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Difference imaging analysis of WTS data

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Outline

- Introduction
  - WTS release 1.0 candidates
  - WTS release 1.0 Munich-Candidates
- Summary: WTS release 1.0 Candidates
- Difference Imaging analysis
  - First results
  - Quantitative comparison
- Conclusions

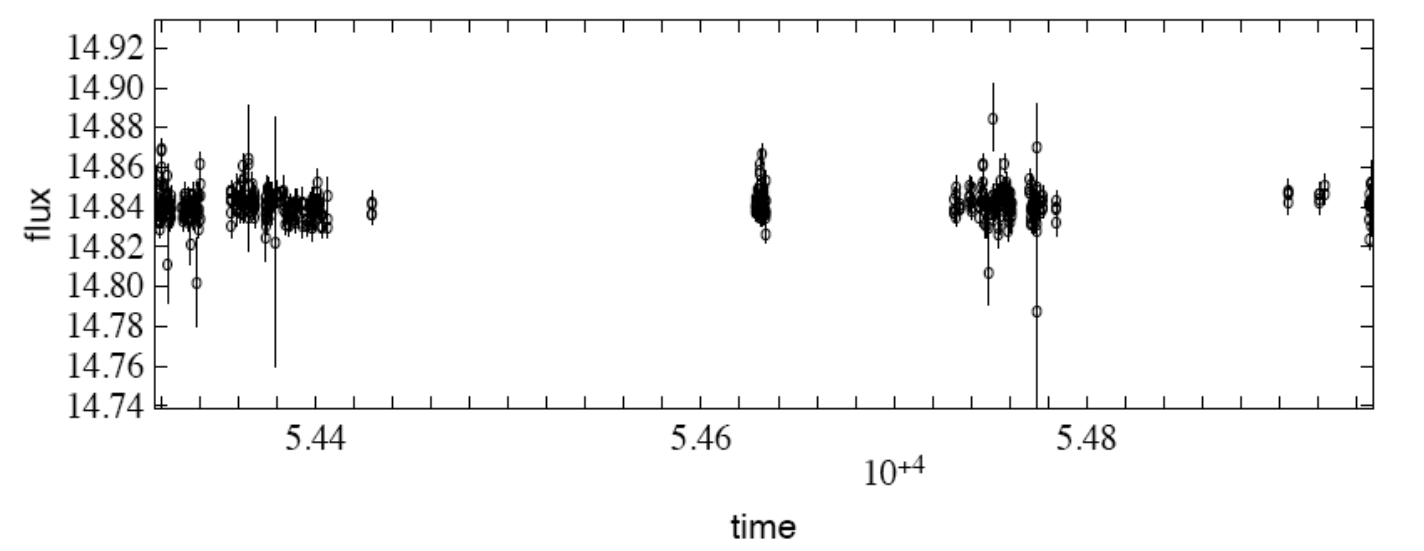
WFCAM Transit Survey Release 1.0

- 8 paw-prints from WF Camera
- 19 hrs field

WTS Release 1.0 Light curves

Detection & Selection Characteristics:

- Occfit- Transit detection algorithm (Box Least Square)
  - i) Periods 0.4-10 days
  - ii) Sensible Transit length range
  - iii) J magnitude in the range < 17.0



Candidates from WTS release 1.0

- 151 candidates

Classification	# Candidates	J mag
P1	1	14.9
P2	10	13.49-16.25
B1	3	15.55-16.23
B2	101	10.94-16.88
W	29	11.63-16.80
V	5	11.92-14.75
S	2	15.35 & 15.53

P-Planets
B-Binary system
V-Variable, no yet understood
W-Watch list
S-Spot

Munich Candidates - WTS Release 1.0

Detection & Selection Characteristics:

- Motivation: Exercise to learn how to identify transits and EBs
- Box-fitting Algorithm (Kovás et al. 2002)
  -Input parameters:
    i) Period 0.5-5 days
    ii) Fractional transit length 0.1 - 0.2

- Depth < 0.15
- Our Candidates were selected by visual examination

Munich Candidates

For the 8 paw-print ~ 20 000 light curves were analyzed by eye:

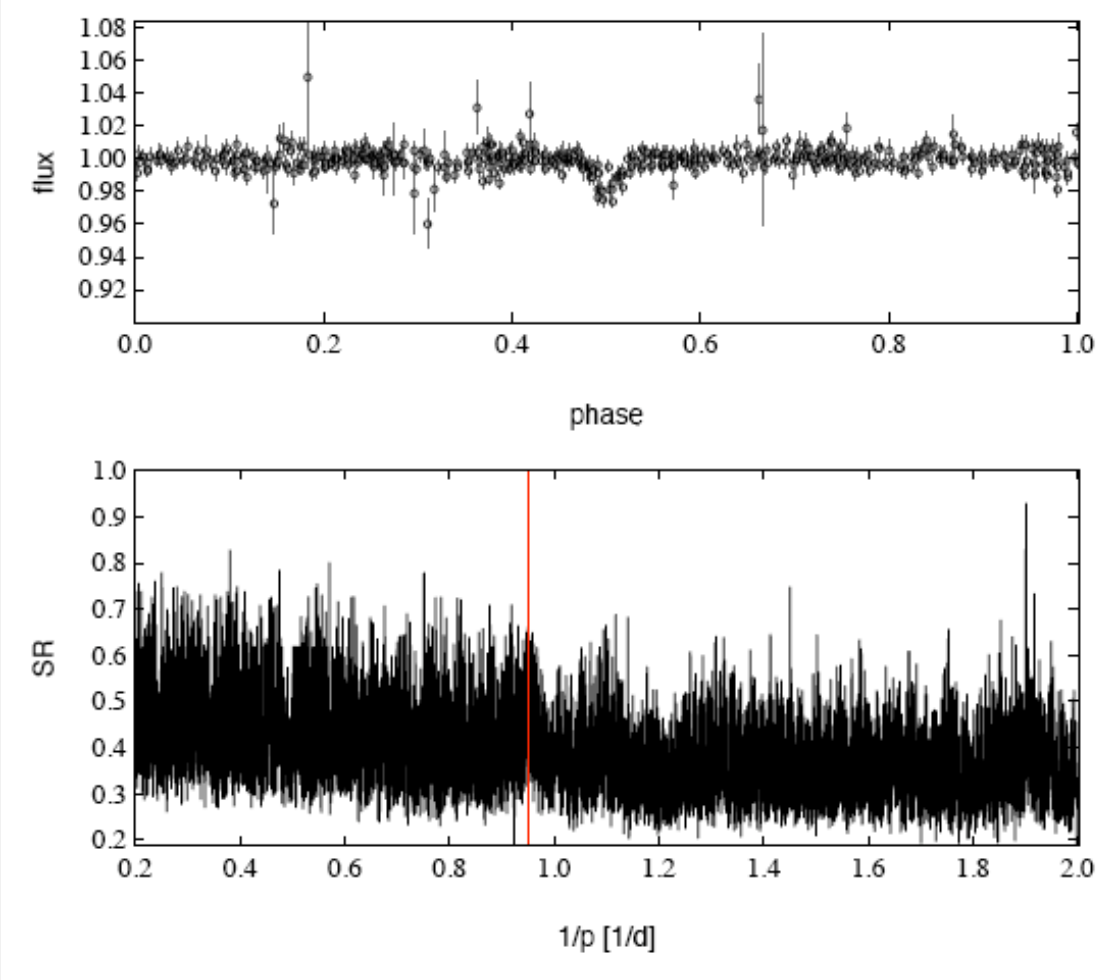
- 55 Candidates & EBs, J mag[12.32-16.91]

Classification	#Candidates	Previously
P1	1	1
P2	9	6
P2-3	4	2
P3	13	6
P3-B	3	1
B	25	9

P1-First priority
P2&3-Lower priority

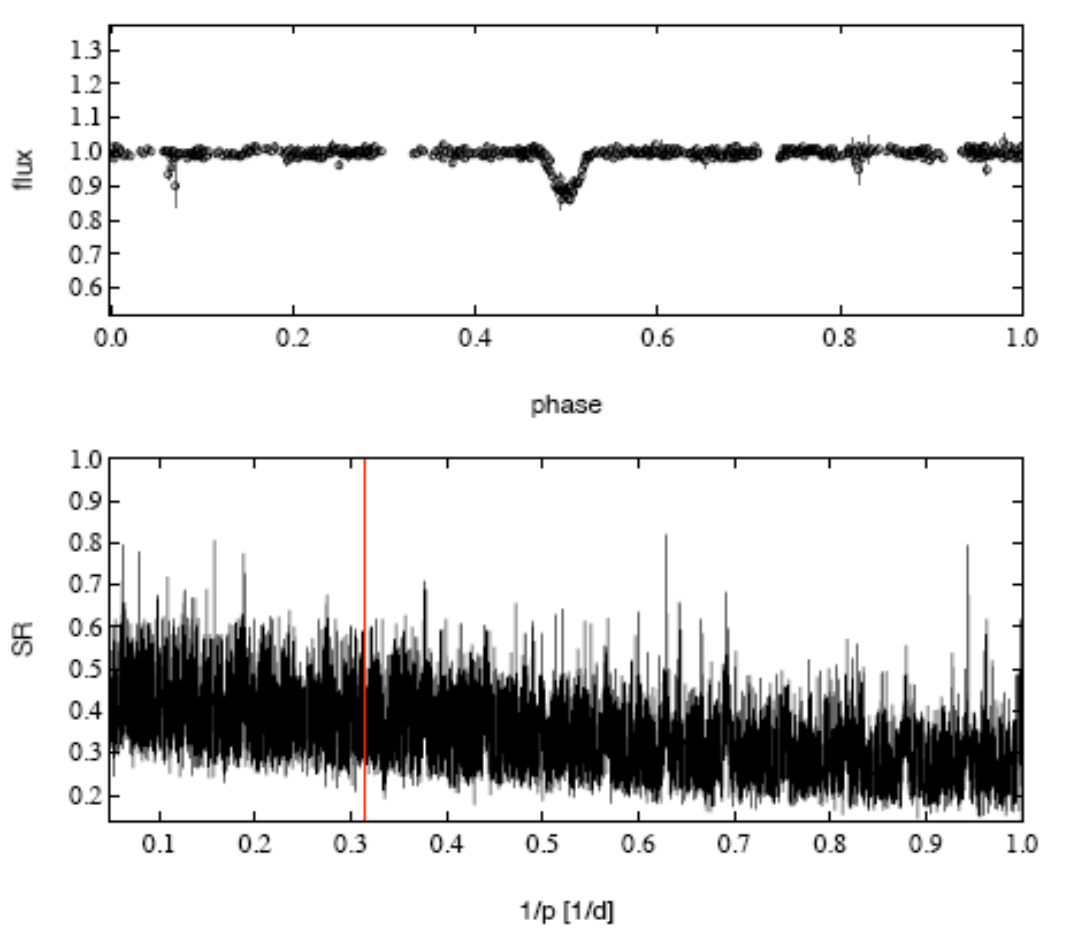
P2-3 & P3-B-No clear classification
B-EBs

Munich Candidates (Category1)



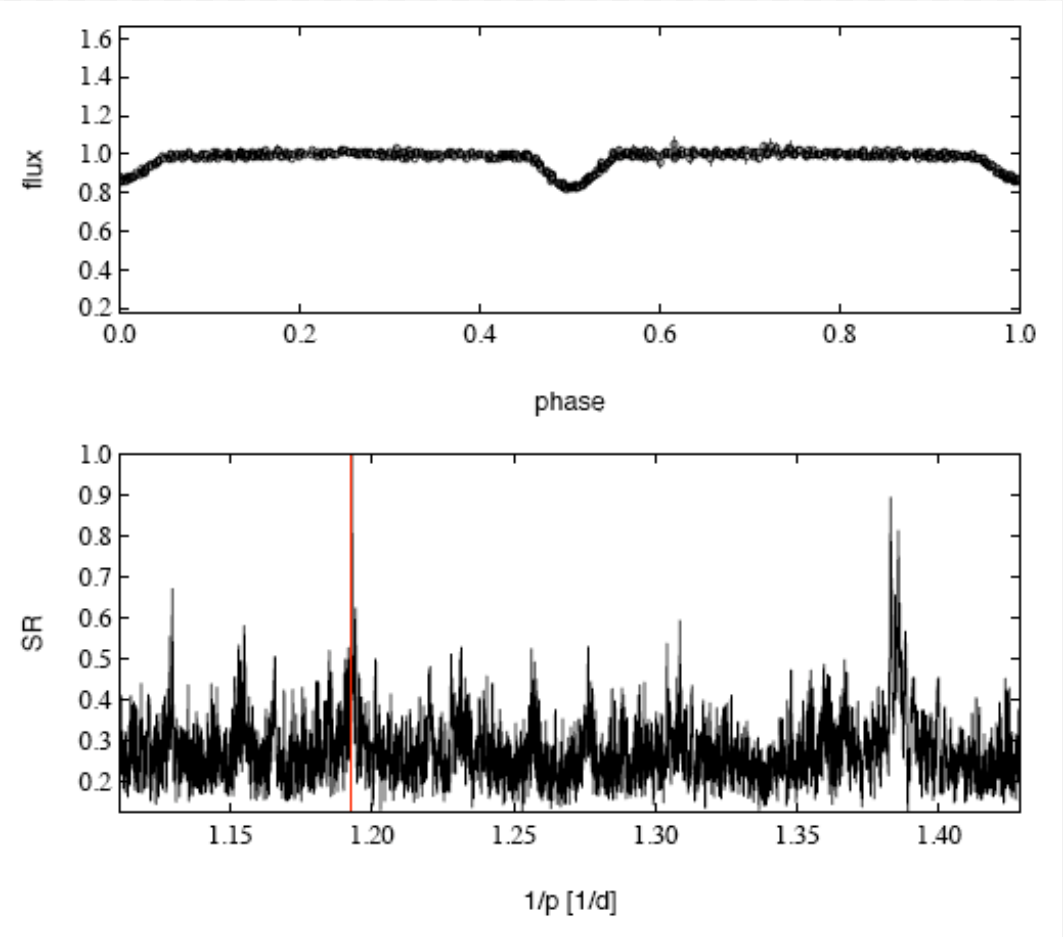
period=1.052
duration= 0.034
drop=0.0166
j_m=14.89

Munich Candidates (Lower priority)



period=3.179
duration= 0.03
drop=0.115
j_m=15.64

Munich candidates (EBs)



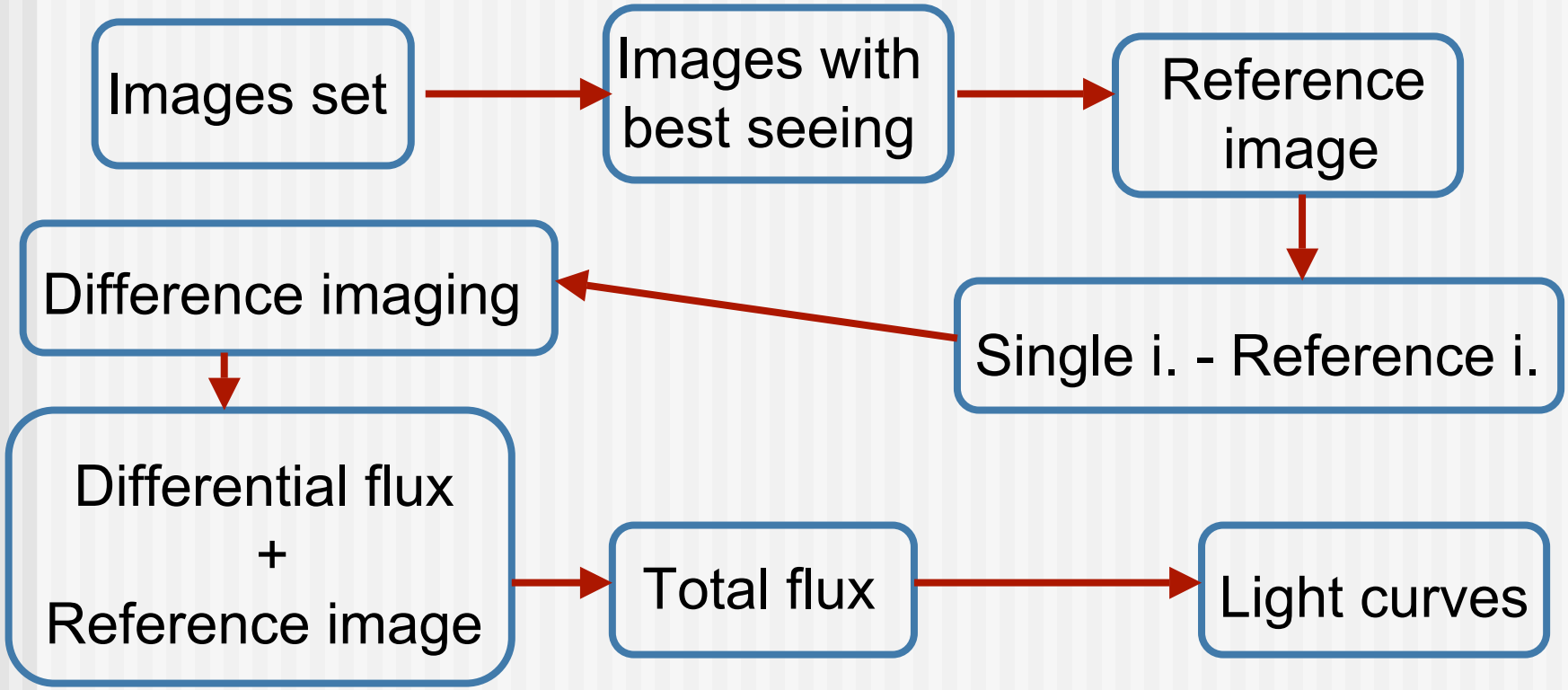
period=0.8383
duration= 0.067
drop=0.1363
j_m=15.46

Summary

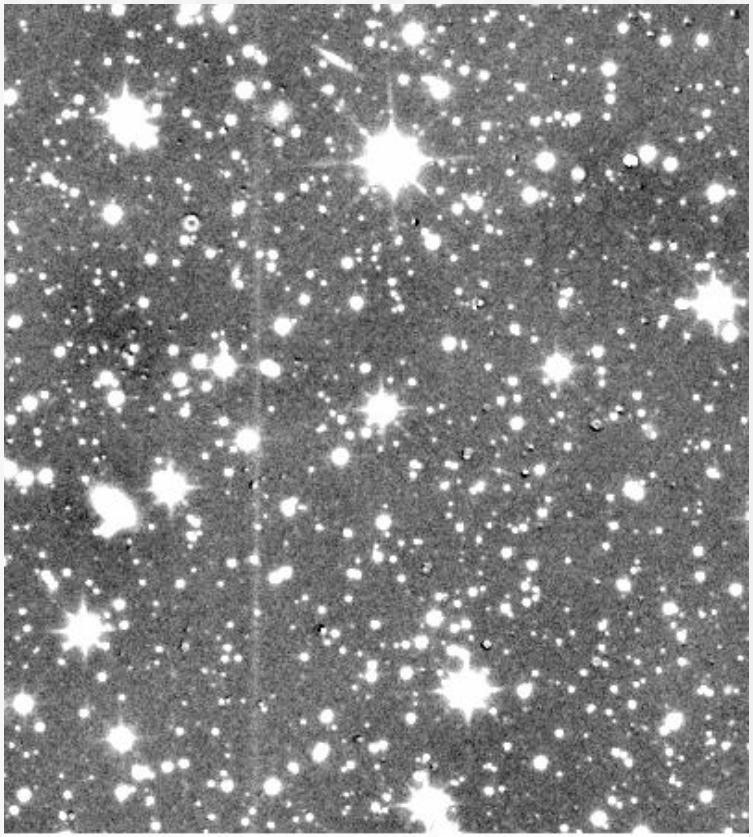
- ~ 20 000 light curves by visual examination from WTS release 1.0. This represented an excellent (but exhaustive) exercise to identify transits and EBs.
- 55 candidates & EBs
- 25 candidates were detected previously
- We found 30 new planets, ask Jayne why?

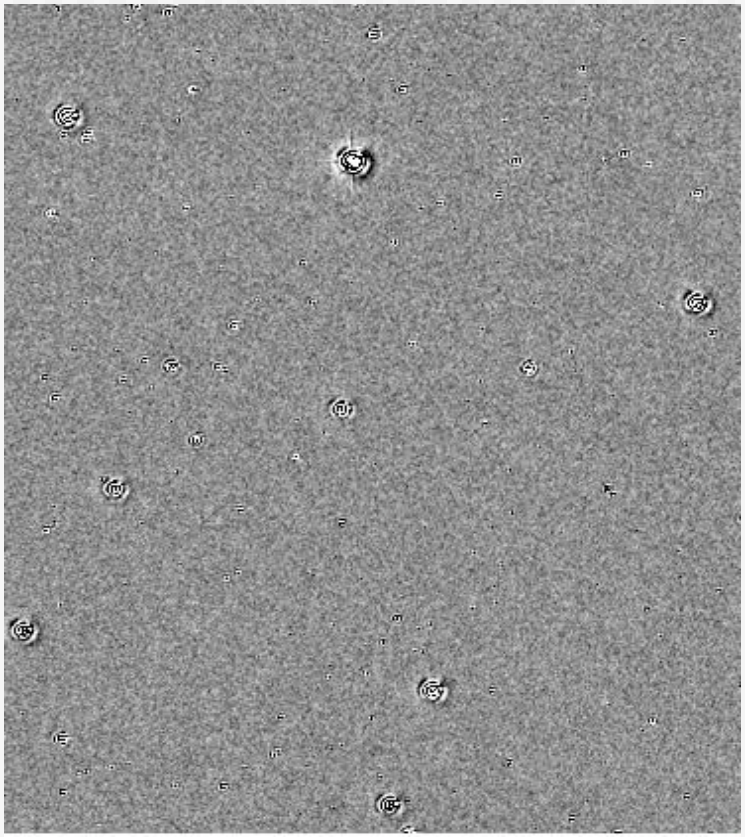
Difference Imaging Analysis

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).



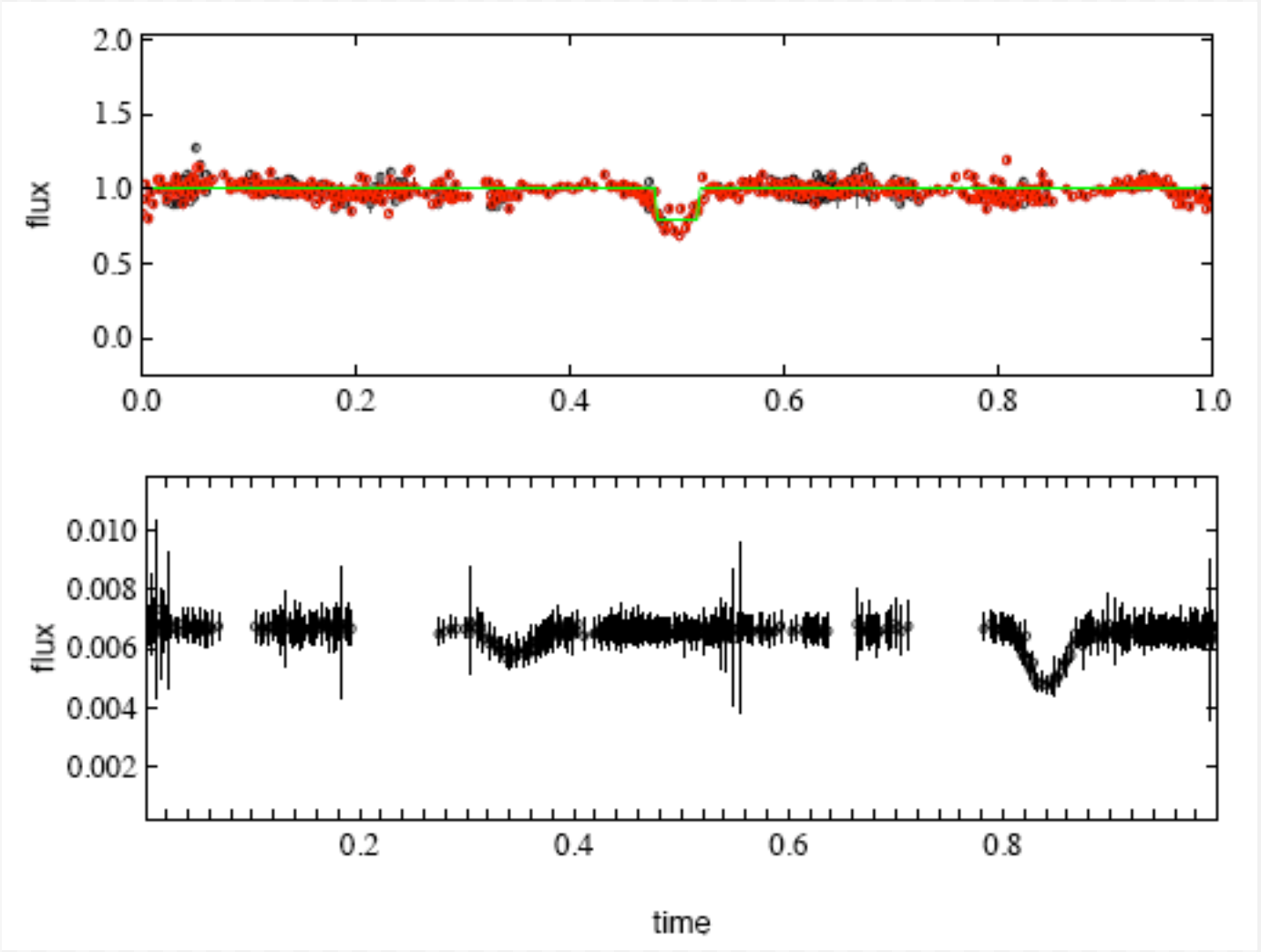
Difference imaging





1 Paw-print from 19 hrs field
~ 60 000 light curves were extracted.

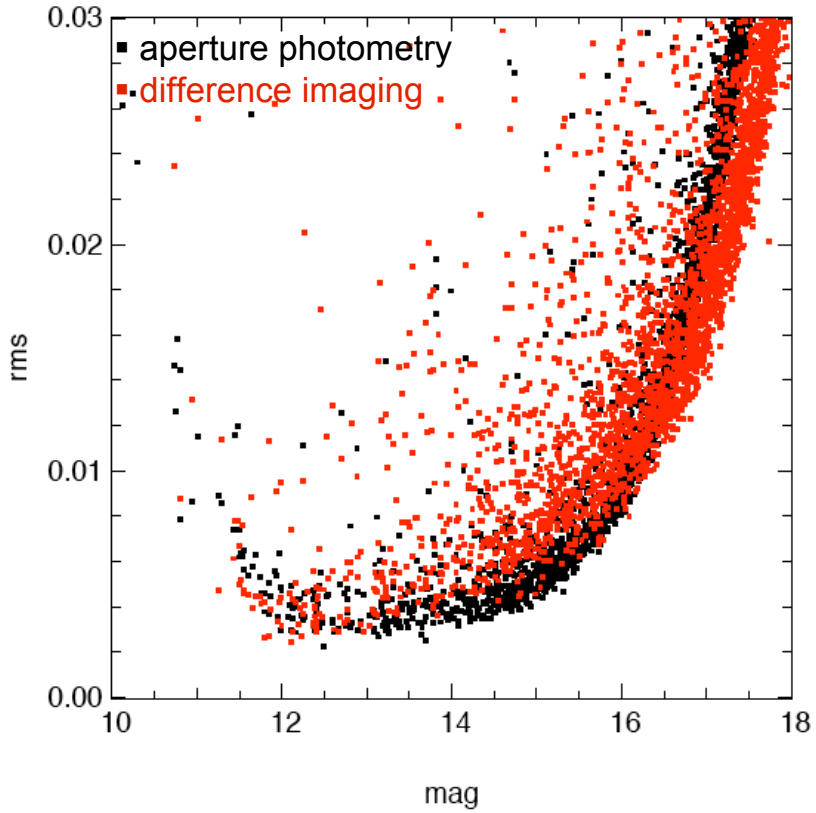
First Results…

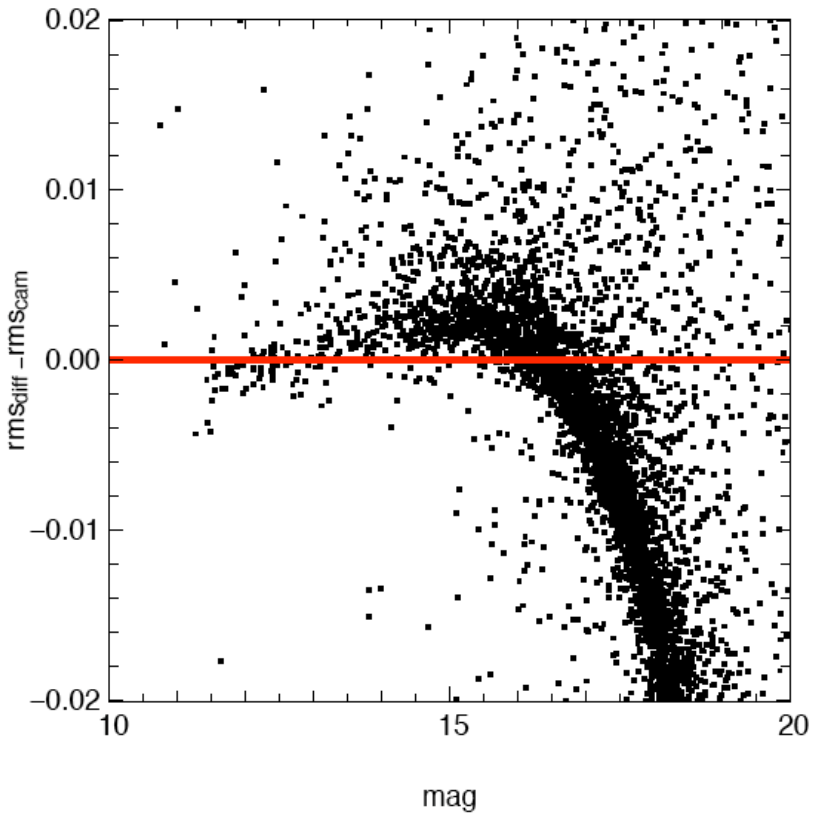


Quantitative light curves comparison Difference imaging vs. Aperture photometry

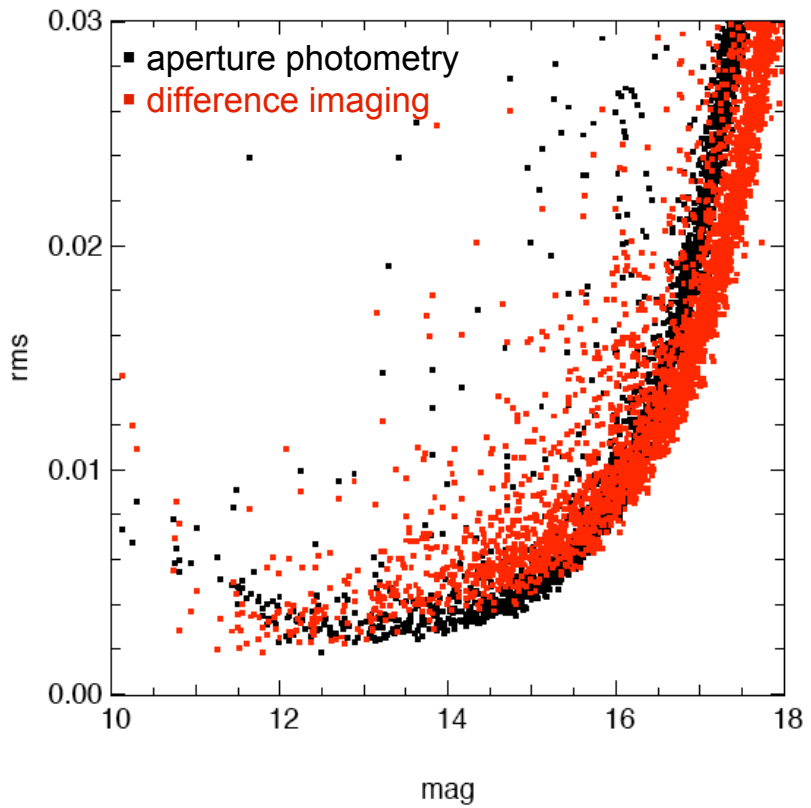
- The WTS release 1.0 light curves were cut out due they presented more data points than the light curves extracted by difference imaging.
- We remove in both cases systematic effects(sysrem)
- We Clip data points with $\sigma > 3$
- Both corrections are applied to both difference imaging and aperture photometry light curves in order to have a consistent comparison.

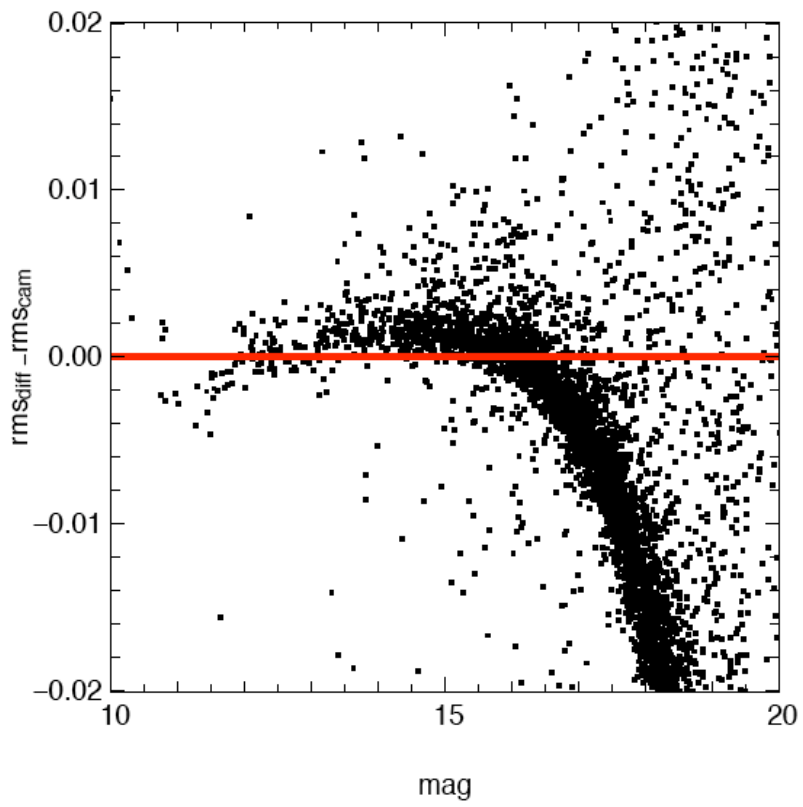
RMS_{Diff} - RMS_{Phot} vs. Magnitude



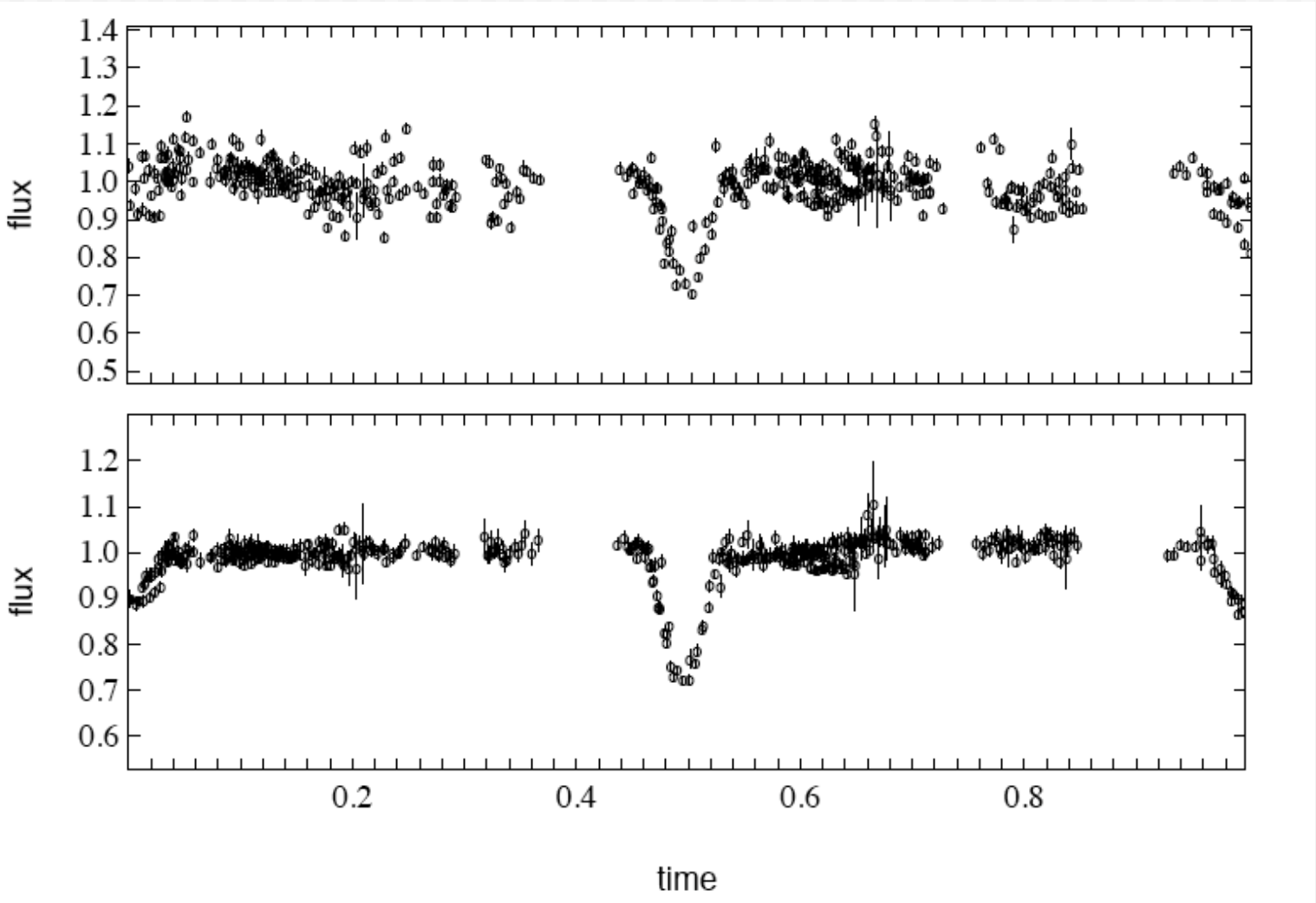


RMS_{Diff} - RMS_{Phot} vs. Magnitude(sysrem)

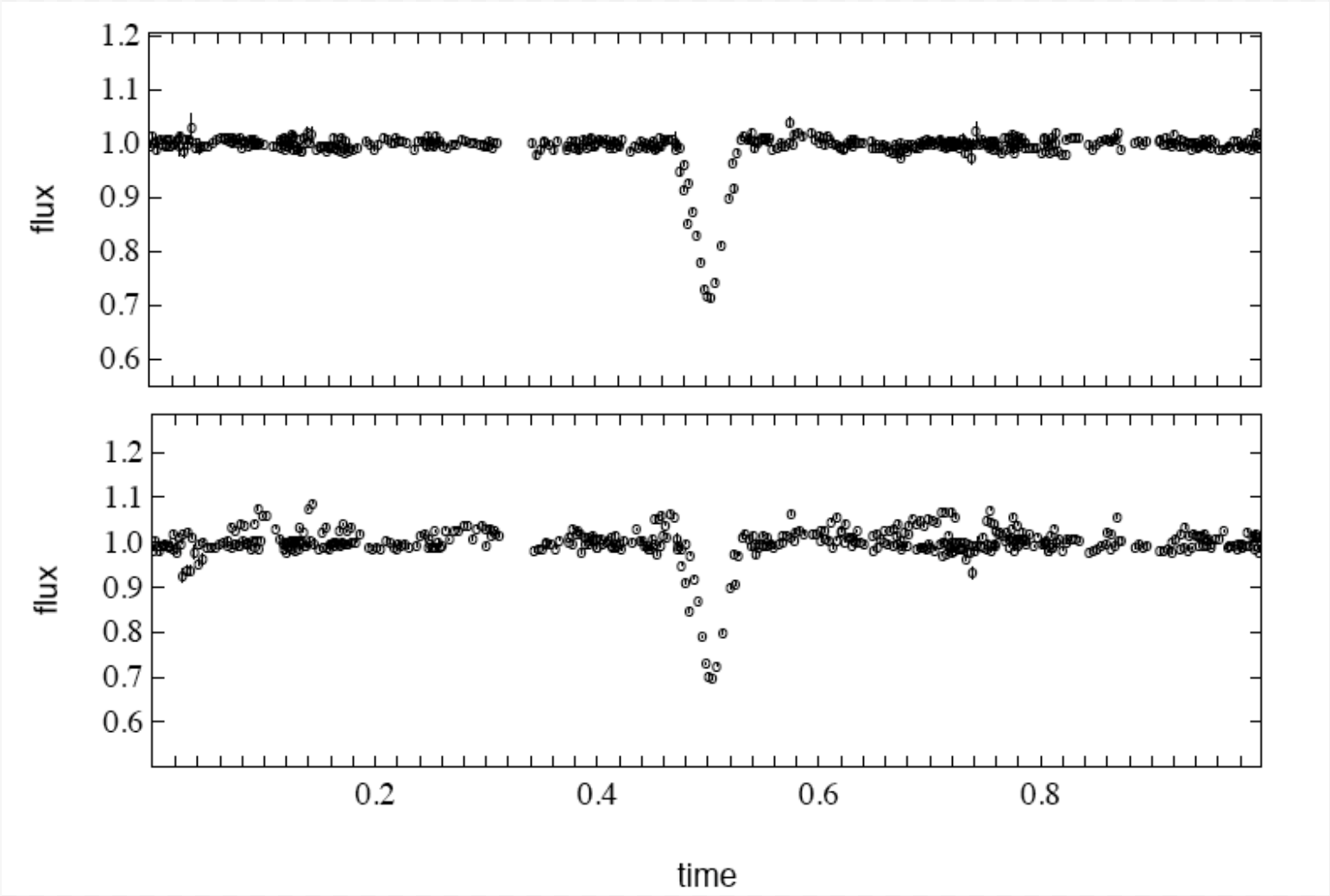




Faint Stars (J_mag = 16.5)



Bright stars (J_mag = 14.7)



Conclusions

- Difference imaging produces better quality light curves only for faint stars.
- Aperture photometry gives excellent results for stars with J_mag < 16.
- We plan two further tests:
  (a) parameterize global kernel
  (b) box-fitting analysis on the difference imaging light curves

If this still does not produce better light curves or new candidate, difference imaging could be useful to study variable stars and transits around faint stars (J_mag>16).

Thank you very much!!!
enjoy Munich(If the weather lets you)….