Observations of V440 Per and αUMi with Poznan Spectroscopic Telescope

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Introduction

Operational since Aug 2007, Poznan Spectroscopic Telescope (PST) is dedicated for spectroscopic observations of binary and pulsating stars. Placed in Borowiec Observatory, near Poznan, Poland, PST is a binary telescope. Initially it was equipped with two 0.4-m parabolic mirrors, currently being replaced with 0.5-m ones. PST is equipped with a middle-resolution (R=35000) fibre-fed echelle spectrograph, based on the MUSICOS construction design. Spectra images are taken with a high-quality low-noise 2k x 2k ANDOR CCD.

Spectroscopic data reduction is performed with IRAF package, as well as Python and cl scripts, developed by our team members. We also use Period04 and TATRY software for periodicity analysis.

Presented below are preliminary results of PST spectroscopy of two classical Cepheids: V440 Per and alp UMi (Polaris).

V440 Per

It is a bright (6.3 mag) classical Cepheid of F7 Ib type. Its main pulsation period is 7.57 d. Over 150 useable V440 Per spectra have been taken since Aug 2007, with typical exposure times of 600-900s. PST data are presented in Fig. 1.

A low amplitude (~90 m/s) second harmonic of V440 Per pulsations has been detected in PST data. If confirmed, that would make V440 Per an overtone Cepheid of the longest period known. Analysis of the data is being carried out in cooperation with P. Moskalik (Nicolaus Copernicus Astronomical Center in Warsaw, Poland).

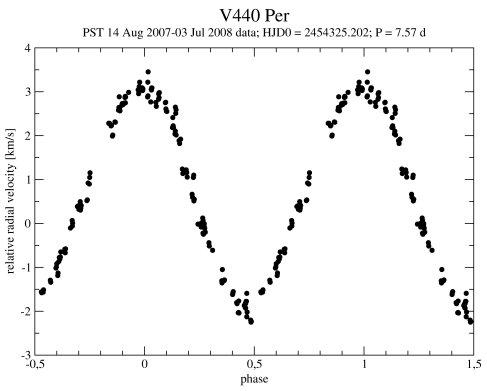

Figure 1. Borowiec radial velocity measurements for V440 Per.

αUMi (Polaris)

PST's construction allows easy observations of this bright classical Cepheid in a multiple system. Polaris has been scheduled for observations with PST at the end of 2007. 330 spectra have been taken over 7 months (Dec 2007 - Jul 2008), out of which 190 have been analysed so far. Typical exposure times were 150s, resulting in S/N of 30-70 (depending on the weather).

Spectroscopic observations of αUMi over the last century (Fig. 2) indicated a growing pulsation period. The amplitude, however, seemed to decrease until 1990's (Fig. 2). This trend suggested that Polaris' pulsations might cease in the future and the star would leave the instability strip.

Preliminary analysis of alp UMi radial velocity data revealed a pulsation period slightly longer than expected (3.978±0.002 days). 2K amplitude of the pulsations was 2.52±0.03 km/s. The influence of orbital motion on the Polaris pulsation period has not been taken into account, as the analysed dataset only covers 4 months of observations (~1% of the orbital period). Although secondary pulsation periods have been reported by other authors, none of them has been confirmed by our data. These results are consistent with recent works by Lee et al. (2008) and Spreckley & Stevens (2008), which provide observational proof of the pulsational period and amplitude growth in 2004-2007.

Further observations are planned on PST for both V440 Per and Polaris.

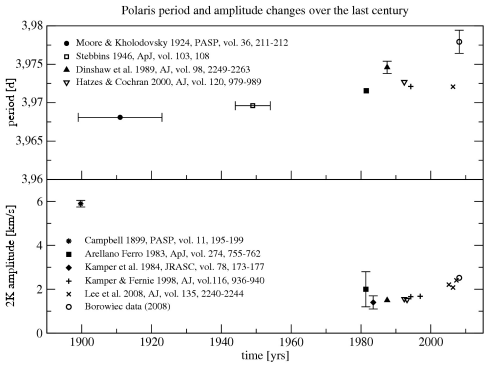

Figure 2. Changes in the period and amplitude of αUMi pulsations over the last century. Lack of error bars means either the errors are less than the size of a mark, or have not been given by the authors.

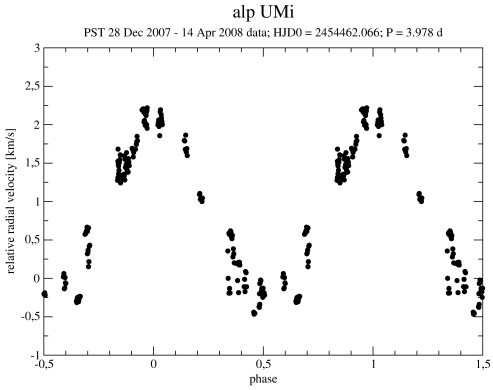

Figure 3. Borowiec radial velocity measurements for Polaris.

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