

Study of Chemically Peculiar Stars-III: High-resolution Spectroscopy and K2 Photometry of New Variables in the Region of M44

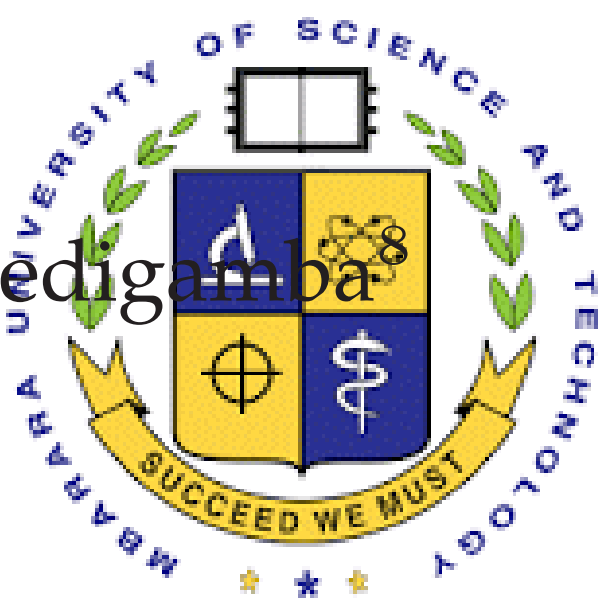
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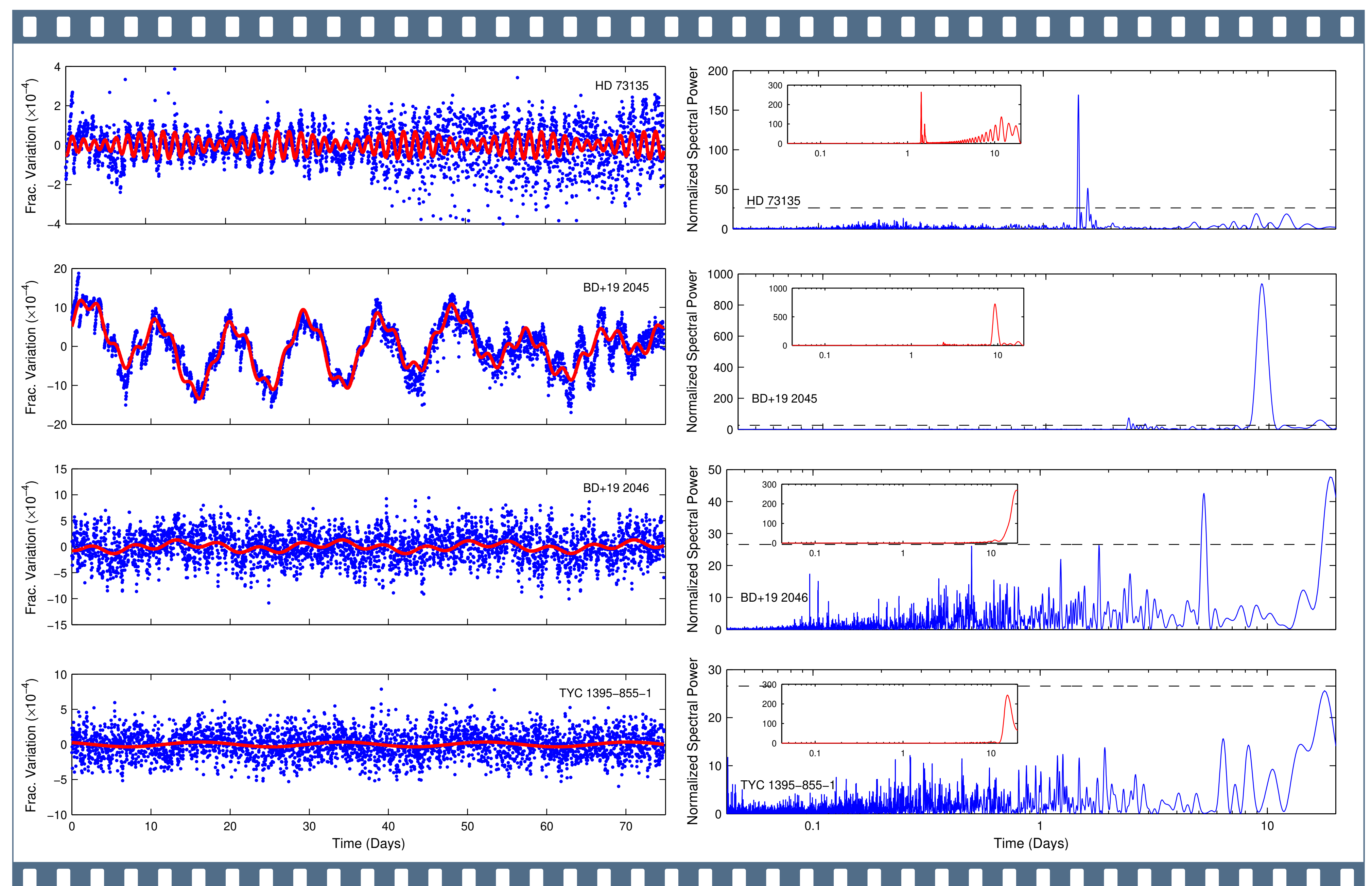
Sub-Saharan Africa Astronomy Summer School, Uganda



ABSTRACT

We aim to carry out a study on the photometric and spectroscopic variabilities of four stars monitored in the Nainital-Cape survey. We analysed the photometric variability of the target stars, HD 73135, BD +19° 2045, BD +19° 2046, and TYC 1395-855-1, using ground-based differential photometry, the analysis of high-precision K2 photometric time-series reveals that HD 73135, BD +19° 2045, and BD +19° 2046 are variable. We do not detect photometric variability in TYC 1395-855-1. Our analyses show that the three stars, HD 73135, BD +19° 2045, BD +19° 2046, which are non-variable based on ground-based observations exhibit rotational variability in *Kepler* K2 data while TYC 1395-855-1 remains constant in both data sets. Based on the chemical abundance analysis, HD 73135 is an Am star, while BD +19° 2045 is non-Am.

K2 PHOTOMETRY

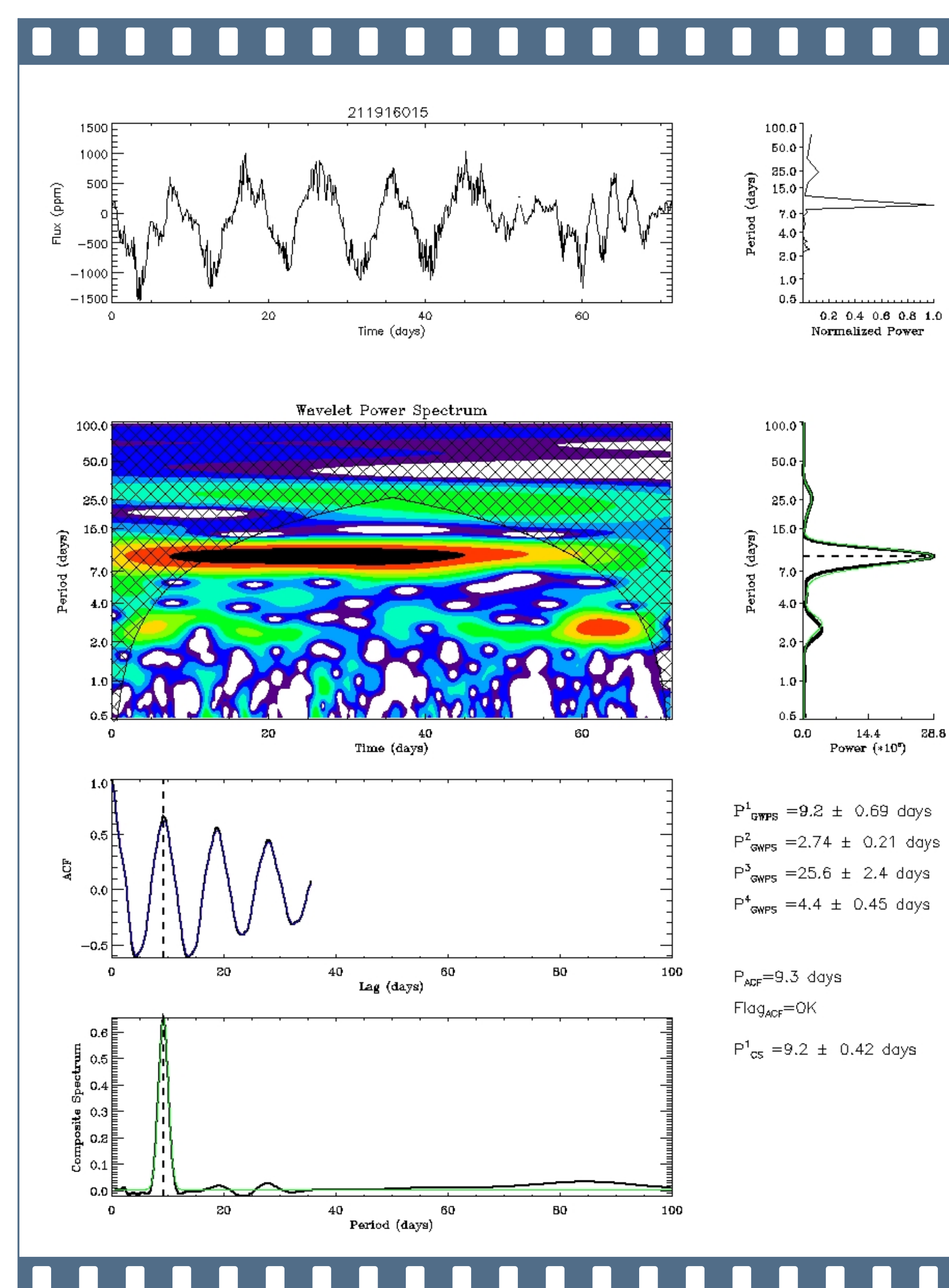


Left: The red line plotted over the 2015 Campaign 05 PDCSAP data (blue points) represents the model time series. Right: Lomb-Scargle periodograms for the four stars studied in this paper during the 2015 K2 Campaign 5. A false probability of 10^{-8} is signified by the black-dashed line. The inset shows the Lomb-Scargle periodogram relating to the time-series after the application of the k2sc algorithm.

INTRODUCTION

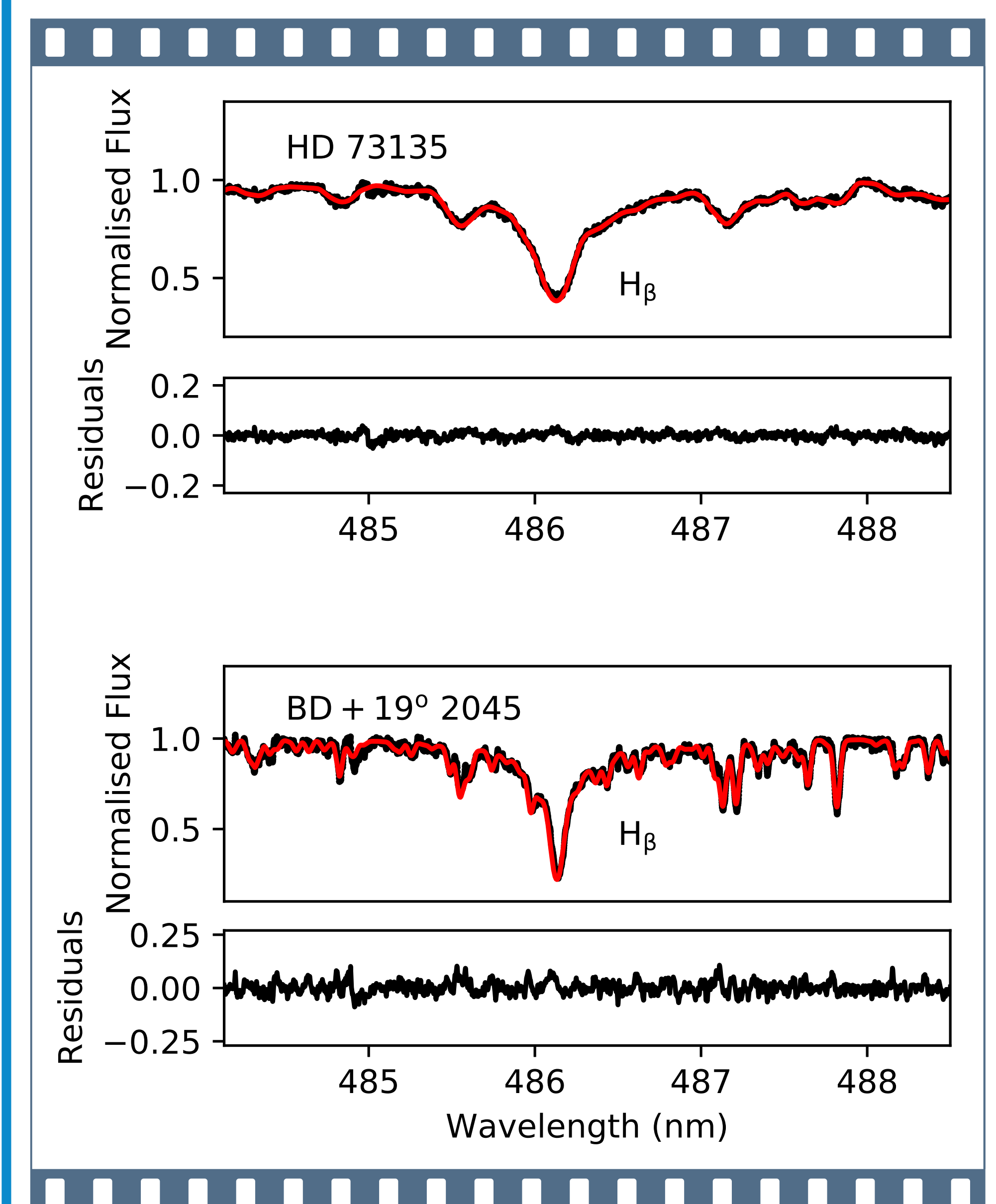
Over 10% of the upper main sequence stars in the spectral range early B to early F exhibit unusual elemental abundances seen in their optical spectra, known as chemically peculiar stars (Preston, 1974). Under the Nainital-Cape survey, a sample of 340 Ap and Am stars were monitored to search for photometric variability and most of which turned out to be non-variable. One of the stars, HD 73045, showed some short-term variability in photometric data. Time-series observations were collected to confirm the suspected variability (Joshi et al., 2022). In the frames of HD 73045, we found close-by four stars (HD 73135, BD +19° 2045, BD +19° 2046, and TYC 1395-855-1) of almost similar magnitude. We analysed ground- and space-based photometric data for these stars in search for their variability. In this study, we do not only present the photometric variability of the target stars, but also put chemical abundances for two of them.

NATURE OF VARIABILITY



The left top panel shows a light curve and in right panel the associated power density spectrum as a function of period for BD+19° 2045. The lower left panel depicts the wavelet power spectrum computed using a Morlet wavelet and associated power density spectrum in right panel. The bottom panels show the autocorrelation function of the full light curve. Finally, at the lowest panel the composite spectrum is shown.

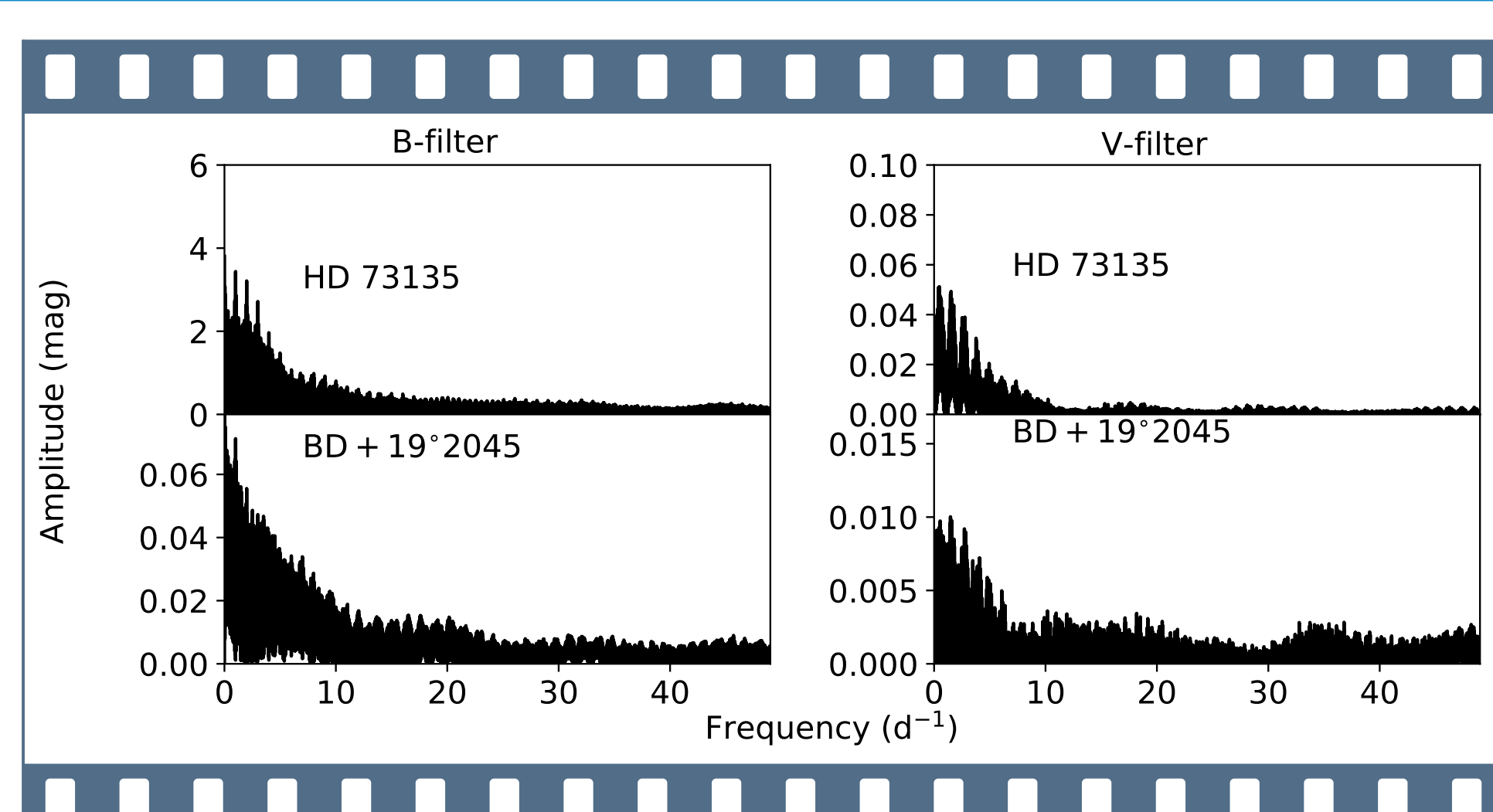
HESP SPECTROSCOPY



CONCLUSIONS

Based on ground-based photometry, all the four stars are non-variable. However, analysis of the K2 data revealed that HD 73135, BD +19° 2045, BD +19° 2046 are variable except TYC 1395-855-1. Based on time-frequency and ACF analyses, the variability detected could be rotational.

GROUND-BASED PHOTOMETRY



The frequency spectra of HD 73135 and BD +19° 2045 using combined data from ground-based observations. No frequencies with S/N above 4.

REFERENCES

Preston, G. W. 1974, ARA&A, 12, 257
Joshi, S., Trust, O., Semenko, E., et al. 2022, MNRAS, 510, 5854

ACKNOWLEDGEMENT

The International Science Program (ISP) from Uppsala University in Sweden and organisers of SSAASS for funding.