Rocky Planets Around Cool Stars

A Marie Curie Initial Training Network

WTS Transits using difference imaging

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Outline

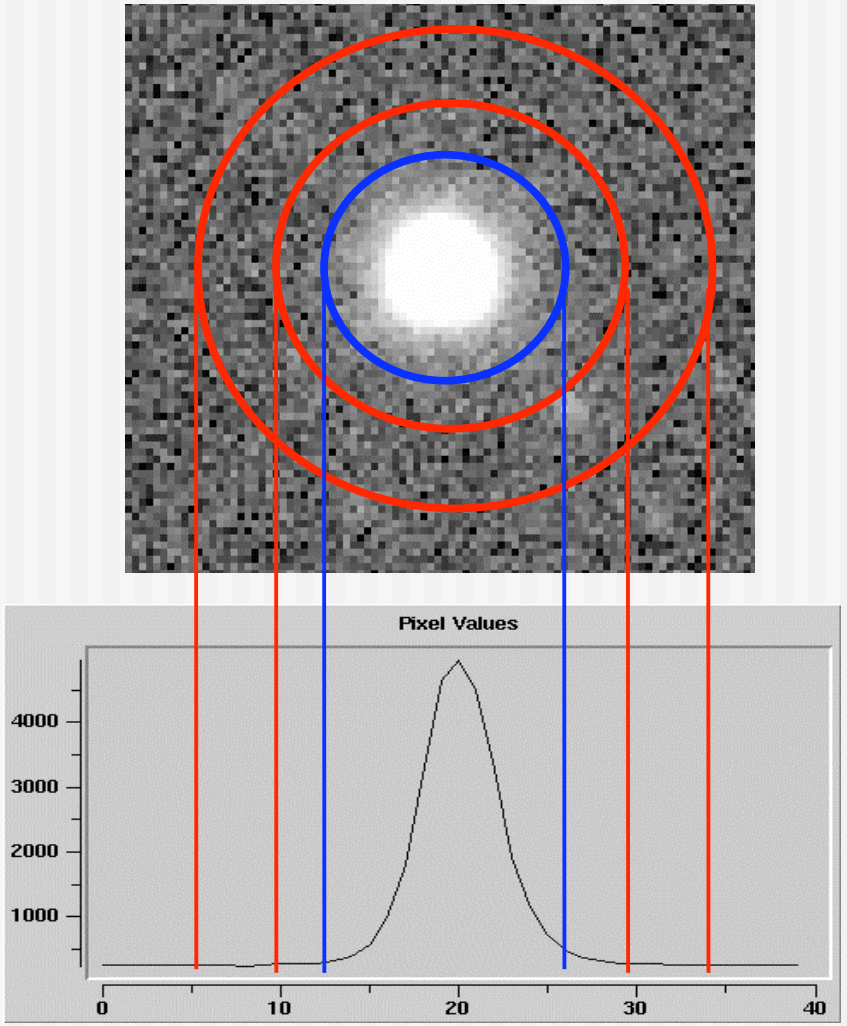
- Introduction
  - Early Training
- Difference Imaging analysis
  - First results
- Conclusions

Aperture photometry

$$N_{ph} = N_{ph} - N_{pix} * \text{median(sky)}$$

Advantages: simple & fast
extended objects
under sampled PSF

Disadvantages: bad/saturated pixel
seeing dependent
crowded fields



Early Training…..

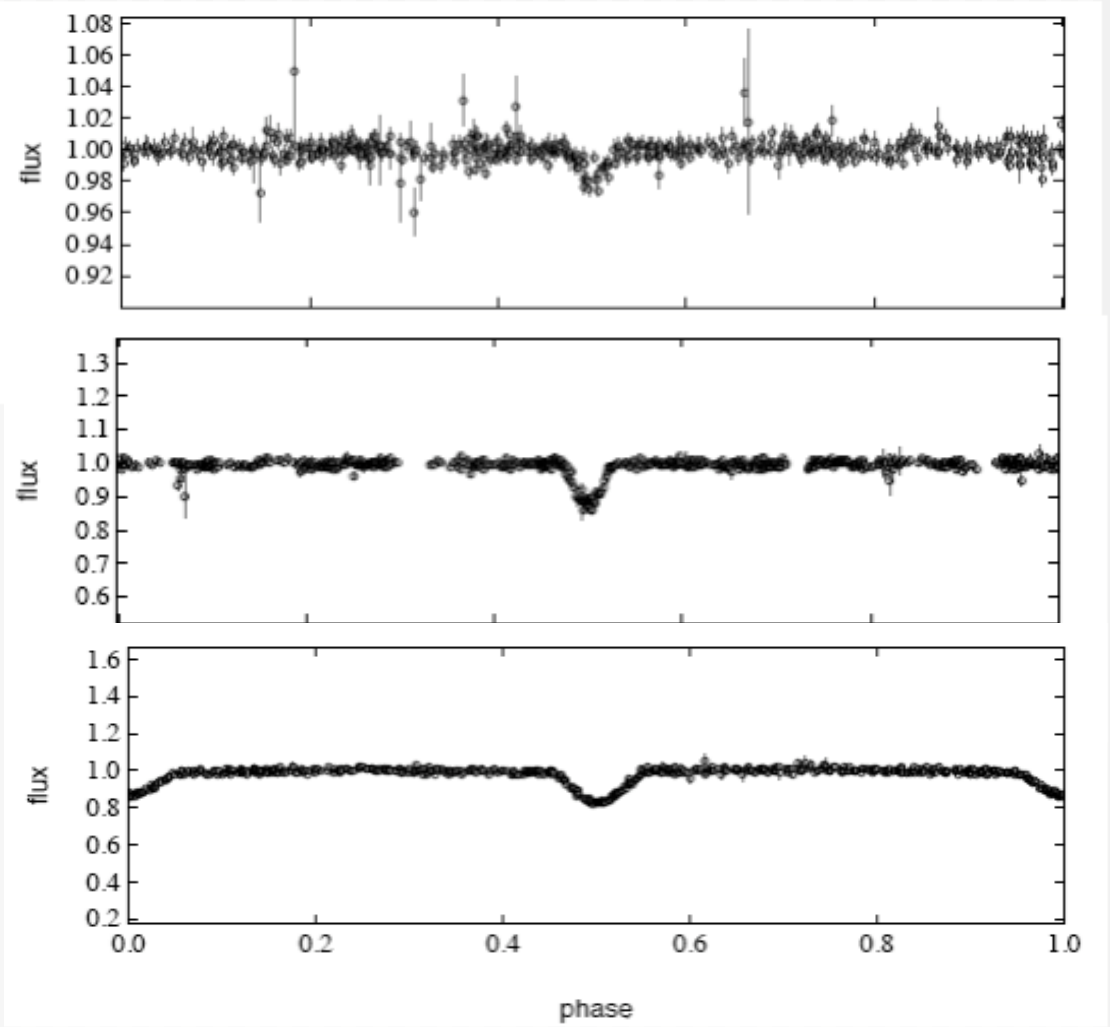
WTS Release 1.0-19hrs field -
Light curves based on aperture photometry

- 8 paw prints, totaling ~500 000 light curves
- Task: learn how to select candidate transits and EBs by:
- Running the Box-fitting Algorithm (Kovács et al. 2002)
- Examining the resulting ~20000 light curves by eye

Results:

- 55 candidates & EBs, J_mag[12.21-17.71]
- of which 29 new ones not found in the ‘official’ release

Candidates



High priority
(1% drop)

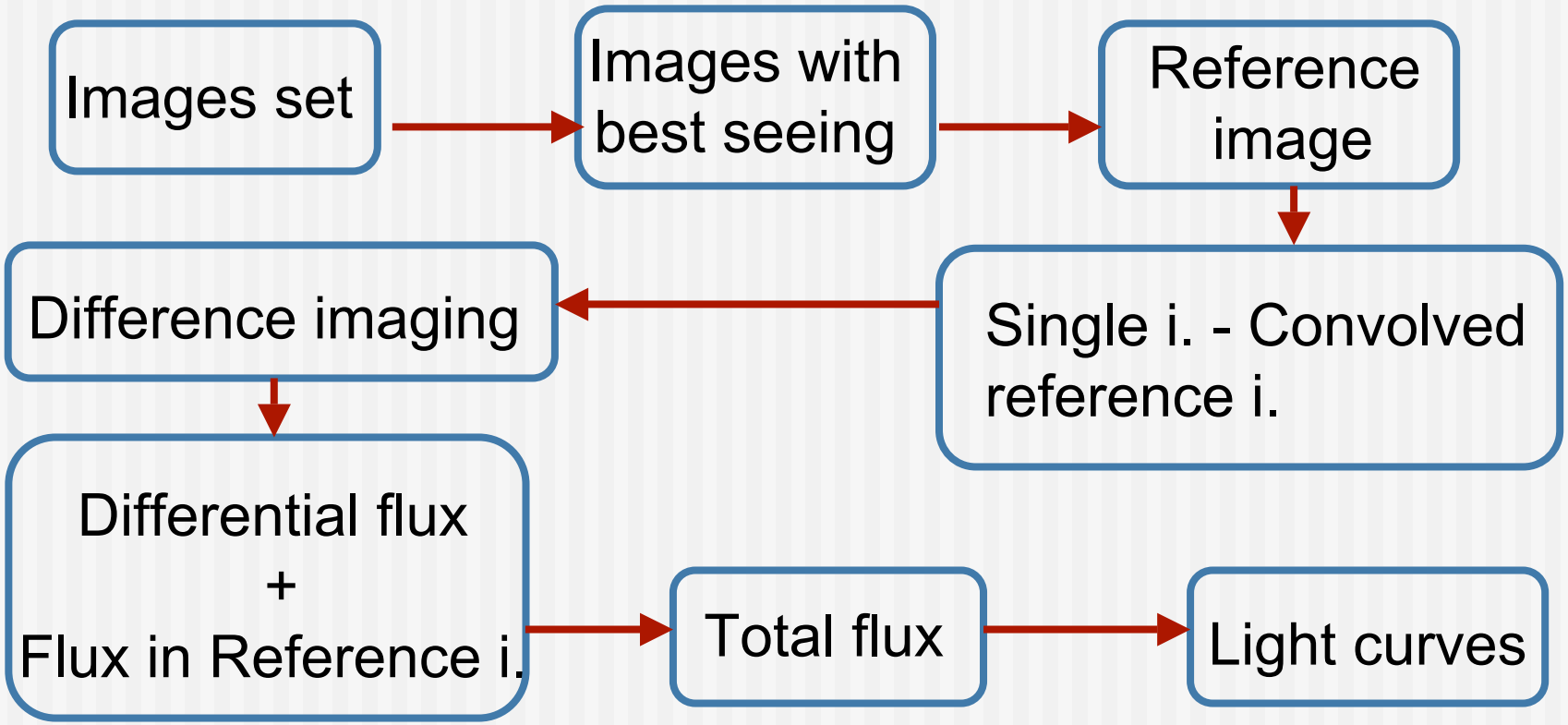
Low priority
(10% drop)

EBs

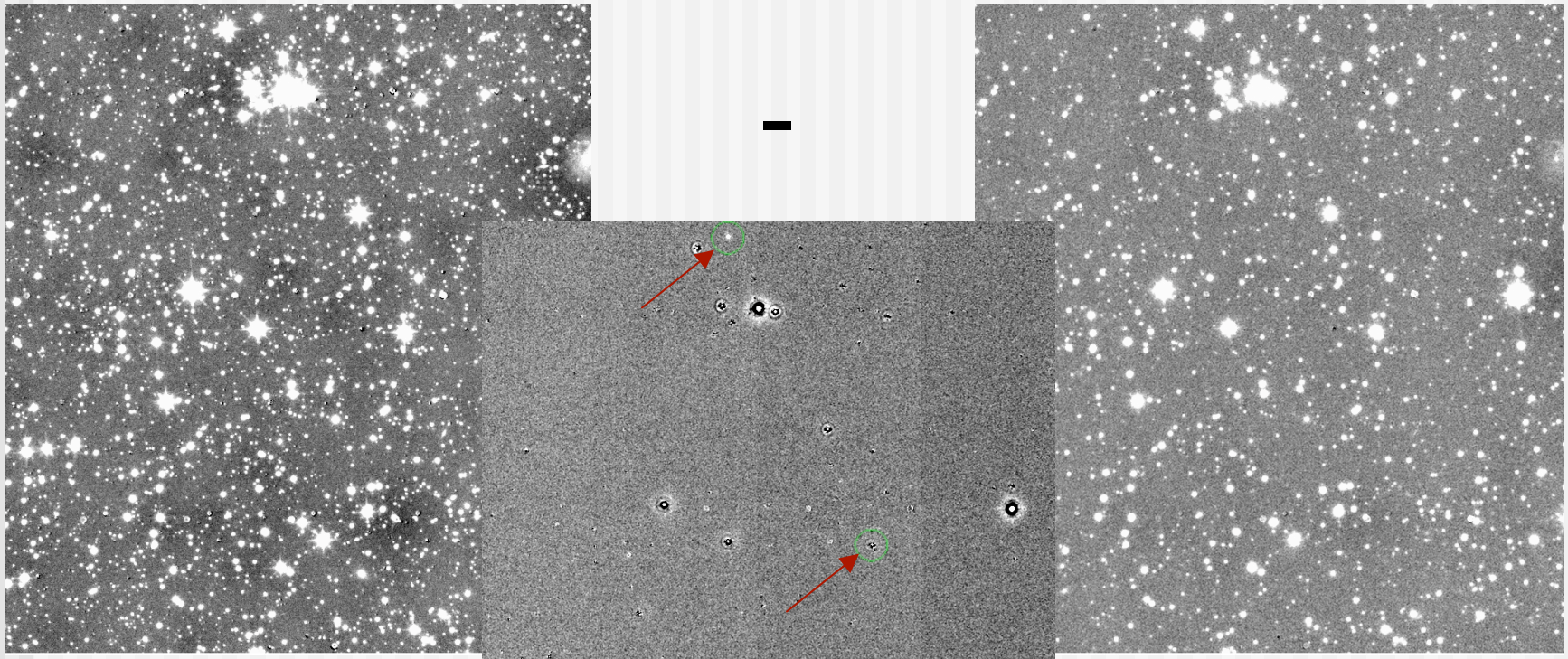
Light curves extraction by Difference Imaging

Difference Imaging Analysis

This technique represents one of the most successful method used for the creation of high precision light curves in crowded fields (Tomaney & Crotts 1996 and Alard & Lupton 1998).



Difference imaging



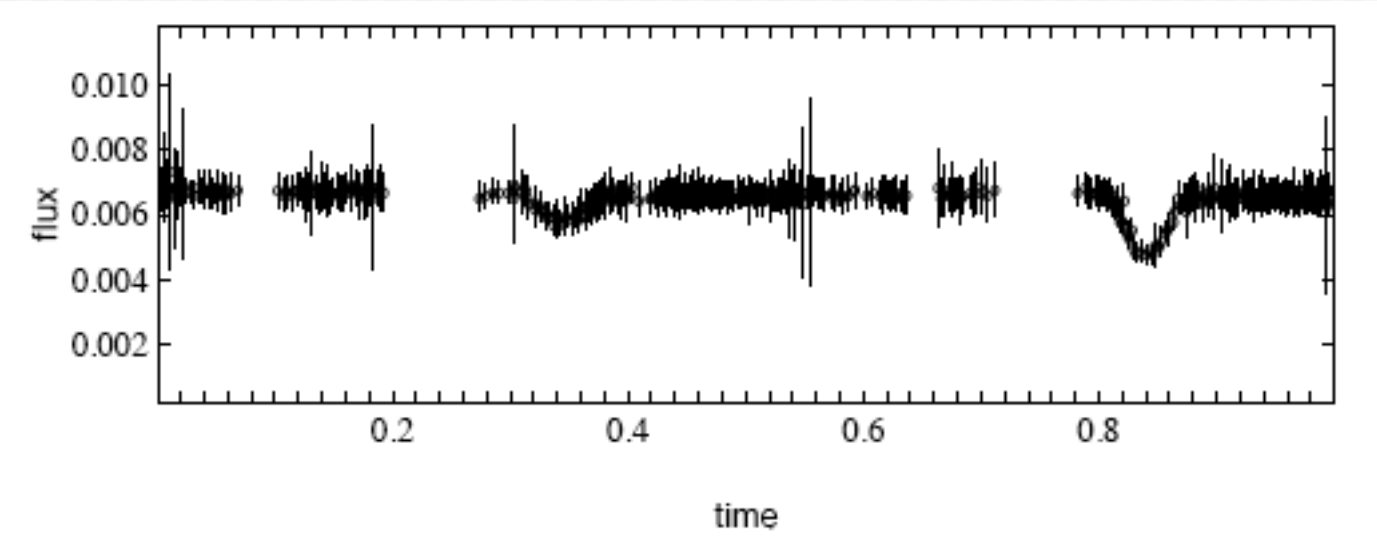
Single Image

Reference imaging

Convolved reference image

Early results……

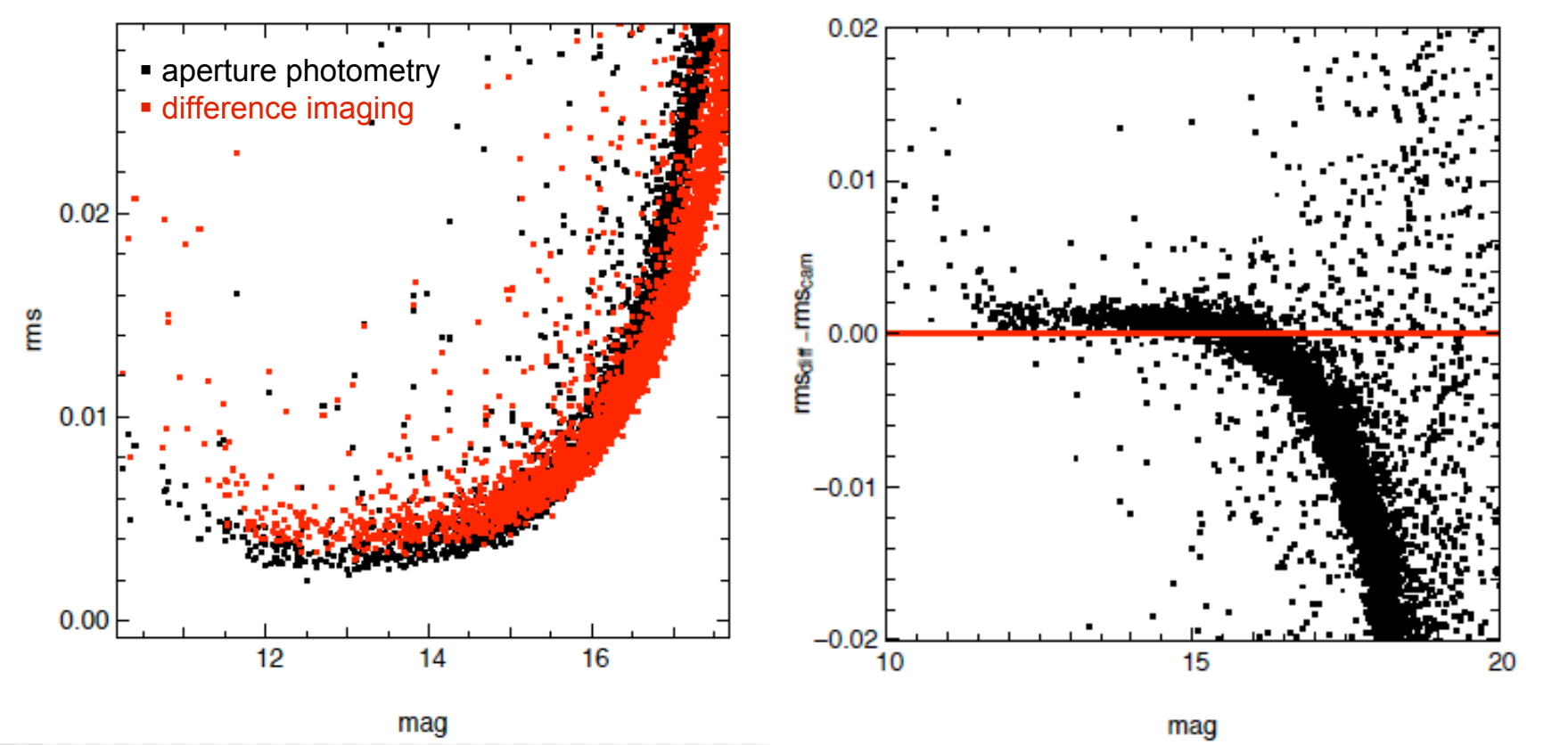
- 1 Paw-print from 19 hrs field
- ~60 000 light curves were extracted
- Quantitative comparison between DI vs. AP



Step by step improvements

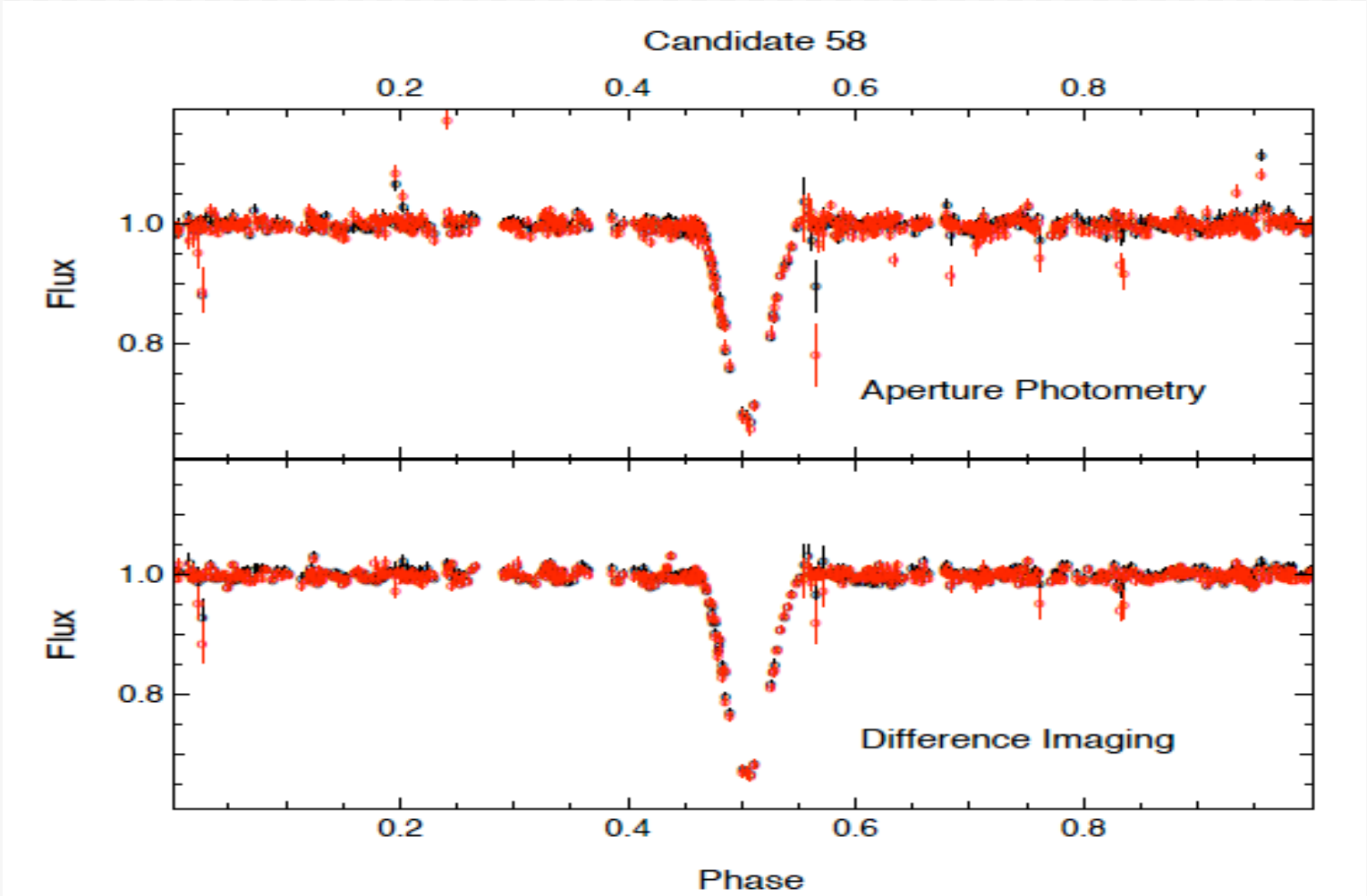
- We remove systematic effects (sysrem)
- We clip data points with $\sigma > 3$
- Mask for bright stars.
- Background corrections

Final results

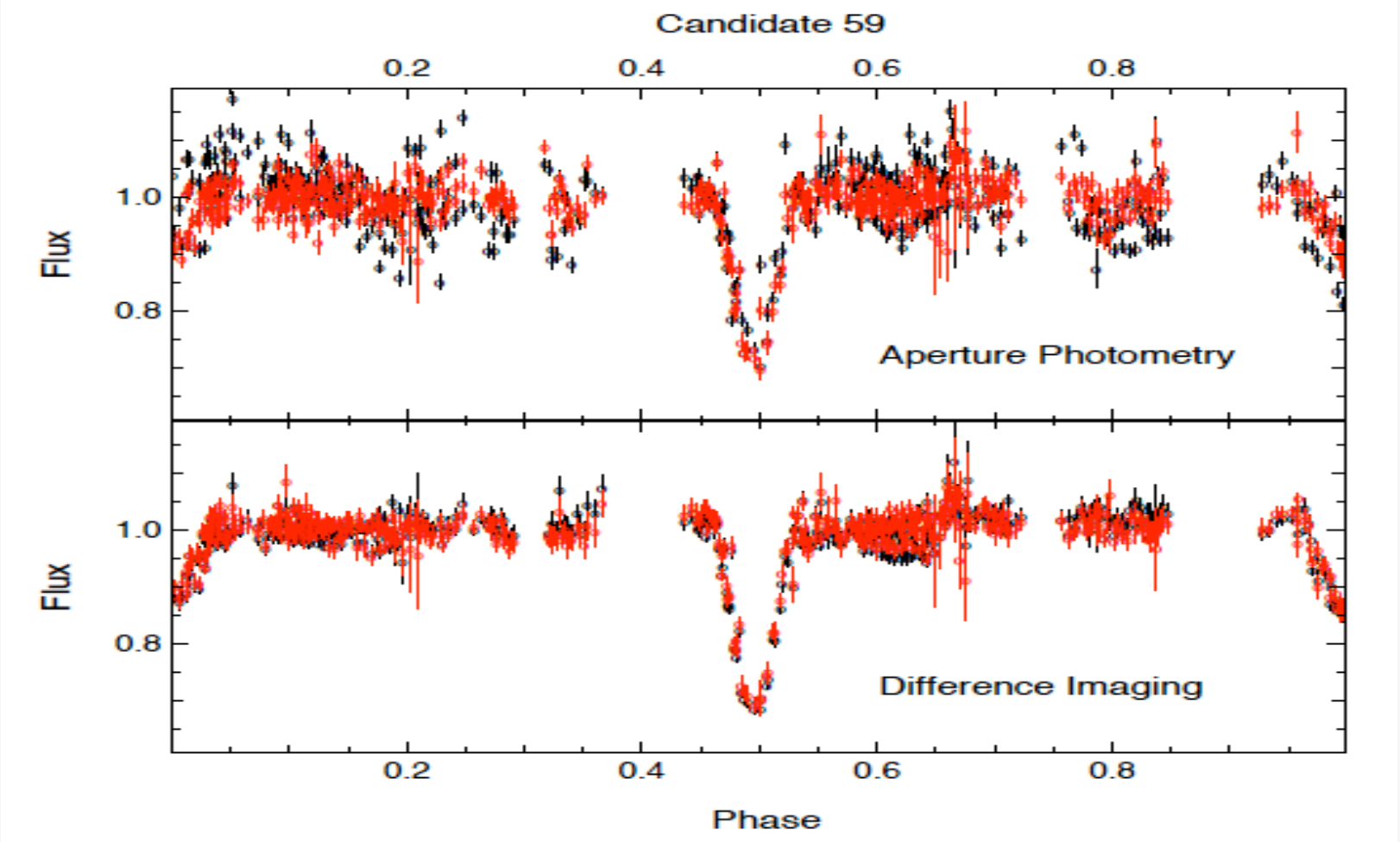


Lower rms for stars fainter than J=16 achieved

Bright stars (J_mag = 15.429)



Faint Stars (J_mag = 16.505)



Conclusions

- Early stage training to identify transits and EBs.

- Difference Imaging to produce higher quality light curves for faint stars with J_mag >~16 complementary to aperture photometry

- A list of candidate transits and EBs using DI is being produced, together with a description of the procedure.