Pi of the Sky catalogue of the variable stars from 2006-2007 data

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Catalogue of the variable stars (second edition)

1. We analysed "Pi of the Sky" data from the 2006-2007 period .
2. About 1.5 million stars with at least 200 data points was selected.
3. For these stars we use AoV algorithm to find period of the variability. We assume that star with statistic (Θ) less than 100 is non variable star.
4. By using this criteria we obtained a sample of 30 000 stars to further investigations For these stars we use scripts to reject false measurements or these with unacceptable large error.
5. Such "cleaned" light curves was analysed again to find any periodicity by using AoV algorithm.
6. We looked for periods in the range from 0.1 day to 50 days.
7. 21 000 with the Θ > 150 was verified and classified by the visual inspection.
8. Finally, a catalogue containing about 1 000 stars was prepared.

Procedure of the light curve cleaning

We flag measurements as false when:

- the stars brighter than 8 mag lies closer than 15 pixels form our star
- within the 20 pixels column do not lies any star brighter than 5 mag - elimination of open shutter effects
- star lies to close the Moon
- star lies closer than 200 pixels from the frame edge

AoV statistics

N observations are divided onto B bins each with j index

$$\Theta_{AoV} = \left| \frac{\Theta_{WR}}{\Theta_{PDM}} \right| = \frac{s_2^2}{s_1^2} = \frac{B-1}{N-B} \cdot \frac{\sum_{j=1}^{B} \sum_{i=1}^{n_j} (m_{ij} - \overline{m}_j)^2}{\sum_{j=1}^{B} (\overline{m}_j - \overline{m})^2}$$

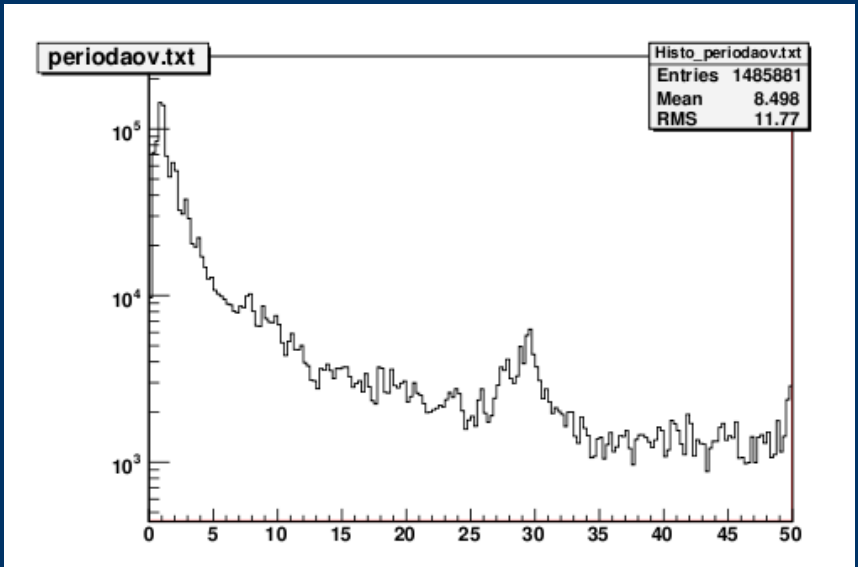
where:

$$\overline{m}_j = \frac{\sum_i m_{ij}}{n_j}$$

n_j - number of points in j-th bin

Θ_{AoV} statistic measure the probability that determined period is proper

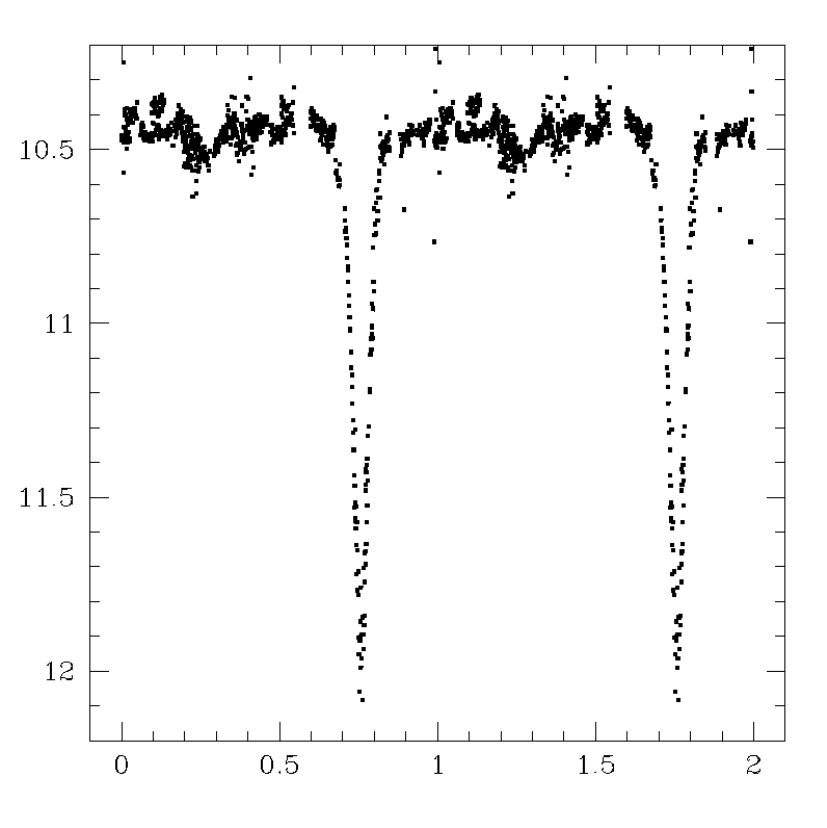
Histograms of determined periods



period around 1 day is an alias - this is not a period related with a star variability

Example of light curves

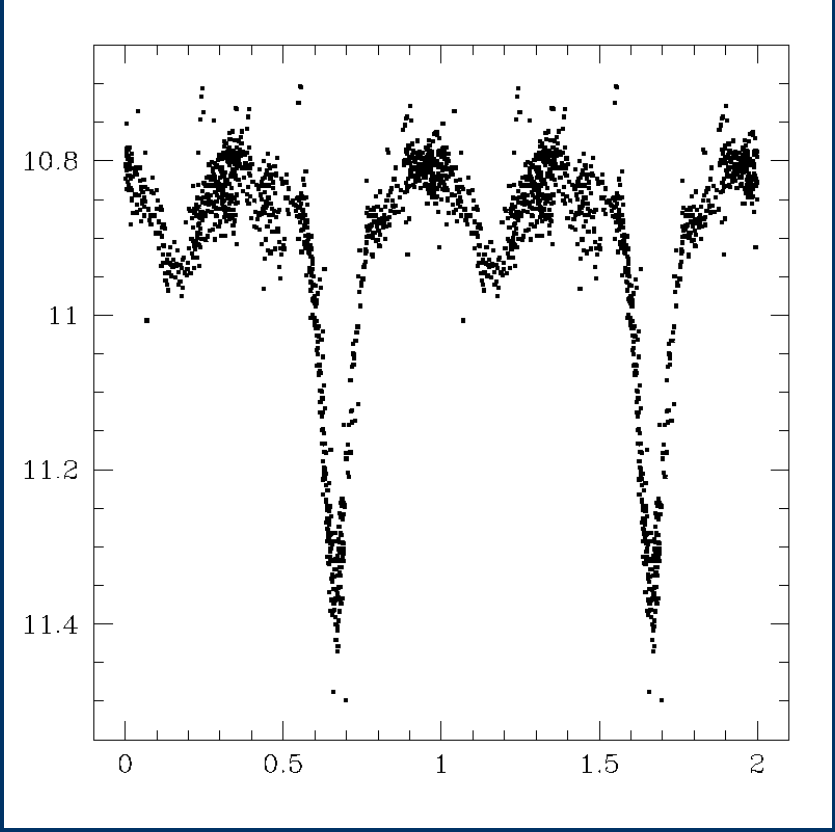
Algol type eclipsing binary



Binaries with spherical or slightly ellipsoidal components. It is possible to specify, for their light curves, the moments of the beginning and end of the eclipses. Between eclipses the light remains almost constant or varies insignificantly because of reflection effects, slight ellipsoidality of components, or physical variations. Secondary minima may be absent. An extremely wide range of periods is observed, from 0.2 to >= 10000 days. Light amplitudes are also quite different and may reach several magnitudes.

Example of light curves

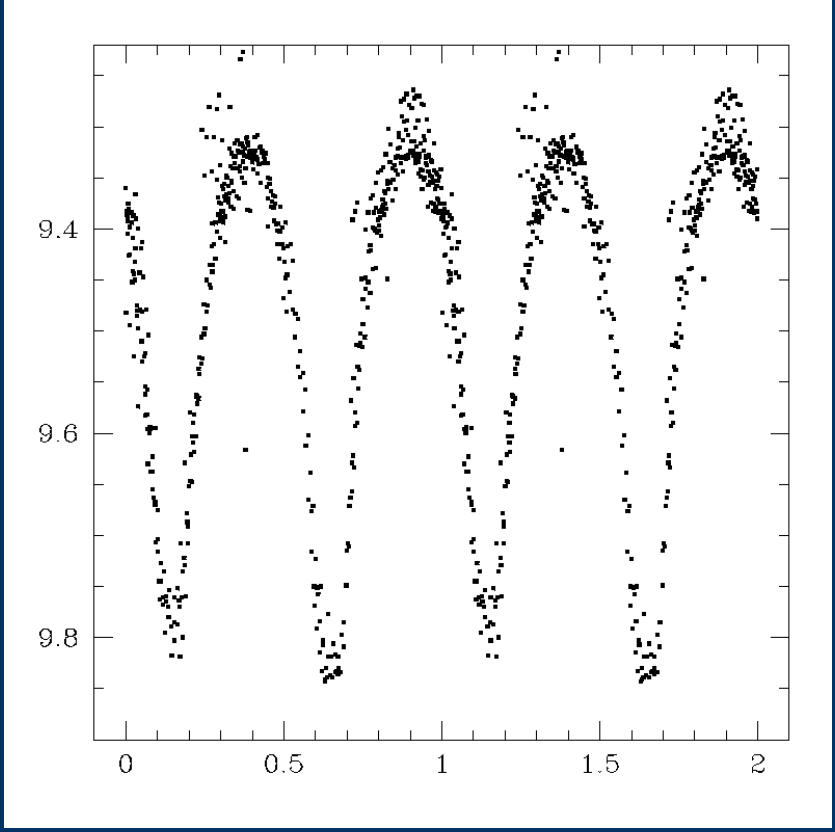
β Lyrae type eclipsing binary



These are eclipsing systems having ellipsoidal components and light curves for which it is impossible to specify the exact times of onset and end of eclipses because of a continuous change of a system's apparent combined brightness between eclipses; secondary minimum is observed in all cases, its depth usually being considerably smaller than that of the primary minimum; periods are mainly longer than 1 day. Light amplitudes are usually <2 mag in V.

Example of light curves

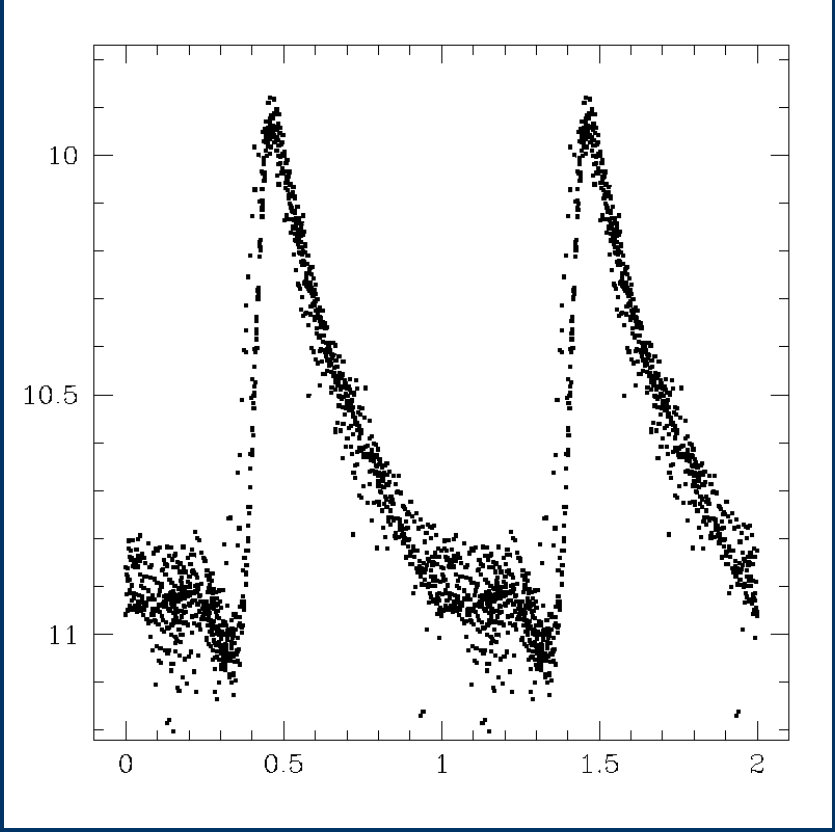
W UMa type eclipsing binary



These are eclipsers with periods shorter than 1 days, consisting of ellipsoidal components almost in contact and having light curves for which it is impossible to specify the exact times of onset and end of eclipses. The depths of the primary and secondary minima are almost equal or differ insignificantly. Light amplitudes are usually <0.8 mag in V.

Example of light curves

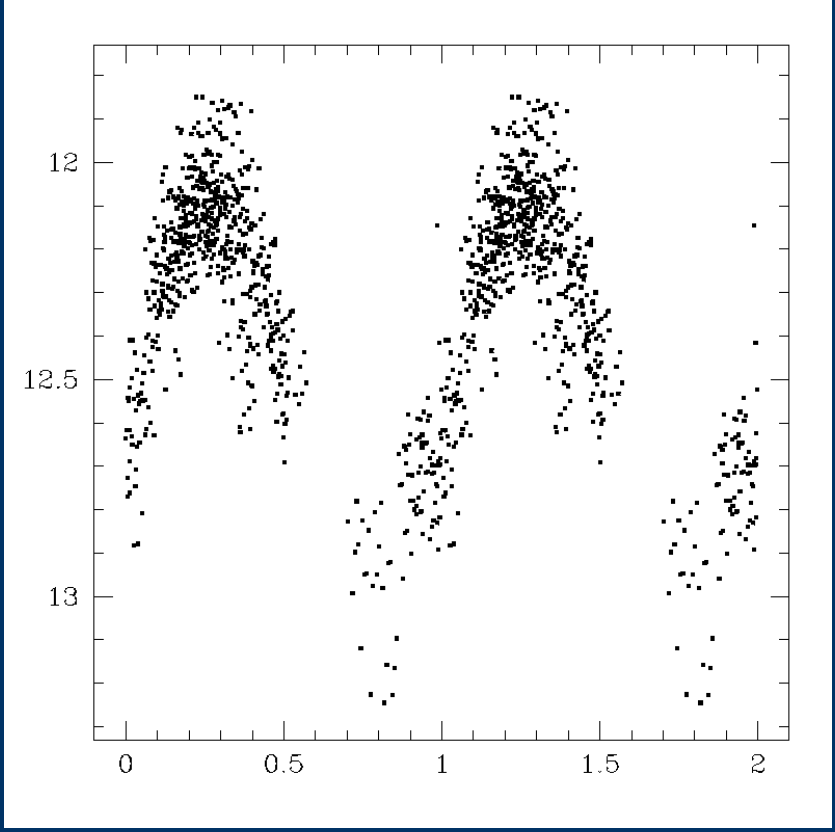
RR Lyrare pulsating star



RRAB - RR Lyrae variables with asymmetric light curves (steep ascending branches), periods from 0.3 to 1.2 days, and amplitudes from 0.5 to 2 mag in V.

Example of light curves

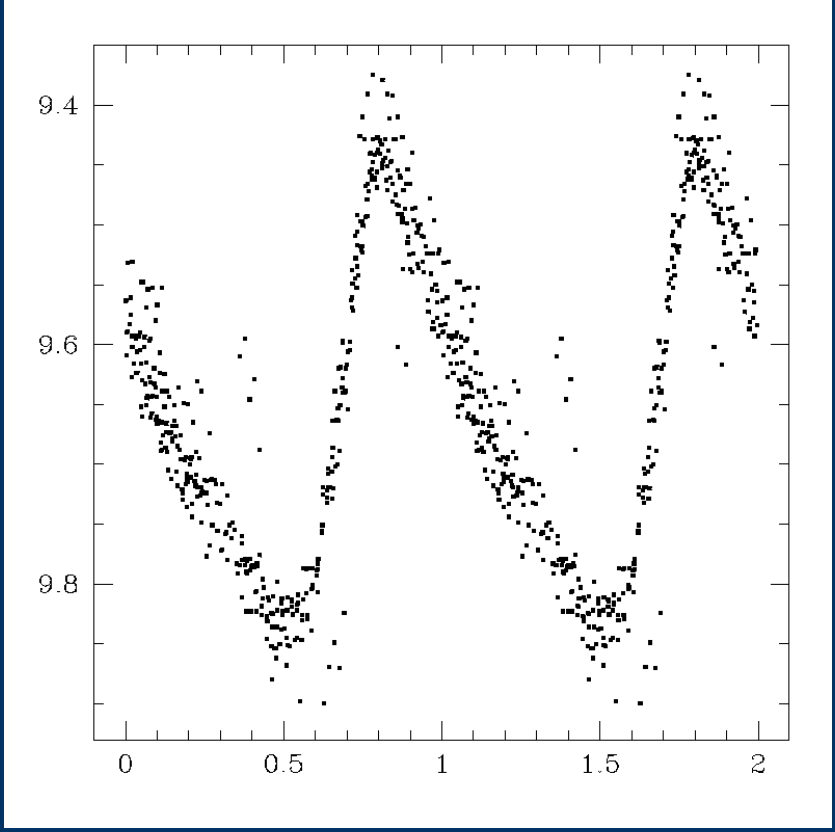
RR Lyrare pulsating star



RRC - RR Lyrae variables with nearly symmetric, sometimes sinusoidal, light curves, periods from 0.2 to 0.5 days, and amplitudes not greater than 0.8 mag in V (SX UMa).

Example of light curves

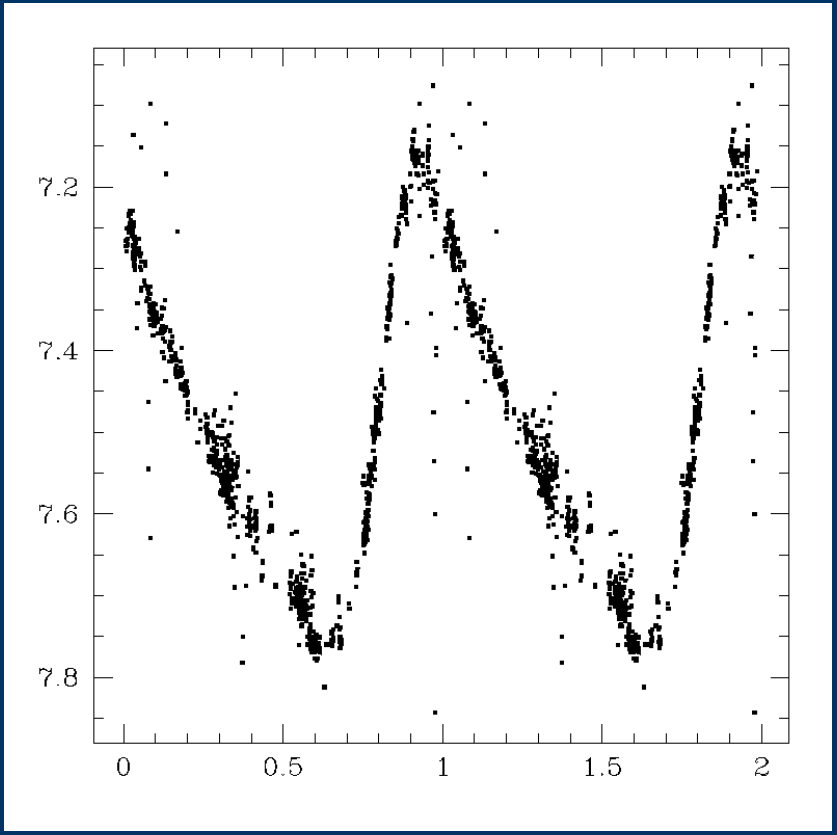
δ Scuti pulsating star



Light amplitudes are from 0.003 to 0.9 mag in V (usually several hundredths of a magnitude) and periods from 0.01 to 0.2 days. The shapes of the light curves, periods, and amplitudes usually vary greatly. Radial as well as nonradial pulsations are observed.

Example of light curves

δ Cephei pulsating star



These are Delta Cep variables having light amplitudes <0.5 mag in V (<0.7 mag in B) and almost symmetrical light curves as a rule. Their periods do not exceed 7 days. They are probably first-overtone pulsators and/or are in the first transition across the instability strip after leaving the main sequence (SU Cas).

Catalogue of the variable stars - summarising table

Type of the variability	Number of stars
EA	81
EB	59
EW	218
RRab	45
RRc	11
DSCT	39
CEP	14
DCEP	48

This is only a part of the catalogue with the most important and numerous types of variability

Summary

1. Catalogue containing 1011 stars of various variability types was prepared.

2. We use the same as GCVS catalogue classification criteria, differ from the ASAS catalogue.

3. The most numerous group of eclipsing binaries are W UMa type stars (218).

4. The most numerous group of pulsating stars are δ Cephei type stars (48) and RRab stars (45).

5. In our catalogue there is a very strong selection effect because of observational strategy and limiting magnitude (12 mag).

6. Because of above effects number of stars with different type of the variability differ significantly from these in both ASAS and GCVS catalogues.