

Seismic investigation of the γ Dor star KIC 6462033: The first results of *Kepler* and ground-based follow up observations

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Abstract. Preliminary results on the analysis of the *Kepler* light curve and photometric ground-based time series of γ Dor star KIC 6462033 (TYC 3144-646-1, $V = 10.83$, $P = 0.69686$ d) are presented in order to determine pulsation frequencies.

Keywords. stars: individual: KIC 6462033, stars: oscillations, stars: variables: γ Dor

1. Introduction

γ Dor variables are multiperiodic nonradial pulsators that oscillate in high-order g-modes with periods of the order of a day (Balona *et al.* 2011). Their position in the H-R diagram partially overlaps with the cool part of δ Sct instability strip. This means that stars showing both types of pulsations may exist (Uytterhoeven *et al.* 2011, Balona & Dziembowski 2011). It should therefore be noted that searches for such objects are highly important for understanding the oscillation mechanisms of simultaneously excited p- and g-modes in a star.

2. Ground-based and *Kepler* photometry

Ground-based observations of KIC 6462033 were carried out at the Astronomical Observatory of the Autonomous Region of the Aosta Valley (OAVdA) between the Julian dates JD 2455 740.4 – 2455 776.5. All data were obtained with the FLI PL3041-1-BB CCD camera attached to the 81-cm telescope in the *UBVI* photometric passbands. The observed light variation of the star in the *B* filter is shown in Fig. 1.

In order to derive the frequency content of the variability of the star, we analyzed *Kepler* short cadence (SC) data which consist of 38016 points taken in *Kepler* quarter Q3.3. The data were prepared for analysis using KEPCOTREND package (Fraquelli & Thompson 2012, Christiansen *et al.* 2012, Ulusoy *et al.* 2013).

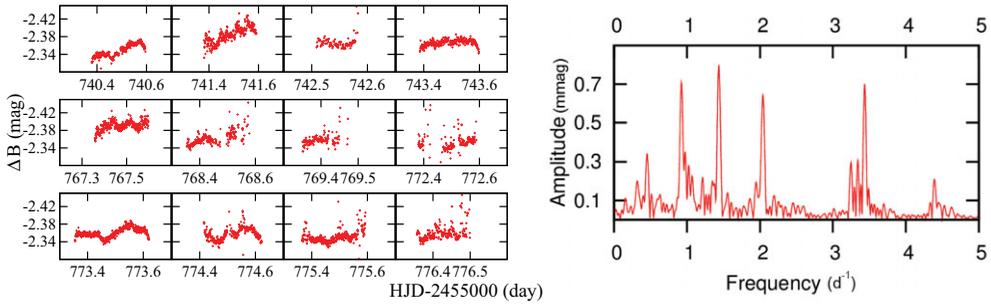


Figure 1. *Left:* *B*-filter light curves of KIC 6462033. *Right:* Fourier spectrum of SC *Kepler* data for KIC 6462033.

3. Fourier analysis

We used PERIOD04 (Lenz & Breger 2005) software for the analysis of both SC and ground-based time series. Following Breger *et al.* (2011), the signal to noise ratio (S/N) equal to 3.5 was adopted as a detection threshold. From the analysis of the *Kepler* data, we find that the light curve is dominated by four independent modes with frequencies $f_1 = 0.9242$, $f_2 = 1.4363$, $f_3 = 2.0409$ and $f_4 = 3.4257 \text{ d}^{-1}$. Due to lack of data with sufficient quality, we were able to detect only the first two frequencies from the ground-based time series. The ground-based *B*-filter light curve and frequency spectrum of the *Kepler* data are shown in Fig. 1.

4. Conclusions

The star KIC 6462033 was recently classified as a γ Dor-type star by Uytterhoeven *et al.* (2011). We have performed frequency analysis of the obtained ground-based data as well as the *Kepler* data for KIC 6462033. This is a first step of our scheduled study. We confirm that KIC 6462033 pulsates in the frequency range of γ Dor type pulsators. In order to try seismic modeling, mode identification will be an essential requirement at least for a few frequencies. We expect that new photometric and spectroscopic observations will provide more data that can be used for this purpose.

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