M$.

Conclusion

The detailed conclusion will be presented elsewhere, but the short version is, as illustrated in Fig. 2, that p modes (and granulation) are not present at the expected amplitudes given by Kjeldsen and Bedding (1995).

References

- Frandsen S., Carrier F., Aerts C., et al., 2002, *A&A*, 394, L5
Kjeldsen H., Bedding T. R., 1995, *A&A*, 293, 87
Ludwig H.-G., 2006, *A&A*, 445, 661
Stello D., Kjeldsen H., Bedding T. R., Buzasi D., 2006, *A&A*, 448, 709

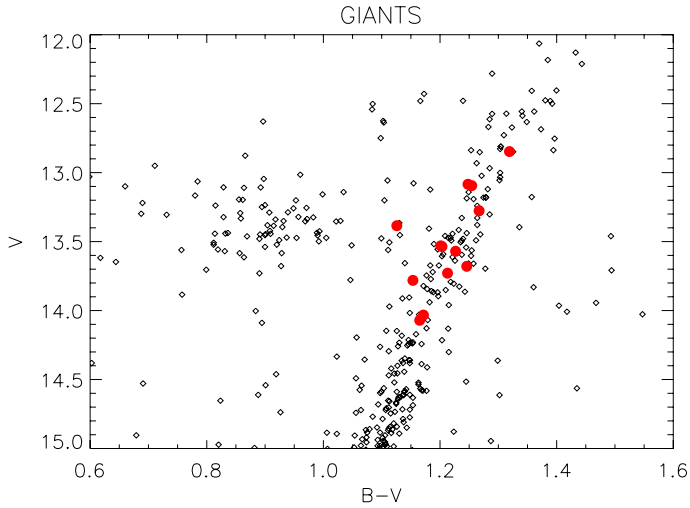


Figure 1: Small part of the Colour-Magnitude diagram illustrating the large number of targets (K giants) present in M4. The scatter on the HB is due to the variability of the RR Lyrae stars: the V magnitude is not the mean/average value.

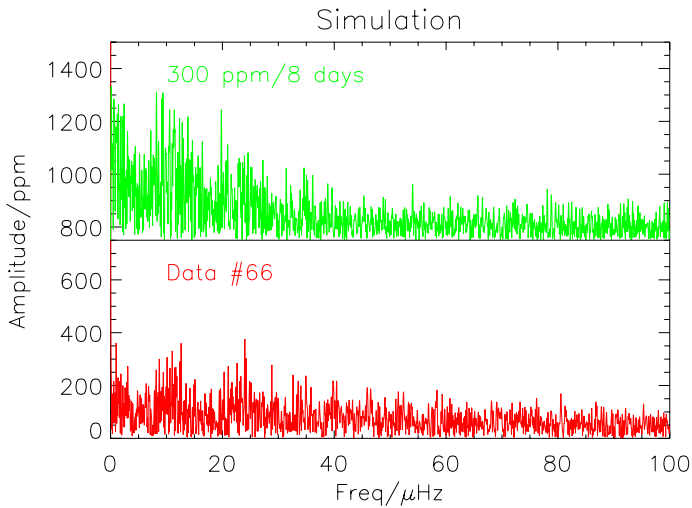


Figure 2: The upper panel is an amplitude spectrum for a simulation of granulation (based on Ludwig 2006), white noise and a p mode spectrum with $A=300$ ppm and a lifetime of 8 days. The lower panel is the spectrum for the brightest K giant in the sample. The spectrum and the simulation look alike. Both have p mode power below the predictions (600–1200 ppm).