

On the first δ Scuti-like pulsating Ap star in an eclipsing binary

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Abstract. HD 99458 was recently discovered to be a first object of its kind: a short-period eclipsing binary hosts a spotted, chemically peculiar A-type primary star that is a δ Scuti pulsator, and an M-dwarf secondary. These phenomena should not co-exist at the same time. Based on new photometric data we find that the previously published period of the main pulsation mode is a Nyquist alias of the true period (0.036 d, and not 0.052 d) given by the *Kepler* sampling.

Key words: Stars: HD 99458 – Stars: chemically peculiar – binaries: eclipsing – Stars: pulsations

1. Introduction

The class of magnetic chemically peculiar stars that show rotational variations due to spots (CP2 class) is characterized by an overabundance of heavy elements (Preston, 1974). From the interaction with the secondary component, a magnetic field is not expected in close binaries and only a few candidates are known (e.g. Carrier et al., 2002; Landstreet et al., 2017). Pulsations of δ Scuti type also have been rarely seen among CP2 stars (Bowman et al., 2018). Here we provide additional results on the reported discovery of a binary star with an A-type CP2 star that shows all the mentioned properties.

2. HD 99458

Skarka et al. (2019) discovered HD 99458 to be a 2.72-day eclipsing binary that shows rotational modulation, overabundance of Si, Ti and other elements, and eclipses that were assumed to be due to a planetary transit (Barros et al., 2016). Skarka et al. (2019) showed that the companion is a $0.45 M_{\odot}$ M-dwarf star.

Multi-mode stellar pulsations with the main period of 19.2 c/d were detected in the *Kepler K2* data.

After obtaining new photometric data in 2019 (Fig. 1, left panel), we found that the main pulsation frequency originally detected in the *K2* data is actually the Nyquist alias of the true frequency (Fig. 1, right-hand panel).

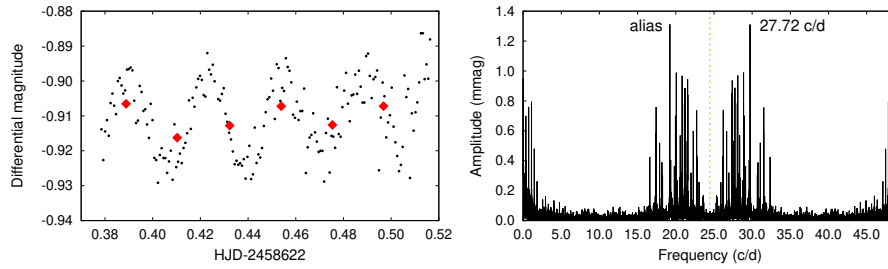


Figure 1. Data in Johnson *B* (left panel) and frequency spectra from the *Kepler K2* mission with identification of the main pulsation frequency and its alias. The red diamonds in the left panel are 30-min bins simulating the *K2* cadence.

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