Long-term variations superimposed on the dominant short-period changes in brightness can be found in many light curves of variable stars. These long-term variations can be periodic or non-periodic, regular, semi-regular or completely irregular, including variations in the amplitude or in the period of the short-term component. Determination and removal of the short-term component is crucial if we are interested in the study of the long-term variations. Such variations can be caused by orbital motion, stellar pulsations and resonances, dust obscuration, or by some other mechanism. Symbiotic Miras are a perfect example of such behaviour, where short-term periodic brightness variations due to the pulsations are superimposed on long-term non-periodic changes caused by dust obscuration (Jurkić & Kotnik-Karuza 2012). Blazhko effect is another example of long-term variations in pulsational amplitudes found in dominant short-term changes in many RR Lyrae variables, and recently in two Cepheids. This effect is still poorly understood, and further research is needed.

**Methods**

**Analysis of light curves of variable stars usually demand use of methods such as Fourier analysis which can be time consuming and require substantial computing power. This is especially true if the shapes of periodic variations are highly asymmetric and can be represented only by a number of harmonics. Methods such as Fourier transforms show setbacks when both short and long period variations are present in the light curves. We propose Phase dispersion minimisation (PDM) method based on work of Lafler & Kinman (1965) and Stellingwerf (1978) as an efficient, very robust and precise method, suitable for analysis of both periodic short- and long-term brightness variations. Light curves can be corrected for short-term variations, leaving only long-term component for further study. Its main advantage is efficient removal of short-term periodic variations regardless of the shape of the light curve, and further analysis of any long-term variations. PDM reduces the number of free fitting parameters usually required by other techniques as the pulsation period is the only parameter to be determined.

The method is based on determination of the phase diagram by dividing the observational times into bins for a trial pulsation period. Observations falling in the same bin are grouped together and phase diagram is constructed. The trial period and number of bins which determine how the light curve is divided vary by the least scattering is achieved. The phase diagram can be also fitted to the Fourier polynomials and subtracted from the observed magnitudes in order to obtain O - C, i.e. the light curve corrected for the short-term variation. Other pulsational parameters such as pulsation amplitude and initial epoch for the light curve variations can be also determined.

Analysis based on discrete Fourier transforms (DFT) was used to verify and confirm the results of PDM method. For this purpose, we applied the publicly available program SigSpec (Reegen 2007) which computes a significance spectrum for a time series by evaluating analytically the Probability Density Function (PDF) of a given DFT amplitude level.

**Symbiotic Miras**

Symbiotic Miras are semi-detached binary systems consisting of a compact hot component such as white dwarf and of a cool AGB giant of a Mira-type. The presented light curves show the presence of short-term variations due to the Mira pulsations superimposed on long-term changes. These long-term variations have been explained by obscuration of dust formed around the Mira (Jurkic & Kotnik 2018). Long-term variations due to the Mira pulsations should be taken in order to study the long-term component. The corrected light curves clearly show different obscuration epochs caused by absorption in circumstellar and circum-dust. PDM also select periodic very long-term variations (~20-30 years). We have analysed light curves of 15 symbiotic Miras, including 5 symbiotic novae and two rare C-riffic symbiotic Miras, and detected such long-term variations in 9 of them that could be related to orbital motion of the dust shell or to the dust formation.

**Blazhko effect**

Modulations of amplitude and phase in the pulsations of RR Lyrae variables are known as Blazhko effect. This effect consists of a period of pulsational phenomena such as period doubling, resonances or chaotic behaviour. It is still poorly understood and remains one of the challenges in stellar astrophysics as RR Lyrae are important distance indicators. Detection of Blazhko effect is further complicated by its low amplitude, presence of both amplitude and phase modulation, and large differences between the periods of the short- and long-term (Blazhko) component which restricts the application of Fourier analysis. If data sampling is low, and seasonal and daily biases and gaps are present, the analysis is further complicated.

We have applied PDM method on a number of RR Lyrae with already detected Blazhko effect, and successfully confirmed the Blazhko period, including the most problematic HH Tel variable. ASAS observations were used in order to mimic the least favourable dataset expected to be provided by LSST observations that includes up to 900 observations during ~9 years, or cadence of ~4 days.

**Results**

We have shown that the method of Phase dispersion minimisation (PDM) can be successfully applied in detection and determination of the properties of long-term periodic variations in light curves of different types of both long and short period variables. PDM method is very efficient in order to obtain Blazhko period from ASAS observations only. Contrary to that, PDM method derived similar Blazhko period as the period obtained from SuperWASP survey. We have also analysed ASAS 160125-5100.3 Cepheid and derived Blazhko period of 1311.3 days which is longer than 1242 days reported by Benítez-Nelson (2017) who detected Blazhko effect for the first time in this Cepheid.

% References