Global characteristics of photometric light curves of mCP stars

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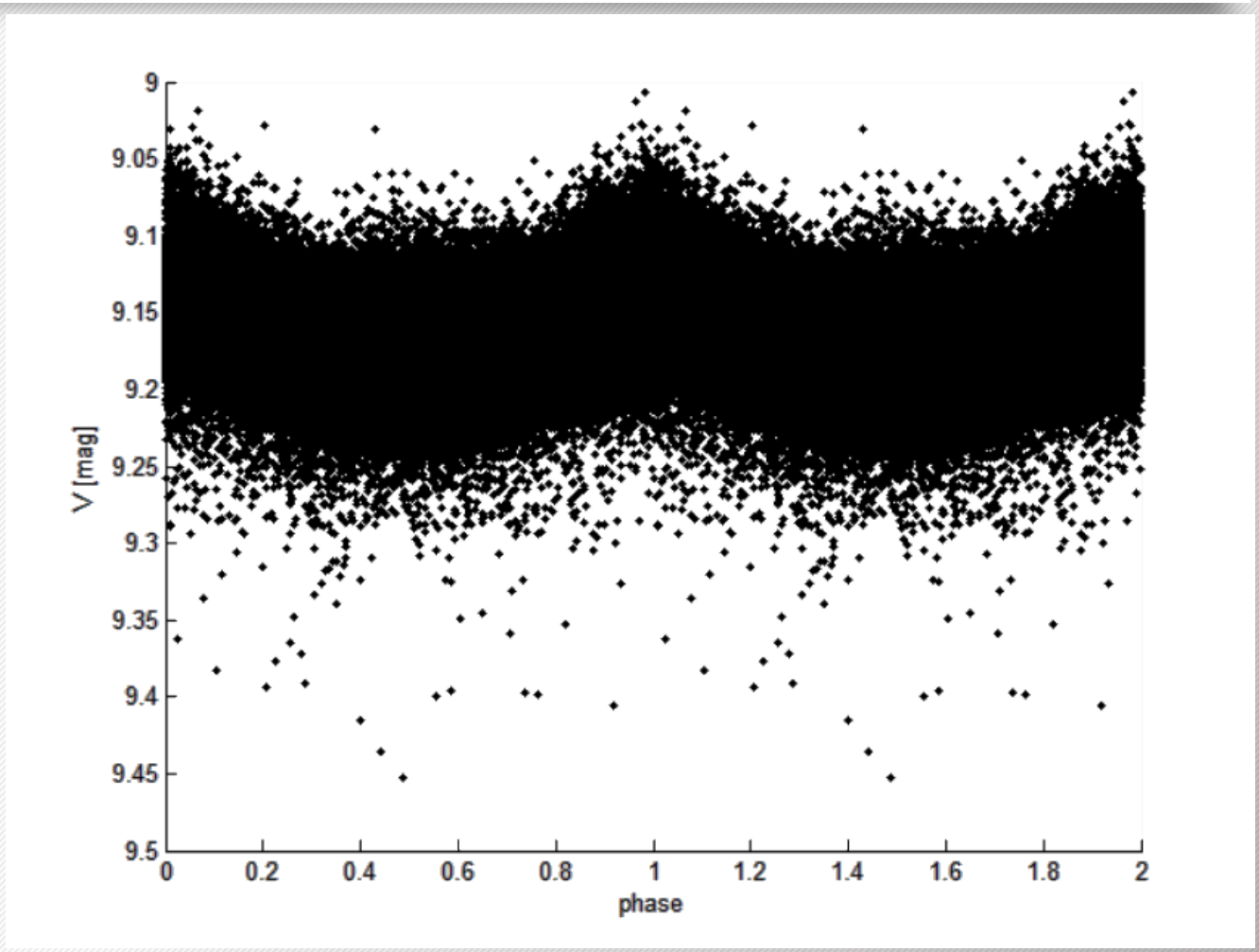
Next 15:00 minutes of your future

- Brief introdction to the the problematic of light curves of mCP stars
- Finding some special groups and characteristics
- How do the real light curves look like?
- How should the light curves look like?
- Comparison of real and expected results

What is a typical shape of light curve of mCP star?



More „scientific“ approach

- Model function:

$$F = F_0 + \boldsymbol{A_1}\cos 2\pi\phi + \boldsymbol{A_2}\cos 4\pi\phi + \frac{2}{\sqrt{5}}\boldsymbol{A_3}\left[\sin 2\pi\phi - \frac{1}{2}\sin 4\pi\phi\right]$$

$$\phi = \varphi - \varphi_0; \qquad \varphi = \mathrm{frac}\left(\frac{t - M_0}{P}\right)$$

$$\boldsymbol{A} = \sqrt{A_1^2 + A_2^2 + A_3^2}$$

- Condition for significance and symmetry:

$|A_i| > 3.5\,\delta A_i$ $\qquad$ $|A_3| < 3.5\,\delta A_3$

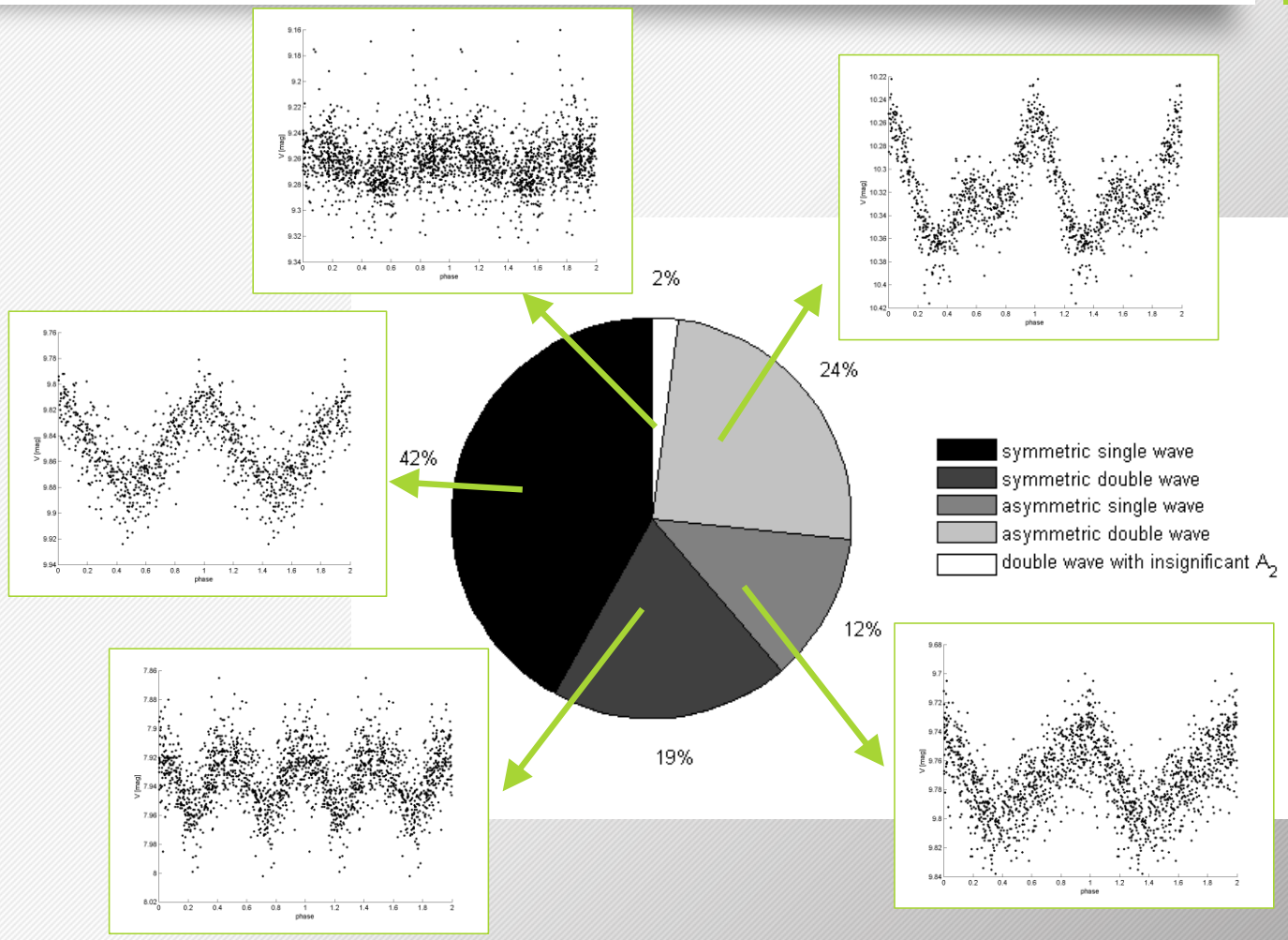
- Conditions for single and double wave:

$\left|\frac{A_1}{A_2}\right| > 4$ and A_1 is significant $\qquad$ $\left|\frac{A_1}{A_2}\right| < 4$ and A_2 is significant

- Conditions for identical minima:

$\left|\frac{A_2}{A_1}\right| > 10$ and A_2 is significant

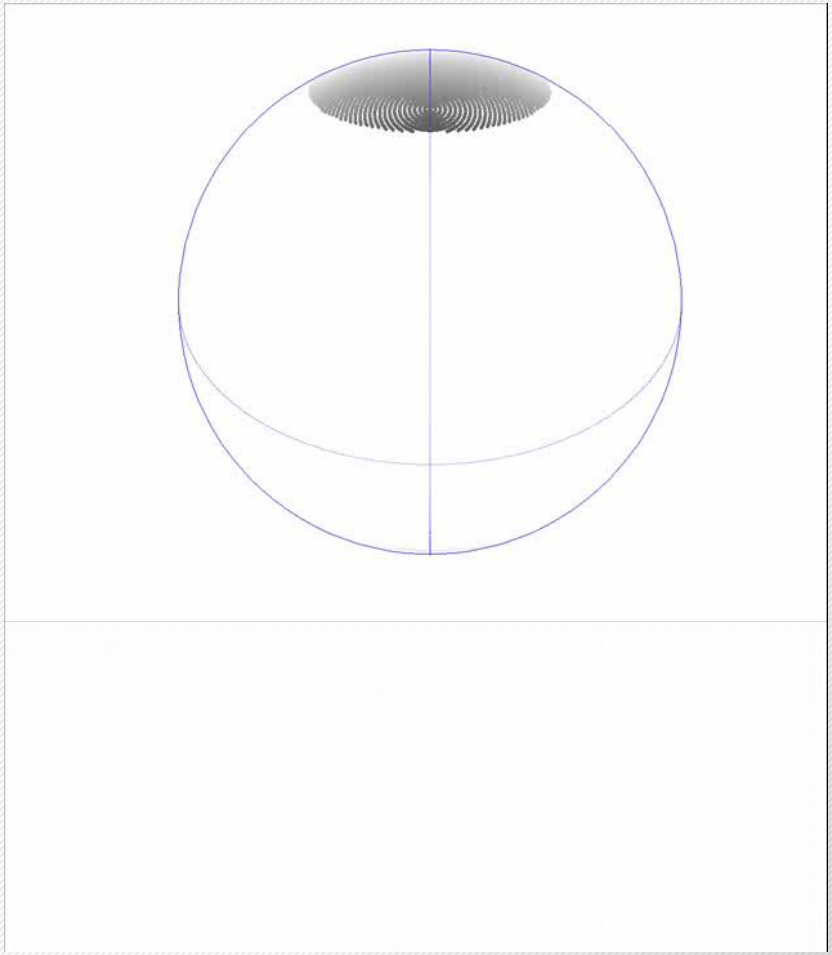
Types of light curves

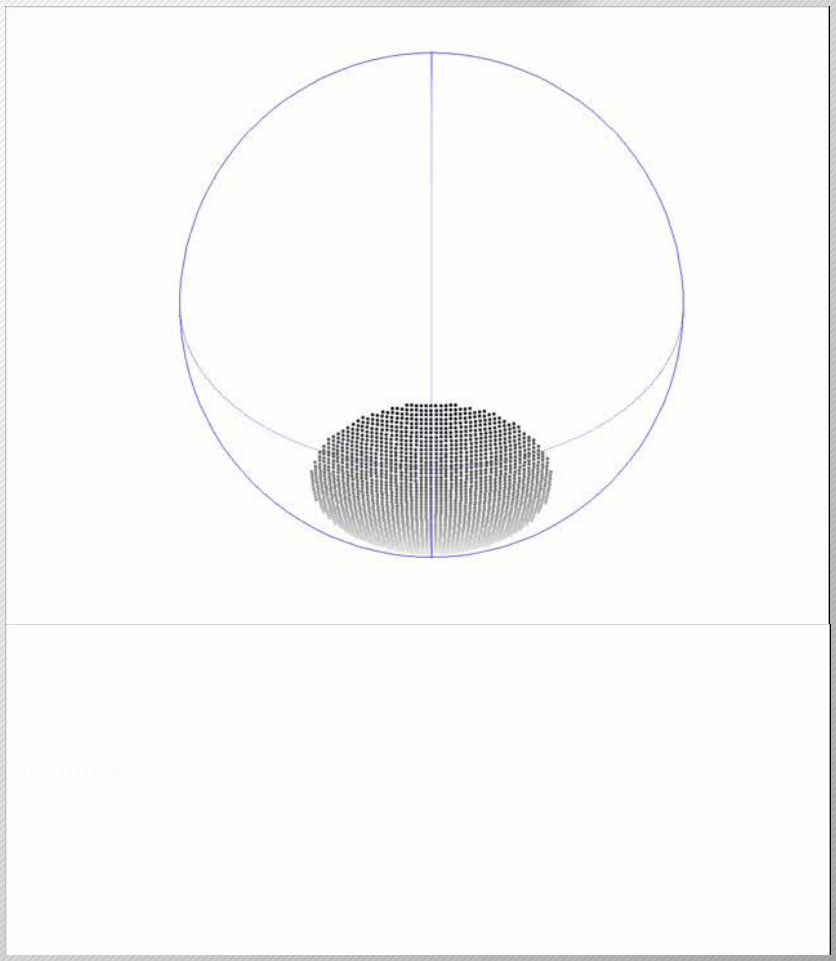


Results from observations

- 54 % of all light curves are single-waved and 44 % are double-waved
- 37 % of all light curves are asymmetric
- amongst symmetric light curves single waves prevail (68 %)
- only 2 % of light curves satisfy the condition for identical minima

Reconstructing the egg from the chicken



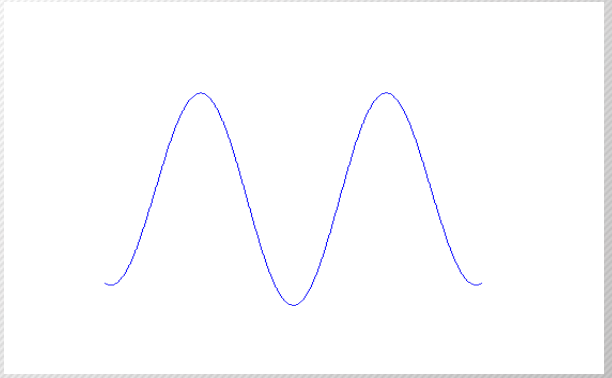


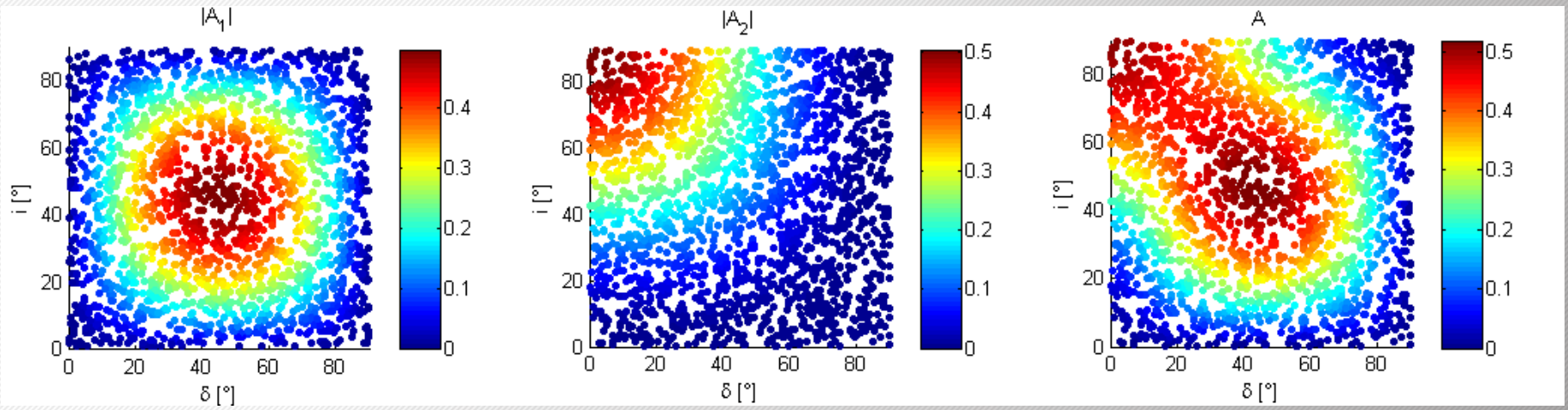
Results from simulations

- 1000 simulations with random parameters (inclination of rotational and magnetic axis)
- circular homogeneous spots with angular radii α and „darkness“ η located on opposite sides
- results:
  - $\alpha = 40^\circ$; $\eta = 1$; → 55 % DW
  - $\alpha = 17^\circ$; $\eta = 1$; → 49 % DW
  - $\alpha = 40^\circ$; $\eta_1 = 1$; $\eta_2 = \mathrm{rand}(0,1)$; → 52 % DW

Didn’t we forget something?

- Are the ASAS periods correct?
  - only 5 % of light curves satisfy the condition for identical minima
- Are all cases equally possible to be observed?





Results from simulations

- 1000 simulations with random parameters (inclination of rotational and magnetic axis)
- circular homogeneous spots with angular radii α and „darkness“ η located on opposite sides
- results:
  - $\alpha = 40^\circ$; $\eta = 1$; → 55 % DW up to 71 % DW
  - ~~$\alpha = 17^\circ$; $\eta = 1$; → 49 % DW up to 67 % DW~~
  - $\alpha = 40^\circ$; $\eta_1 = 1$; $\eta_2 = \text{rand}(0,1)$; → 52 % DW up to 65 % DW

≈ 60 % DW

Conclusions

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