

The Nainital-Cape Survey : A Project Initiated by Don Kurtz et al. at ARIES Nainital-India

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Abstract

The Nainital-Cape Survey is a dedicated search programme initiated in 1999 by Don Kurtz et al. in the coordination of astronomers from SAAO, South Africa, ARIES Nainital and ISRO Bangalore. Over the last 17 years a total of 337 candidates pulsating CP stars were observed, making it one of the longest ground-based survey to search for pulsation in CP stars in terms of time span and sample size. Under this survey, we discovered the rapid pulsation in an Ap star HD12098 while δ - Sct type pulsations were detected in seven Am stars. The major credit of the success of this survey goes to Prof. Don Kurtz who motivated to start the first such survey in Himalayan foot hill of India.

Motivations

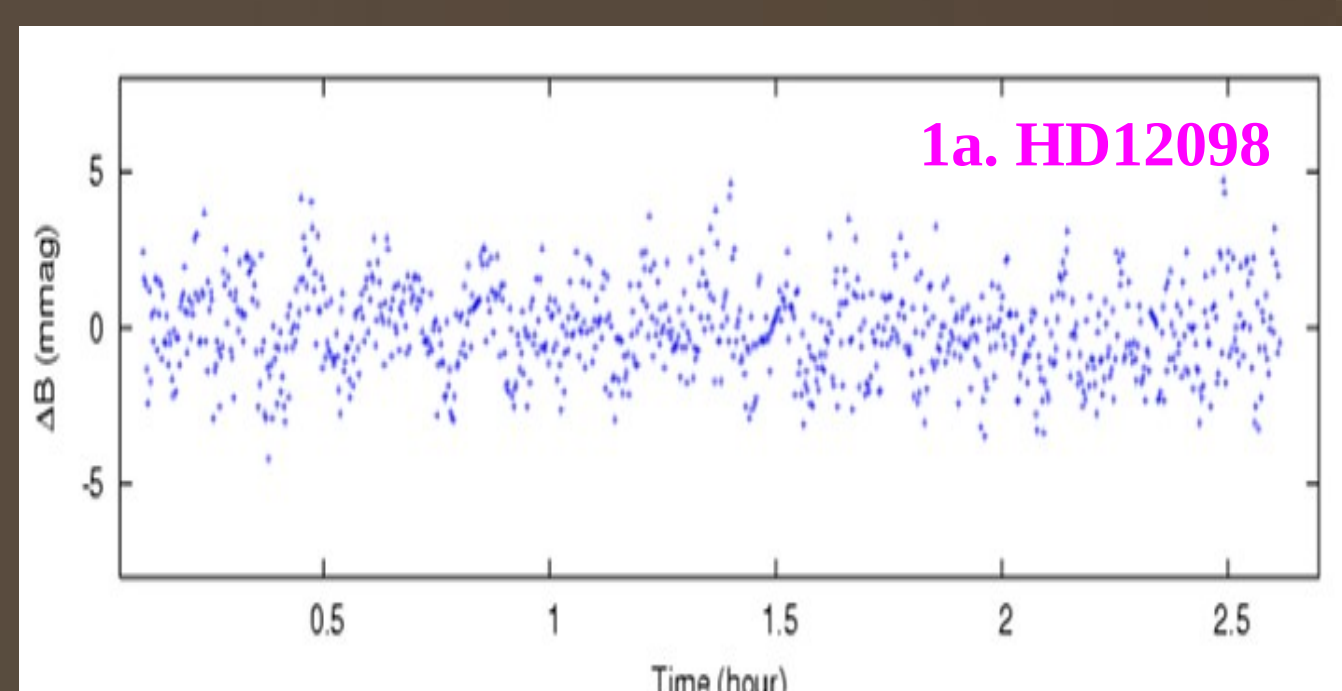
- (1) To find new roAp stars in the Northern hemisphere, (2) Search for pulsational variability in Am Stars, (3) Asteroseismic study of the newly discovered pulsating CP variables.

Sample Selection Criteria

$$0.082 \leq b-y \leq 0.431, 0.178 \leq m_1 \leq 0.387, 0.002 \leq c_1 \leq 0.870, 2.64 \leq H_B \leq 2.88, -0.204 \leq \delta m_1 \leq 0.012, -0.370 \leq \delta c_1 \leq 0.031$$

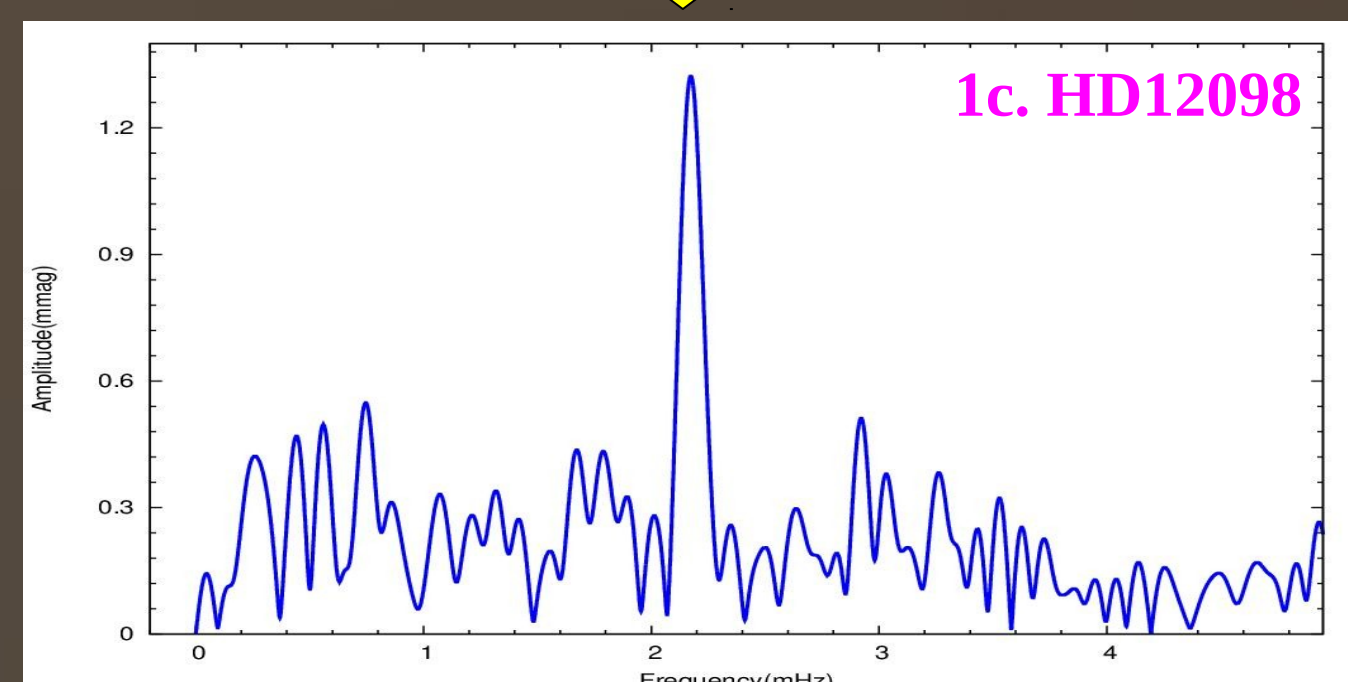
Instruments

- (1) 1.04-m Sampurnanand telescope of ARIES India, Detector : 3-channel fast photometer, Filter : Johnson B, diaphragm : 30", Integration time : 10-sec.
- (2) 1.0-m and 0.5-m telescope of SAAO, South Africa, Detector : Modular photometer, Filter : Johnson B, diaphragm : 30", Integration time : 10-sec.

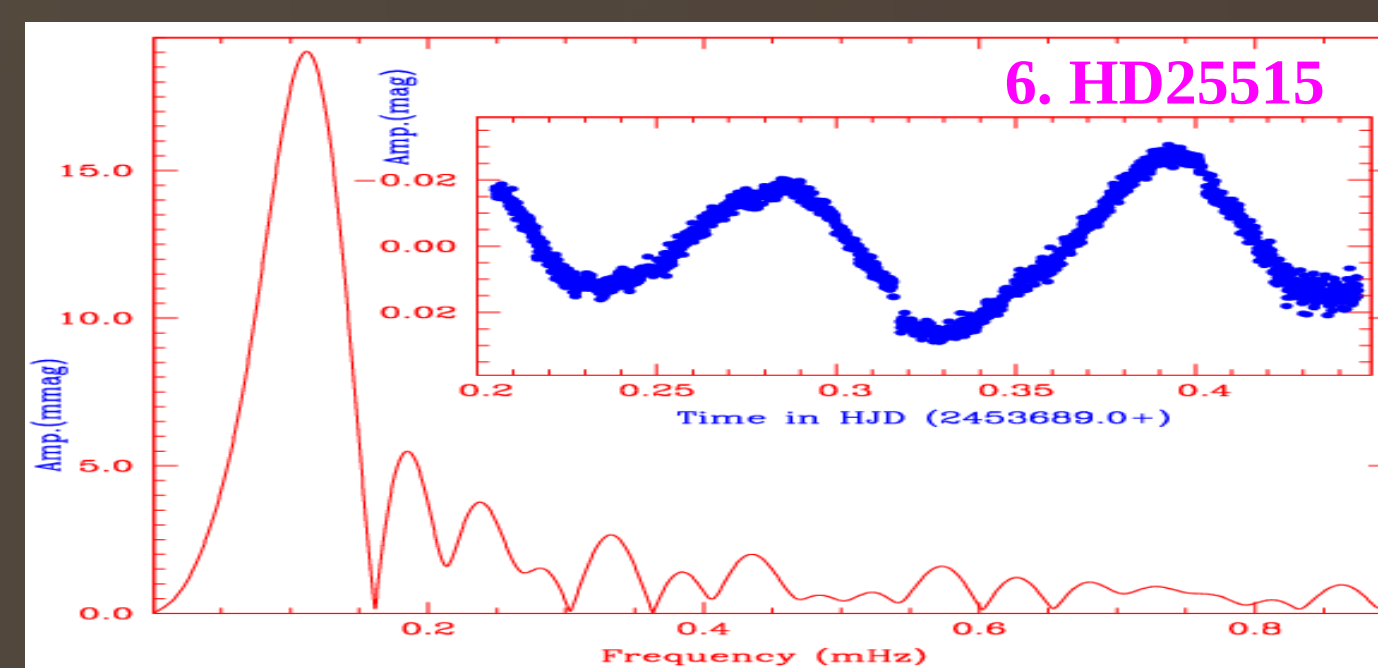


1a. HD12098

HD12098 is the first roAp star discovered under the Nainital-Cape survey. The period of this star is 7.6-min which shows amplitude modulation with maximum amplitude 3-mmag. The basic physical parameters of HD12098 are: Sp.Type: F0, $b-y=0.191$, $m_1=0.328$, $c_1=0.517$, $\delta m_1=0.122$, $\delta c_1=0.279$, $H_B=2.796$, $T_{\text{eff}}=7800$, $P_{\text{rot}}=5.46\text{-d}$, $H_{\text{eff}}=1.4\text{ kGauss}$ (Girish et al. 2001).



1c. HD12098



HD25515

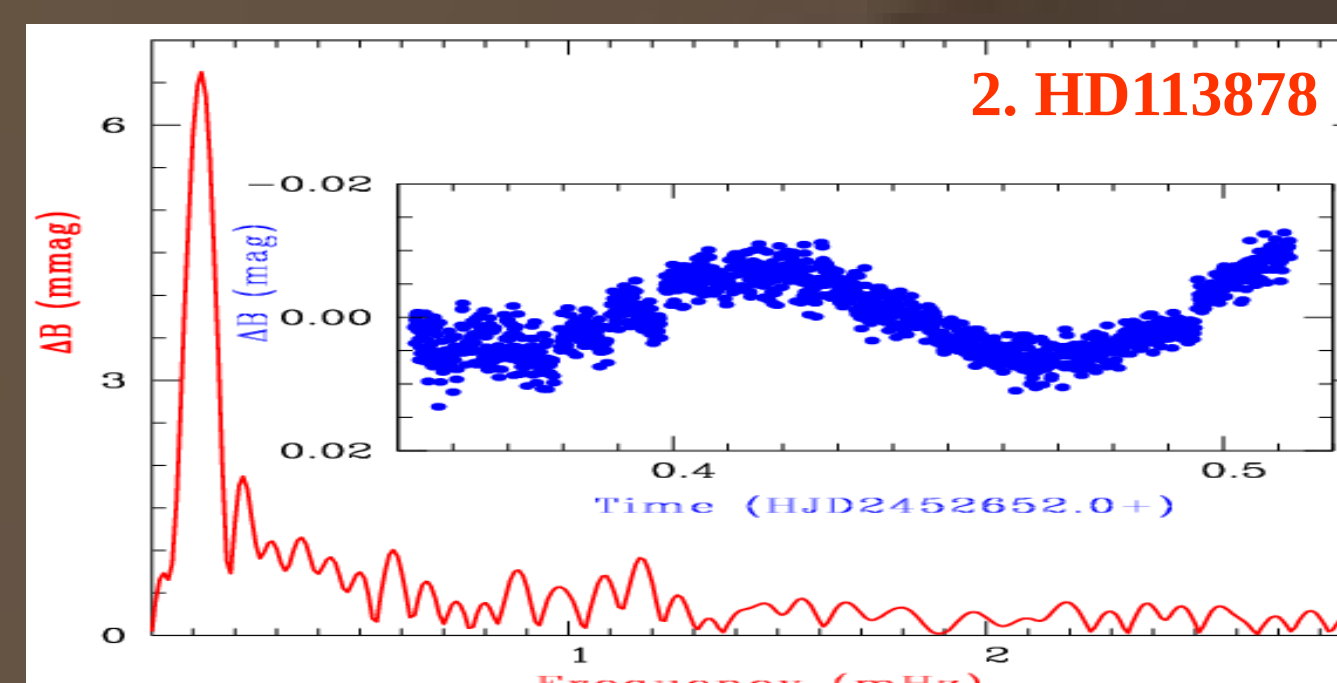
The Strömgren indices of HD25515 are $b-y=0.262$, $m_1=0.177$, $c_1=0.745$, $H_B=2.706$. This star pulsates with period of 2.8 h. The amplitude modulation is clearly seen in the light curve (Joshi et al. 2009).

References

- Fossati et al. 2007, A&A, 476, 911
Fossati et al. 2008, A&A, 483, 891
Girish, V., et al., 2001, A&A, 380, 142
Joshi, S., et al., 2006, A&A, 455, 303
Joshi, S., et al., 2003, MNRAS, 34, 43
Martinez, P. et al., 2001, A&A, 371, 1048

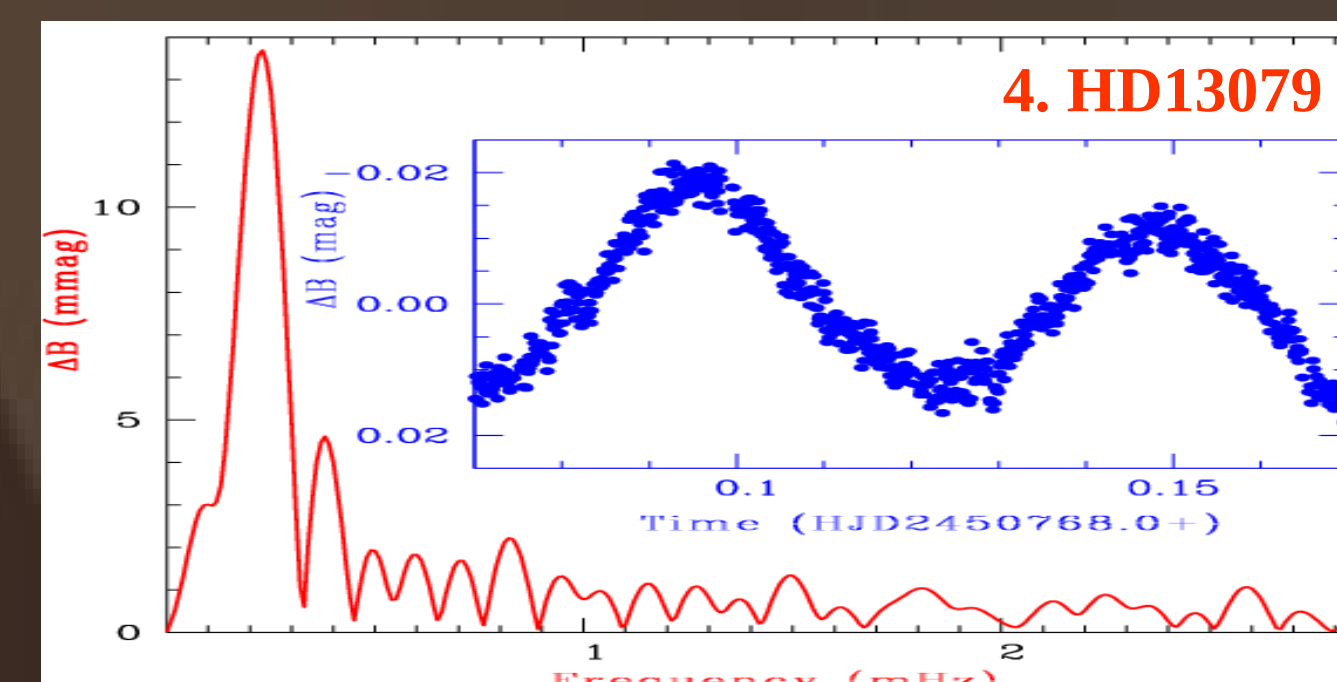
Results

- (1) New roAp star HD12098 was discovered under the survey.
(2) δ -Scuti type pulsations discovered in 7 Am stars.
(3) The discovery light curves and FTs are shown above.



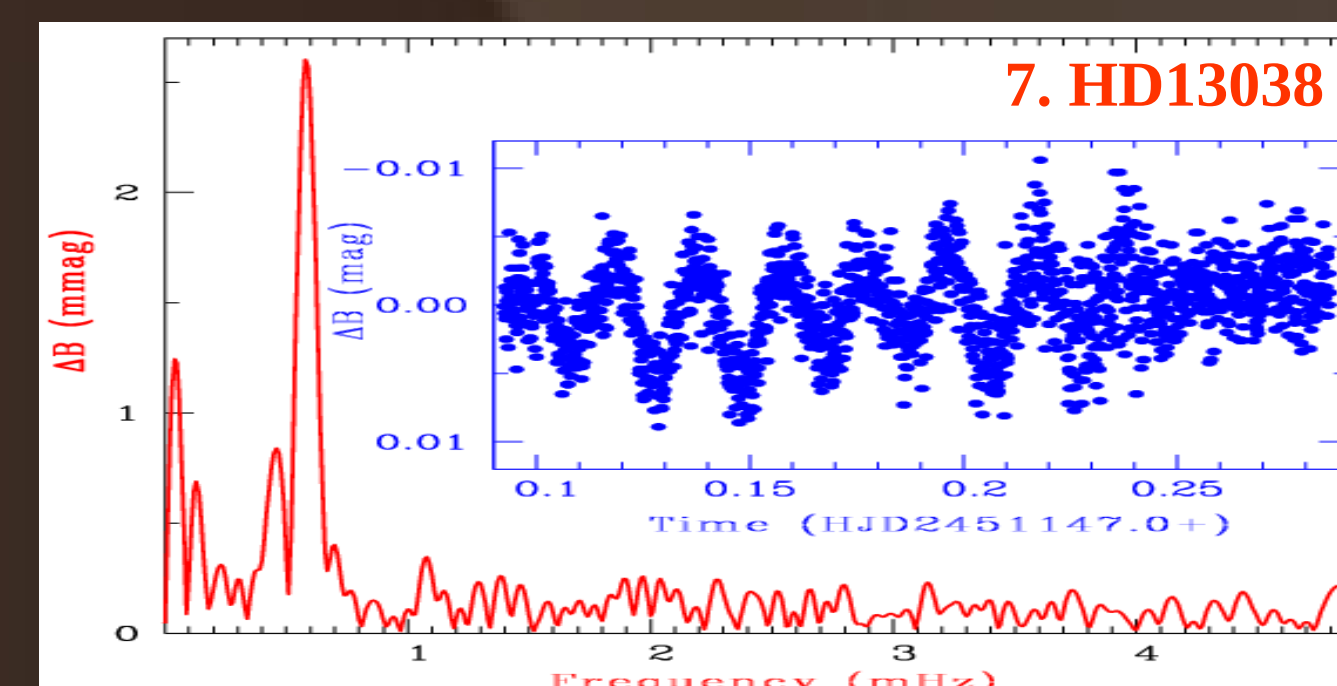
2. HD113878

HD113878 is an Am star pulsating with period of 2.31 hr a typical for δ Sct stars. This is an early F-type star, with the Strömgren photometric indices: $b-y=0.219$, $m_1=0.257$, $c_1=0.729$, $H_B=2.745$, $\delta m_1=-0.037$ and $\delta c_1=0.069$. The spectral type of this star is F1/F3V/F3 indicating HD113878 is a marginal Am star (Joshi et al. 2006).



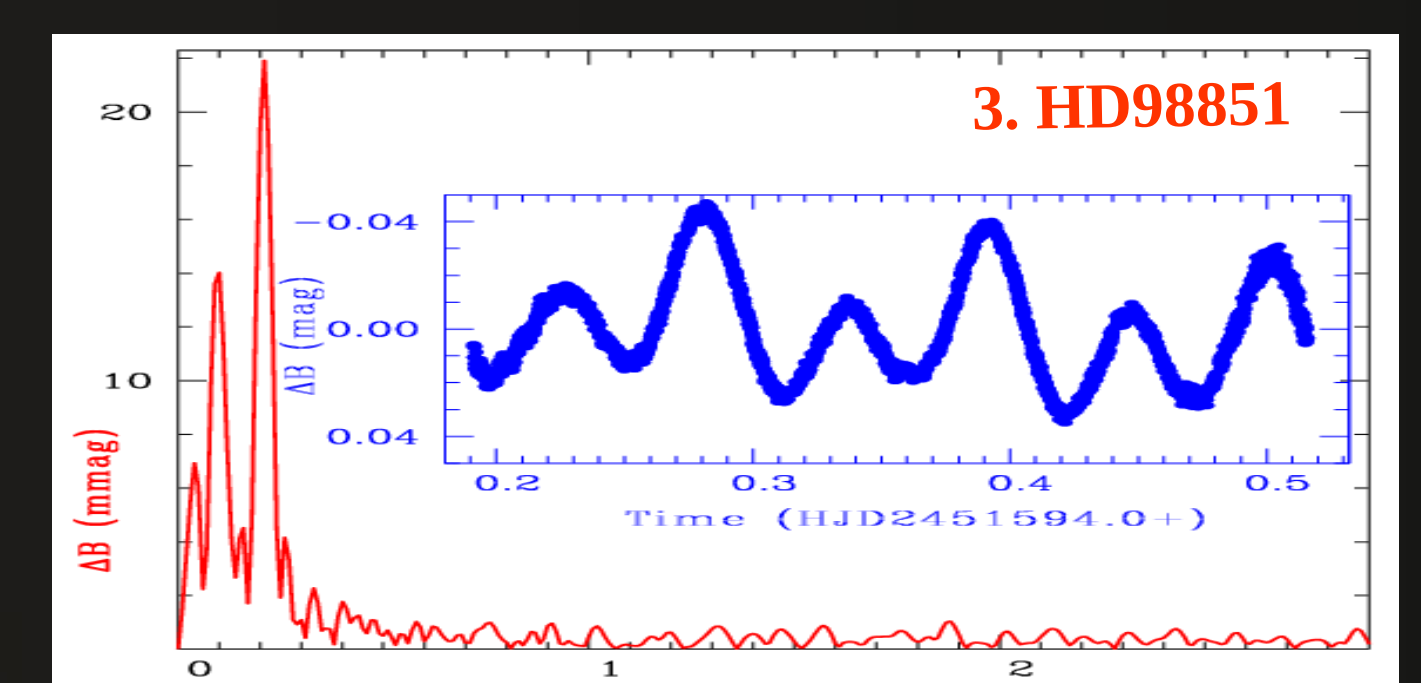
4. HD13079

HD13079 is a CP star shown to be pulsating with a 78-min period and a peak-to-peak B amplitude of 0.02 mag. This is a fundamental-mode pulsator near the zero-age main sequence (Martinez et al. 2001).



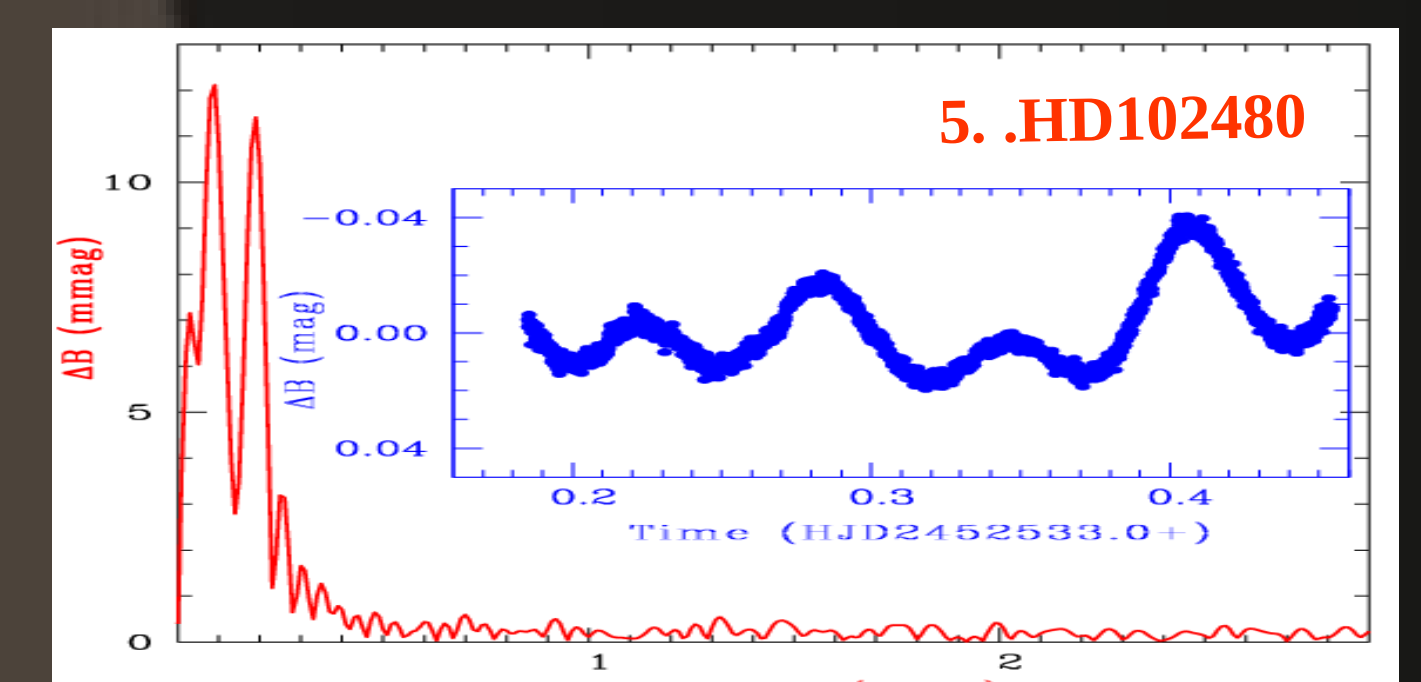
7. HD13038

HD13038 is classified as spectral type A3. This star pulsates with a period of 28.7 min and 36.23 min. The beating phenomena of these two frequency is seen in the light curve. The Ap or Am nature of this star is unclear yet (Martinez et al. 2001).



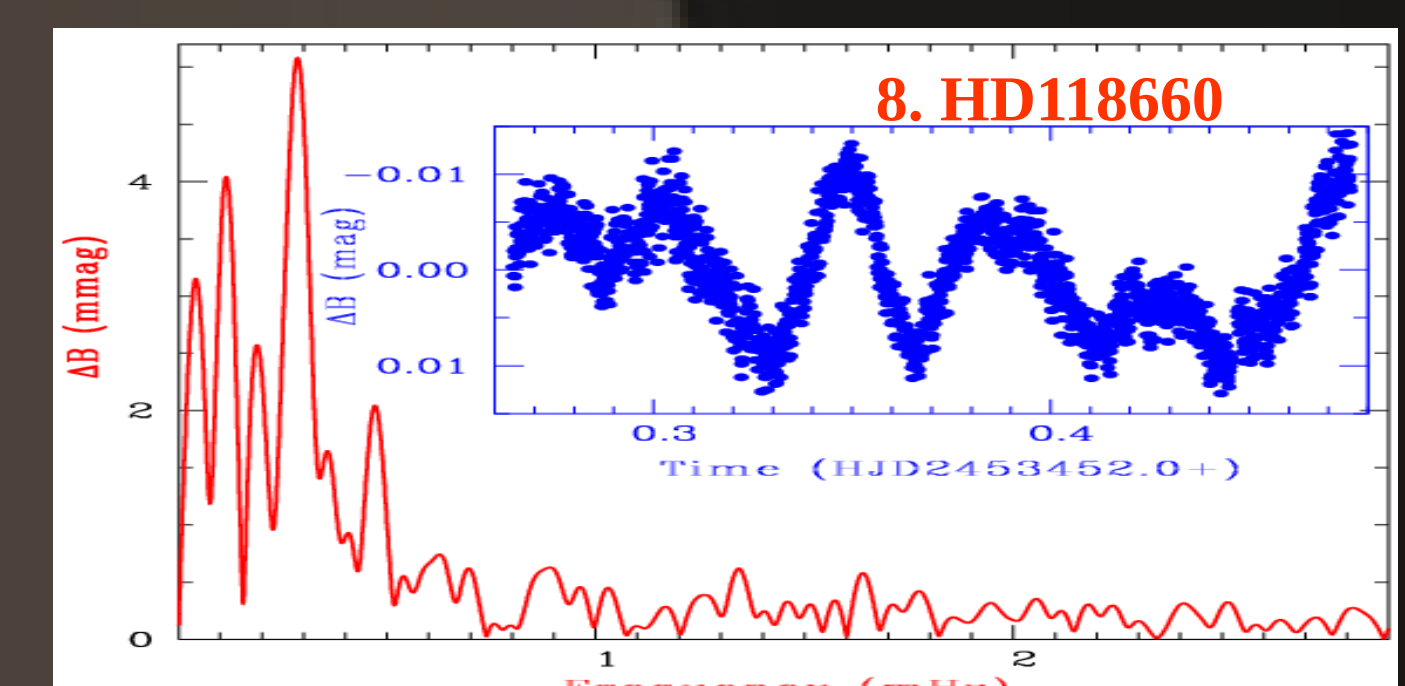
3. HD98851

HD98851 is an Am star of spectral type F2. The Strömgren indices are: $b-y=0.199$, $m_1=0.222$, $c_1=0.766$, $\delta m_1=-0.051$, $\delta c_1=0.236$. The pulsation periods of this star are 80.4-min and 162-min. Alternating high and low amplitude cycles visible in the light curves indicate a nearly sub-harmonic period ratio of 2:1 (Joshi et al. 2003).



5. HD102480

HD102480 is an Am star of spectral type F1. The Strömgren indices of this star are: $b-y=0.211$, $m_1=0.204$, $c_1=0.736$, $\delta m_1=-0.034$, $\delta c_1=0.292$. This star pulsates with periods of 156.0-min and 84-min with alternating high and low amplitude variations with period ratio close to 2:1 (Joshi et al. 2003).



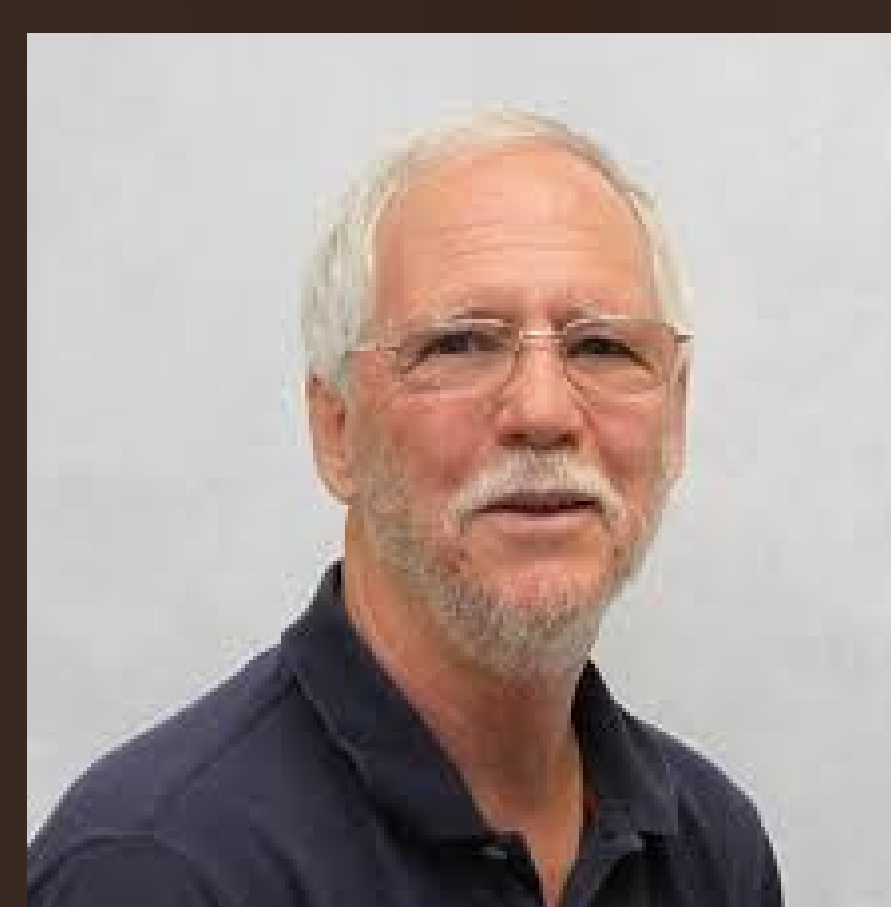
8. HD118660

HD118660 is a peculiar star of spectral type A8V. Its Strömgren photometric indices are $b-y=0.150$, $m_1=0.214$, $c_1=0.794$, $H_B=0.778$, $\delta m_1=-0.018$, $\delta c_1=0.054$ indicating that the star is metallic, and evolved. This is a multi-periodic δ Sct variable pulsating with a principal period of about 1 hr and period of 2.52 hr is also apparent (Joshi et al. 2006).

HD118660

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