RevMexAA (Serie de Conferencias), **49**, 87–87 (2017)

XV Latin American Regional IAU Meeting (Cartagena de Indias, Colombia, 3-7 October 2016)
Editors: Mario Armando Higuera Garzón & Santiago Vargas Domínguez

A SEISMIC ANALYSIS OF THE δ SCUTI STAR KIC 6951642 OBSERVED WITH KEPLER

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We present the preliminary results of a period analysis of the δ Scuti star KIC 6951642 observed with the *Kepler* satellite in long cadence mode between 2009 and 2013 years.

The *Kepler* satellite (Borucki et al. 2011), successfully launched in 2009 March, is providing light curves of impressive quality which are specially well suited for probing the interior of the stars by using the techniques of asteroseismology. For stars of spectral types A-F, the *Kepler* high precision photometry revealed a large numbers of candidate hybrid stars of δ Scuti (δ Sct) and γ Doradus (γ Dor) pulsation types that occupy the entire region between the blue edge of the δ Sct instability strip and the red edge of the γ Dor instability strip (Uytterhoeven et al. 2011). As well known, the δ Sct stars pulsate in low-order g and p modes with periods between 15 min and 5 h, driven by the κ mechanism operating in the He II ionization zone. On the other hand, the γ Dor stars pulsate in high-order g modes with period of order 1 day, driven by convective blocking at the base of their envelope convection zone. Several outstanding questions on the structure, evolution and pulsation excitation mechanisms in A-F type-pulsators arise with regard of such hybrid stars.

KIC 6951642 (= BD+42 3370, GSC 03143-00305) has a *Kepler* Kp = 9.7 mag. It has been classified as a A5 type star. The atmospheric parameters derived from high resolution spectroscopy are $T_{\rm eff} = 7200 \pm 100$ and $\log\ g = 4.0 \pm 0.2$ (in cgs units) (Niemczura et al. 2015). It is likely a rapid rotator with $v\ sin\ i = 127 \pm 3$ km s^{-1} (Niemczura et al. 2015). A period analysis of two quarter *Kepler* data is reported by Uytterhoeven et al. (2011).

The data used for the period analysis in the present contribution are the *Kepler* quarters 0 to 17 (Q0 - Q17) with 30-min exposures spanning from BJD 2454953.5390024 to 2456424.0013204 for a total of 65183 data points. The raw time series data have been processed as explaining in Baran et al. (2011). The Fourier analysis of the data set has been performed by using the PERIOD04 package (Lenz & Breger 2005). The full amplitude spectrum out to the Nyquist frequency for KIC 6951642 is shown in Figure 1. There are pulsations in both g-mode and p-mode regions which are clearly separated. The former pulsations between 0-4 c/d are typical of γ Dor stars while the later pulsations between 8-20 c/d are typical of δ Sct stars. Therefore, this target is likely a hybrid star showing both kind of oscillations -δ Sct and γ Dor. An in depth analysis of KIC 6591642 to confirm its hybrid status and to characterize its pulsation properties will be given elsewhere. This work received financial support from the DGAPA-UNAM grant PAPIIT-IN105115.

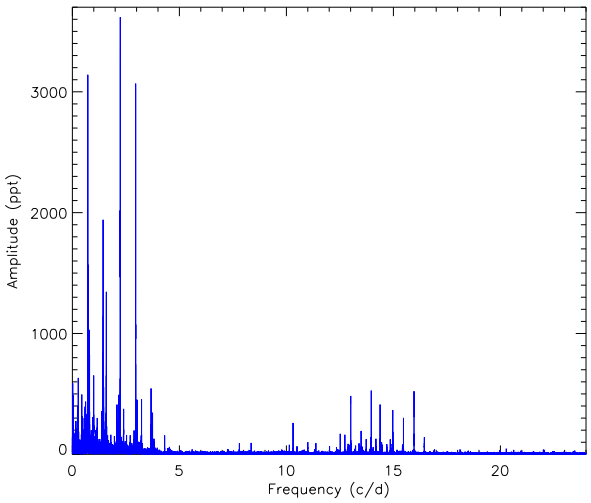

Fig. 1. Amplitude spectrum of KIC 6951642.

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