CT20. SPECTROSCOPIC VIEW ON THE PULSATING STARS HD 73045 AND HD 118660

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HISTORICAL INTRODUCTION

- A «magnetic» conference at SAO (Russia) in 2010
- Cape-Nainital photometric survey and «probably» roAp-stars
- HD 207561, a roAp-star that doesn’t pulsate. 2012MNRAS.424.2002J
- Seven more A-stars with detailed analysis of a chemical composition: HD 13038, HD 13079, HD 25515, HD 98851, HD 102480, HD 113878, HD 118660. 2017MNRAS.467..633J
- The main goal is a determination of basic atmospheric parameters and chemical composition from high-resolution spectroscopy
OBSERVATIONAL SUPPORT

- BTA (6 m, F/4), 41°E 43°N
- NES, Nasmyth Echelle Spectrograph, 400-700 nm, R=40,000
- MSS, Main Stellar Spectrograph, 500/850 nm long, R=15,000, spectropolarimetry

- programme nights
- Director’s reserve
- technical time
HISTORICAL INTRODUCTION

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HD 118660

- Bright (6.3 mag) multiperiodic pulsating variable
- $T_{\text{eff}} = 7550$ K, $\log g = 4.0$
- $v \sin i = 108$ km/s
- Mild Am-type anomalies in abundances
HD 118660

- Bright (6.3 mag) multiperiodic pulsating variable
- $T_{\text{eff}} = 7550$ K, $\log g = 4.0$
- $v_{\sin i} = 108$ km/s
- 40-frame’s series (20/03/2016)
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P $\approx 35-40$ min
HD 118660

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- 40-frame’s series (20/03/2016)

P $\approx$ 35 min

**Figure 2.** Johnson B light curve (inset) and amplitude spectrum of HD 118660 obtained on HJD 2453452. Of about 1 h. Another prominent period of 2.52 h is also apparent. Preliminary analyses indicate that many other periods may also be present in the data, though we could not investigate them further so far. More time-series data are consequently required.

At a declination of about 14°, HD 118660 is a target for a multi-site campaign with 0.5-m to 1.0-m class telescopes situated in both northern and southern hemispheres.

**Figure 3.** Johnson B light curves of HD 207561 obtained on two consecutive nights. These curves clearly show the 6-min oscillations.

**Figure 4.** Johnson B light curves of HD 207561 obtained on a third night from a different season. This curve shows a clear lack of signal at high precision. In all the light curves, the data have been merged to 40-s integrations and low-frequency sky transparency variations have been prewhitened at frequencies below 0.5 mHz.

While roAp stars are oblique pulsators, so their observed amplitude varies with rotation and can decrease to zero, or rise to many mmag from night-to-night, most of them have stable frequency spectra. Exceptions to this is HD 60435 (Matthews et al. 1987) where the mode lifetimes appear to be shorter than one week, and HD 217522 which had a new frequency at 2.02 mHz in 1989 in addition to the 1.2 mHz peak known from 1982 (Kreidl et al. 1991). We have not previously seen the apparent behaviour that the light curves and amplitude spectra for the 17 nights of observations of HD 207561 show, so...
**HD 73045**

- A 8.62 mag (V) Praesepe member

- Spectroscopic binary, \( P = 435 \) days, \( e = 0.32 \). [2007MNRAS.380.1064C]

- Am-type non-magnetic star: \( T_{\text{eff}} = 7570 \) K, \( \log g = 4.0 \), \( \text{vsin} \, i = 10 \) km/s. [2007A&A...476..911F]

- Photometry at STEREO: \( P = 1.25 \) days, possible blending. [2013MNRAS.429..119P]

- Kepler K2 mission: \( P = 13.01 \) days ([2017ApJ...839...92R]) and \( P = 12.83 \) days ([2017ApJ...842...83D]) – axial rotation?

- and many more periods…
HD 73045. PHOTOMETRY

Summary by Santosh Joshi:

- Photoelectric Photometry:
  - $P = 50$ min, 90 min (SAAO) → pulsation?
  - $P = 40$ min (ARIES) → pulsation?

- Ground based Differential CCD Photometry:
  - $P = 2$ hrs (ARIES, 1.3-m DFOT) → ?
  - $P = 4$ hrs (MASTER-II-URAL) → ?

- Space Photometry:
  - $P = 1.25$-days (STEREO, Paunzen et al. (2013) → rotation?
  - $P = 13.01$-days (Kepler, Rebull et al. (2016) → rotation?
HD 73045. SPECTROSCOPY

- BTA. Several observations, one series. RV drift ($P \approx 4 \text{ hrs}$) caused by instrumental instabilities
MSS@BTA. Several observations, one series.
RV drift ($P \approx 4$ hrs) caused by instrumental instabilities
**HD 73045. SPECTROSCOPY**

- MSS@BTA. Several observations, one series. RV drift ($P \approx 4$ hrs) caused mostly by instrumental instabilities.

- HERMES. Several sets (?) Subrange 440 - 495 nm General mask for a A8p-type star
  
  \[ P/2 \approx 145 \text{ min} \]

  → The same period $P \approx 4$ hrs?

  If $P_{\text{rot}} = 13$ days: $R \geq 2.5 \, R_\odot$ (evolved star?)

- A lot to do in the future
Thank you for your attention!

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RSF grant 14-50-00043