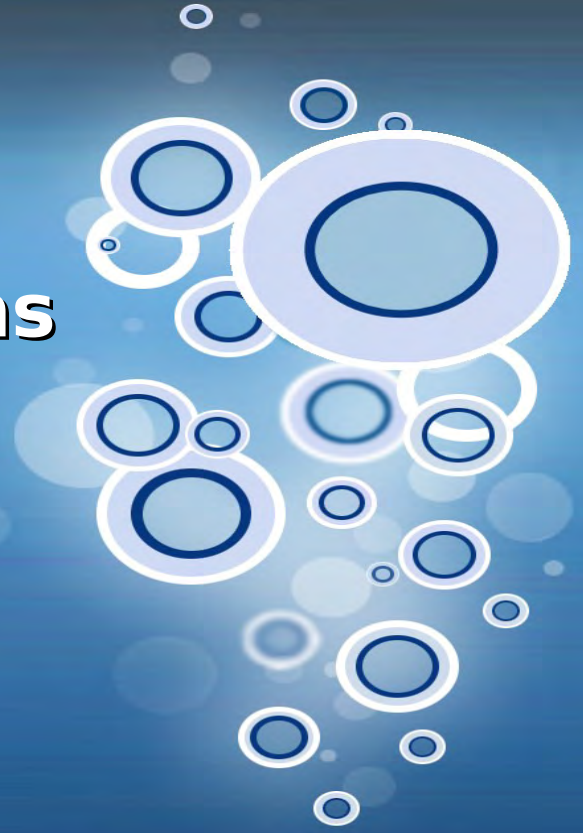


**Spotted eclipsing binary  
KIC 7023917 with  $\delta$ -Scuti pulsations**

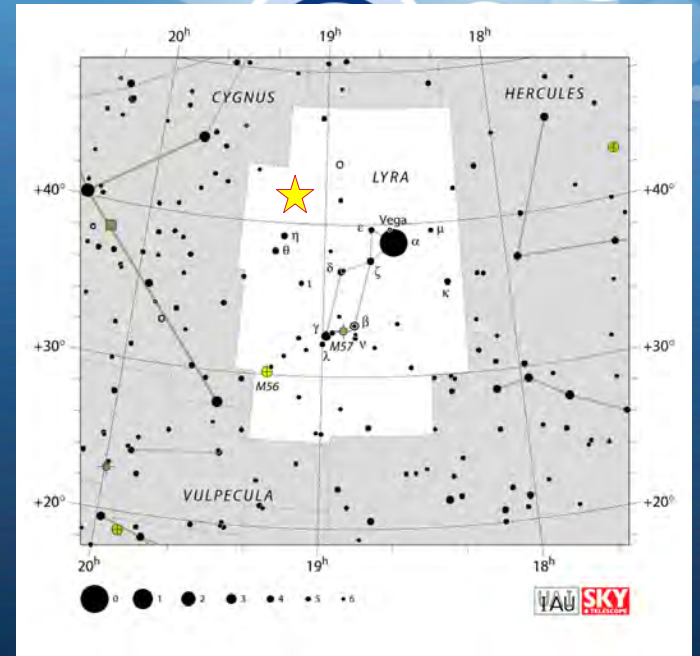
**Pavol Gajdoš  
Štefan Parimucha**

**Institute of Physics, Faculty of Science  
Pavol Jozef Šafárik University in Košice**



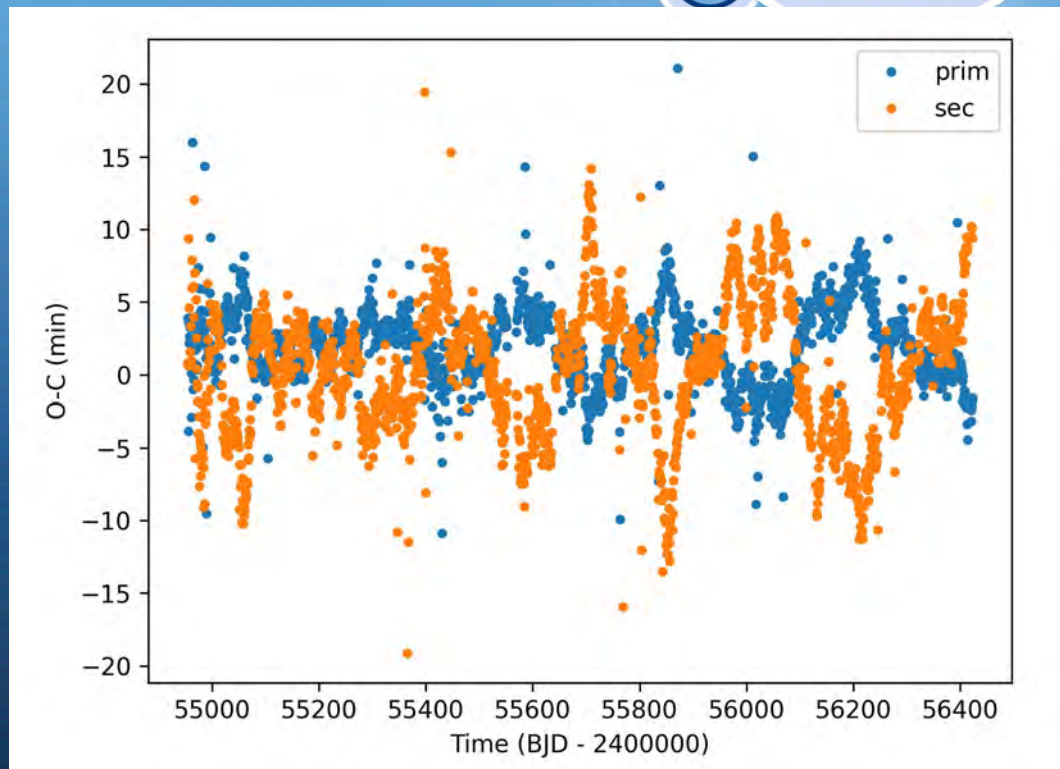
# Eclipsing binary KIC 7023917

Magnitude	10.1 V
Parallax	2.337 mas
Distance	~ 428 pc
Orbital period	0.7728 day (18.5 h)
Temperature (primary)	7460 K
Spec. type (primary)	A7 III



# O-C diagram

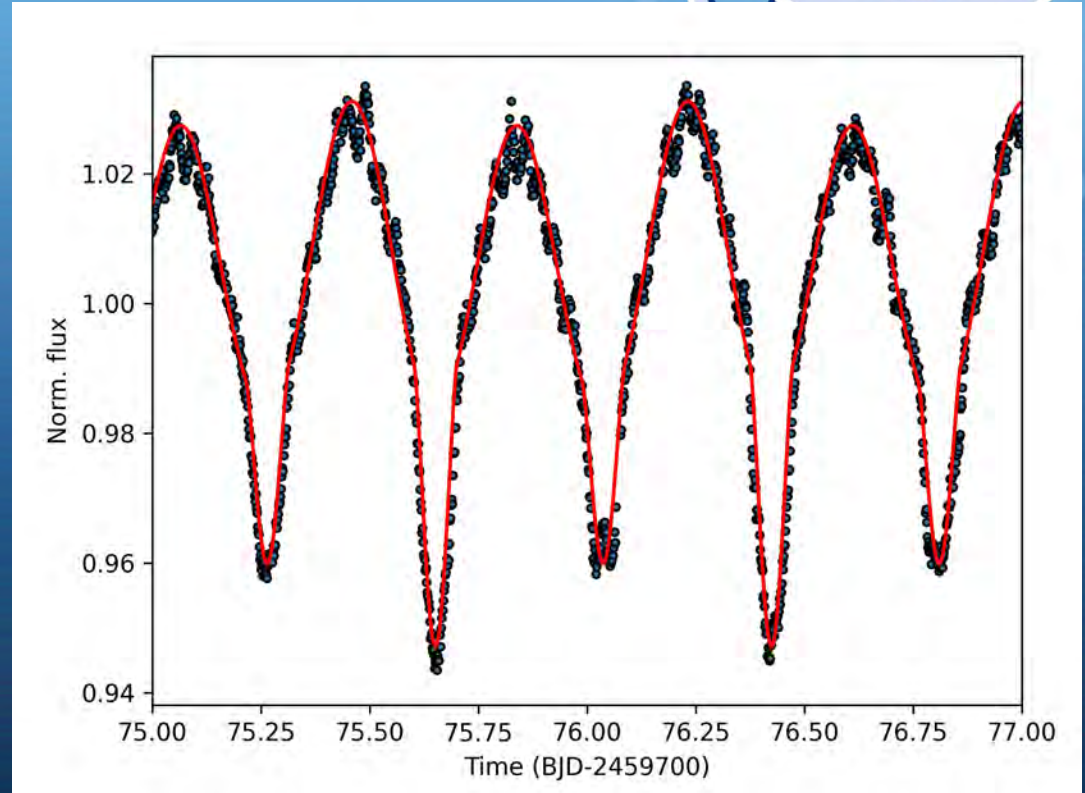
- Kepler long-cadence data
- anti-correlated changes – apsidal motion?
- amplitude ~5 minutes
- period 200-300 days (very fast for AM)
- additional effects...





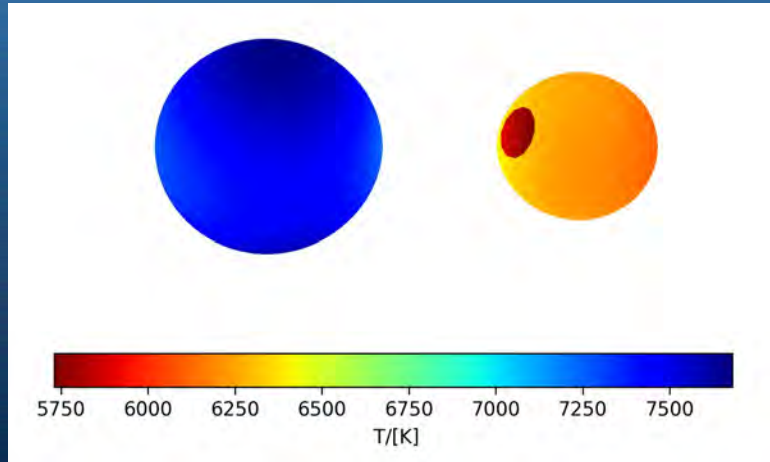
# Light-curve analysis

- TESS – sectors 14, 40, 41 and 54; 2-min. cadence
- evidence of spots
- short-period pulsations
- Kepler – only spots

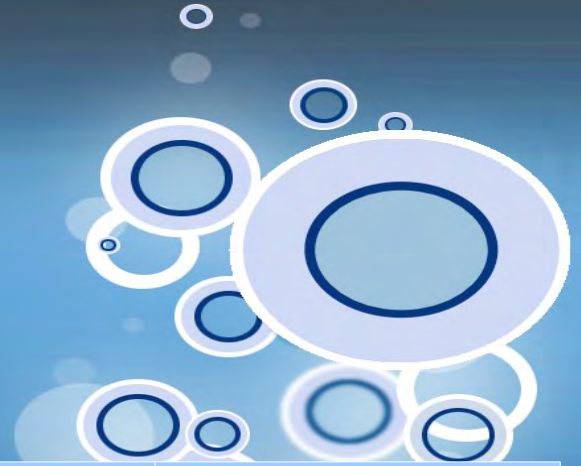


# Model of Eclipsing Binary

- used software ELISa
- assumed one cold spot on secondary component
- second spot?

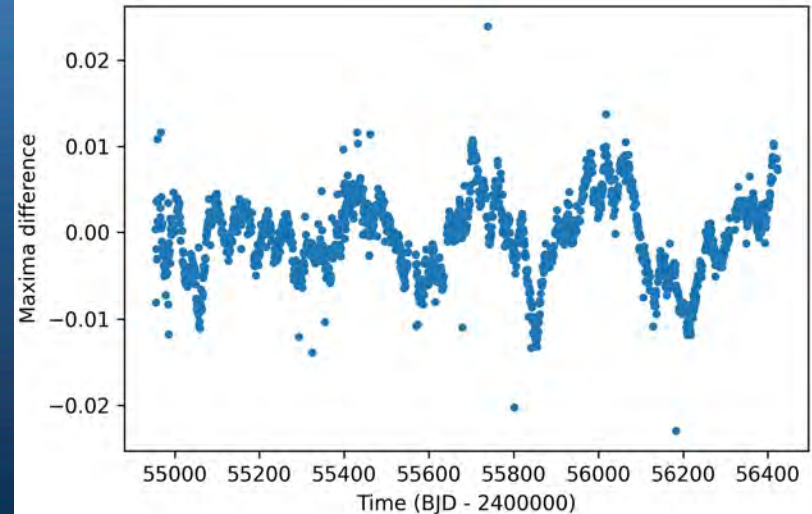
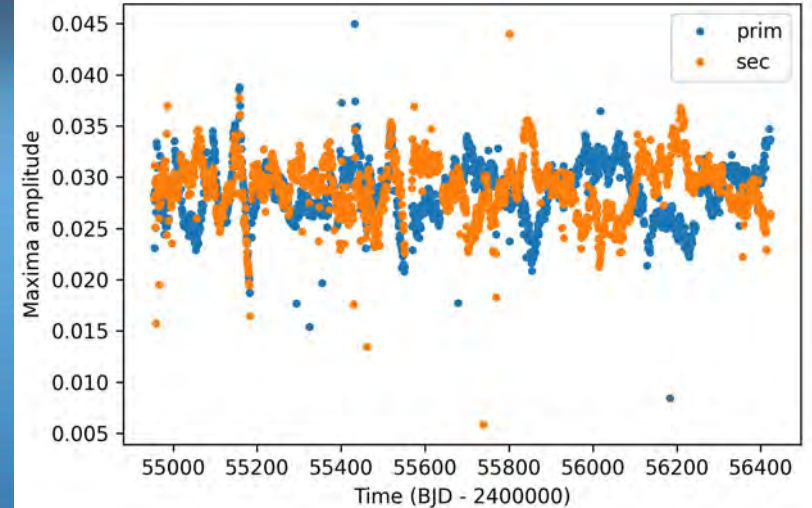


Temperature (primary)	7460 K (fixed)
Temperature (second.)	6500 K
Spec. type (primary)	A7 III
Spec. type (second.)	F6 - F7
Mass ratio	0.45
Inclination	60°
Spot radius	~20°



# O'Connell effect

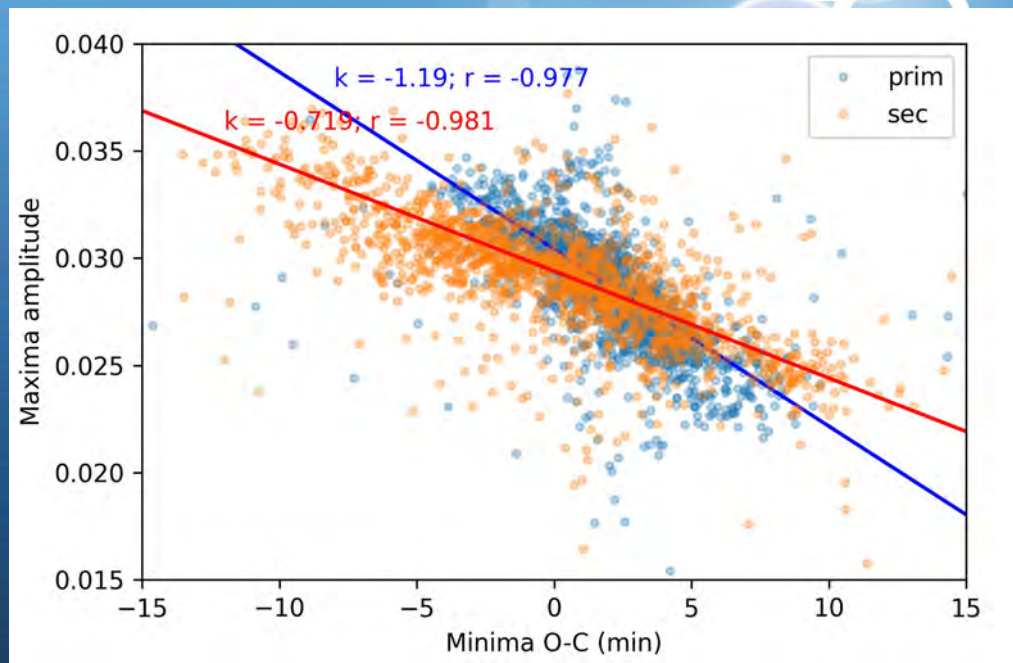
- different heights of maxima
- result of stellar spot(s)
- analyzed mainly Kepler data
- similar curves to O-C diagram





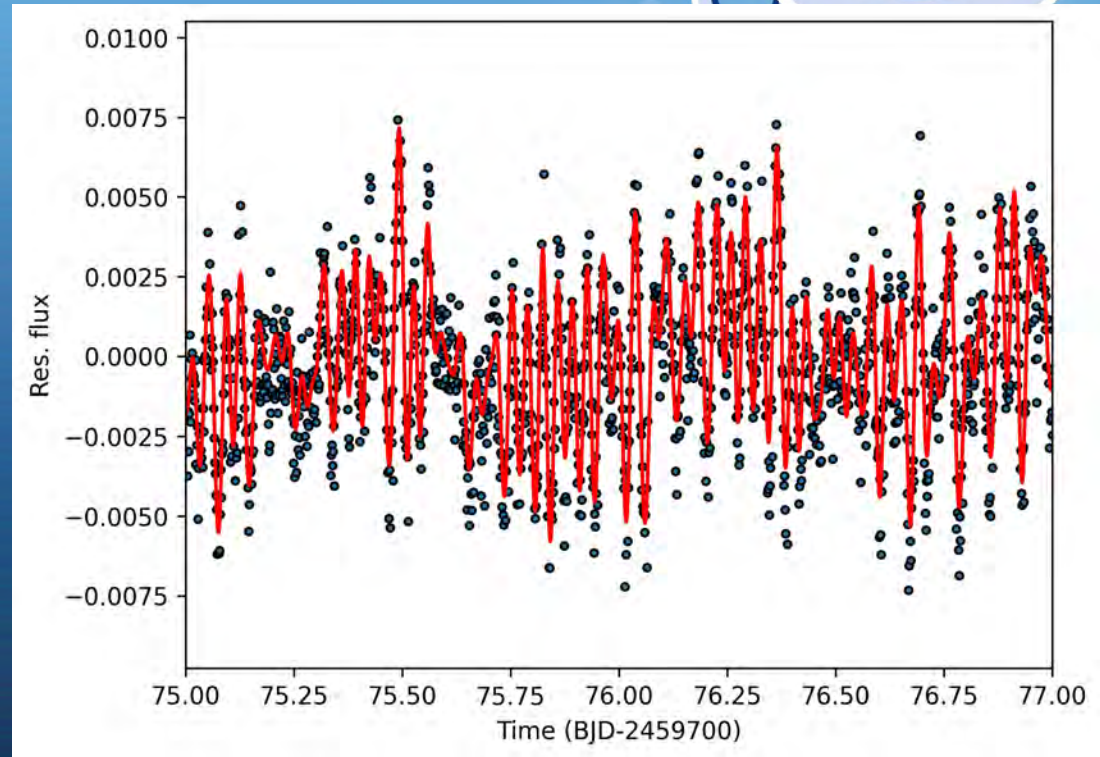
# O'Connell & O-Cs

- strong correlation between heights of maxima and O-C (~98%)
- anti-correlated
- same reasons for both
- deformation of LC
- effects of stellar spots?



# Residual light curve

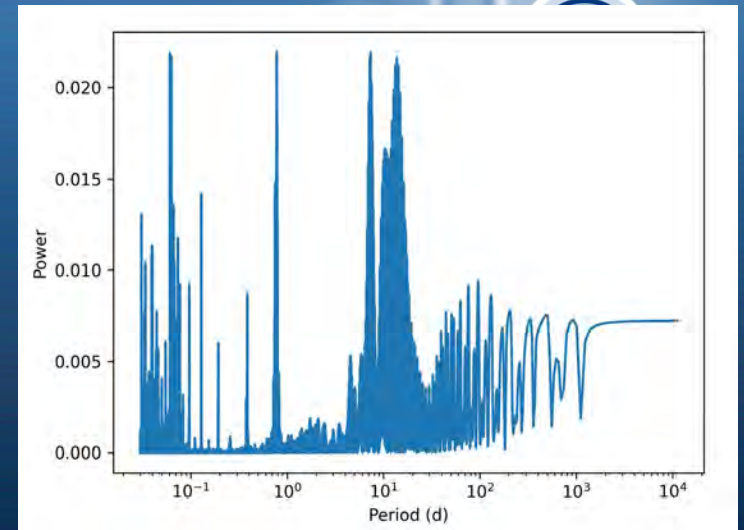
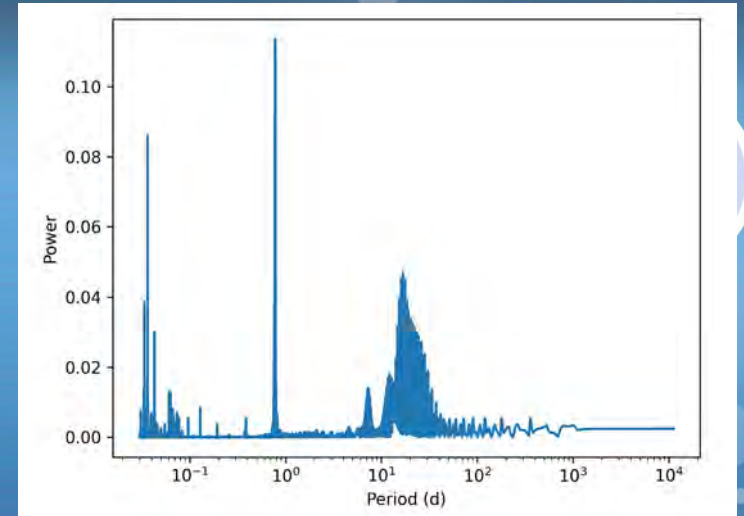
- TESS LC – short-periodic signal in residuals
- amplitude few mmag
- period ~50 minutes
- not visible in Kepler data – very short period





# Pulsations

- period analysis of residuals (GLS)
- multiple frequencies
- orbital period bias, long periods (TESS?)
- ~50-100 minutes –  $\delta$  Scuti
- further analysis... – pulsat. modes, changes over time



# Conclusions

- short-period eclipsing binary KIC 7023917
- significant changes on O-C diagram
- O'Connell effect on light-curve
- stellar spot(s) – deformation of LC – O-C & O'Connell
- strong pulsations – probably  $\delta$ -Scuti
- research still in progress...
- multi-color photometry and spectroscopy – very helpful

