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# DISCOVERY OF PULSATION IN THE $\lambda$ Boo STAR HD 111786

The group of $\lambda$ Bootis stars consists of early A type population I objects which are metal poor and their $v \cdot \sin i$ values exceed on average 100 km/s. HD 111786 ($m_V$=6.15, HR 4881, BD−26°9369) was classified by Gray and Corbally (1993) as A1.5 Va $\lambda$ Boo .

Our photometry was obtained using the 'modular photometer' attached to the 0.5m telescope of the South African Astronomical Observatory (SAAO) in Sutherland and was scheduled from April 20, to May 10, 1994. The measurements are 10 second integrations with a Strömgren $v$ filter. A 30 arcsec diaphragm was used throughout. As primary comparison star we used

HD 111295 (C1, $m_V$=5.7, HR 4860, BD−26°9340, G5III-IV), and during the last two nights as an additional comparison star

HD 111226 (C2, $m_V$=6.4, HR 4857, BD−26°10540, B8III).

HD 111786 was found to be variable already in the first night (May 3/4, 1994) and monitored during the following seven nights. A full observing log is given in Table 1. The observations from the night of May 8/9 were excluded from our present analysis, because of strong sky transparency variations and hence poor quality of the data.

Table 1: Observing log.

| night | hours | data points | | |
|---|---|---|---|---|
| May '94 | | HD111786 | HD111295 | HD111226 |
| 3/4 | 3.62 | 1118 | 69 | - |
| 4/5 | 7.80 | 2591 | 57 | - |
| 5/6 | 7.43 | 2362 | 72 | - |
| 6/7 | 6.51 | 1916 | 57 | - |
| 7/8 | 7.28 | 2377 | 72 | - |
| 8/9 | 5.15 | 734 | 201 | 202 |
| 9/10 | 7.38 | 1550 | 216 | 211 |
| total | 45.17 | 12648 | 744 | 413 |

Figure 1 shows the light curves of the program and both comparison stars for the last night. The instrumental magnitudes are plotted relative to the night mean. The variability of HD 111786 is clearly visible and superimposed on low frequency transparency changes, which are evident also in the light curves of both comparison stars.

In a next step, long term trends were removed from the data sets of each night and a Fourier analysis was computed. The amplitude spectra and the spectral window from the merged data are shown in Fig. 2. The maximum peak in the frequency spectrum appears at f=31.02 $d^{-1}$ (46.42 min) with a semi-amplitude of 6.2 mmag. This amplitude spectrum gives evidence for the presence of more than one pulsation frequency, a presumption which is supported by the amplitude modulation of the entire light curve (Figure 3).

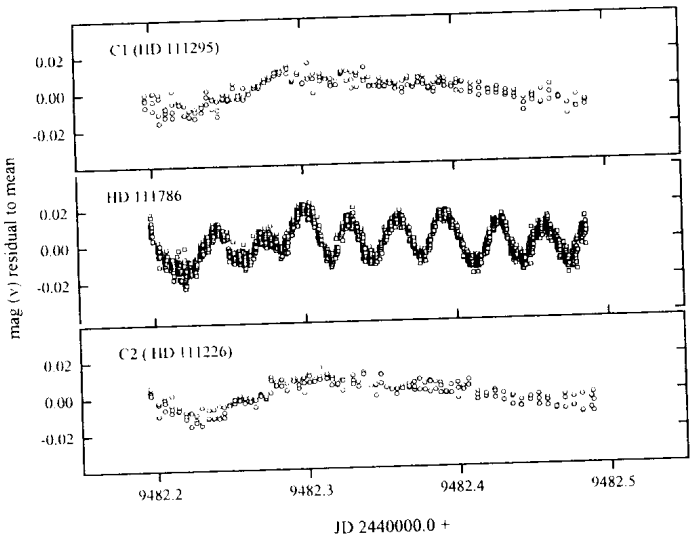


Figure 1: Instrumental Strömgren $v$ data for HD 111786 and both comparison stars

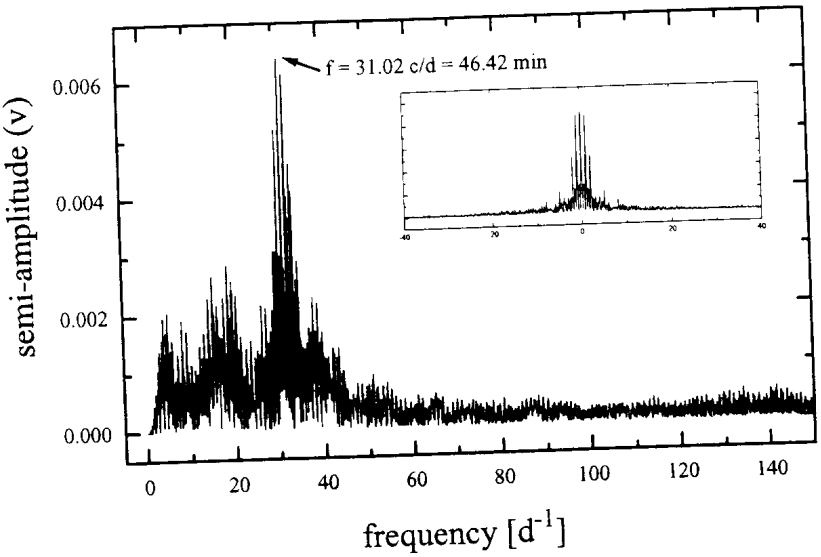


Figure 2: Amplitude spectra ($v$) for HD 111786 and the comparison star C1

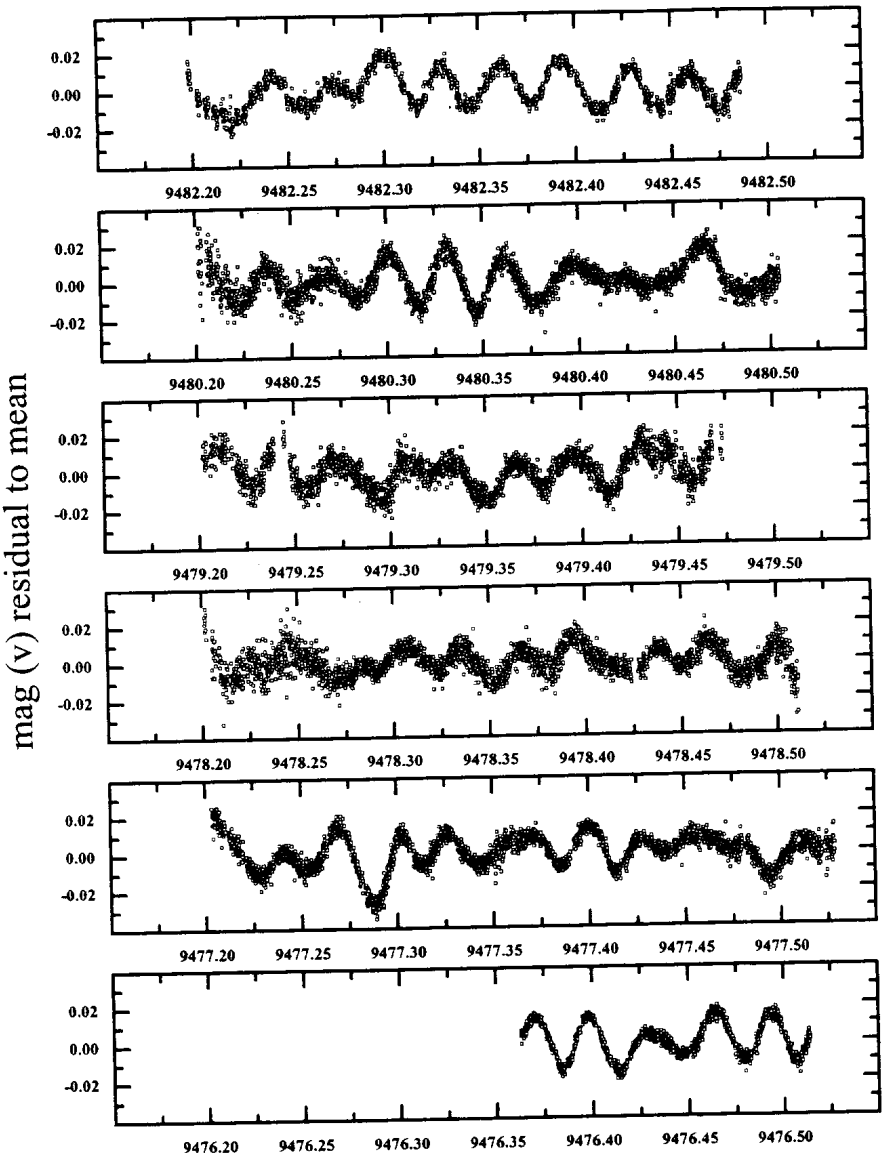


Figure 3: Light curve of HD 111786

(46.42 min) with a semi-amplitude of 6.2 mmag. This amplitude spectrum gives evidence for the presence of more than one pulsation frequency, a presumption which is supported by the amplitude modulation of the entire light curve (Figure 3).

This object is the third one found to be variable as a result of our survey for pulsation among $\lambda$ Boo stars (Paunzen & Weiss 1994, Weiss et al. 1994). The driving argument for this survey was the possibility to apply the technique of asteroseismology for determining the structure and evolutionary status of $\lambda$ Boo stars. Finding multi-periodic pulsation increases significantly the potential of this method, because each new observed frequency allows a better determination of stellar model parameters.

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**References:**

Gray R.O., Corbally C.J., 1993, *AJ*, **106**, 632
Paunzen E., Weiss W.W., 1994, *IBVS*, No. 3986
Weiss W.W., Paunzen E., Kuschnig R., Schneider H., 1994, *A&A*, **281**, 797