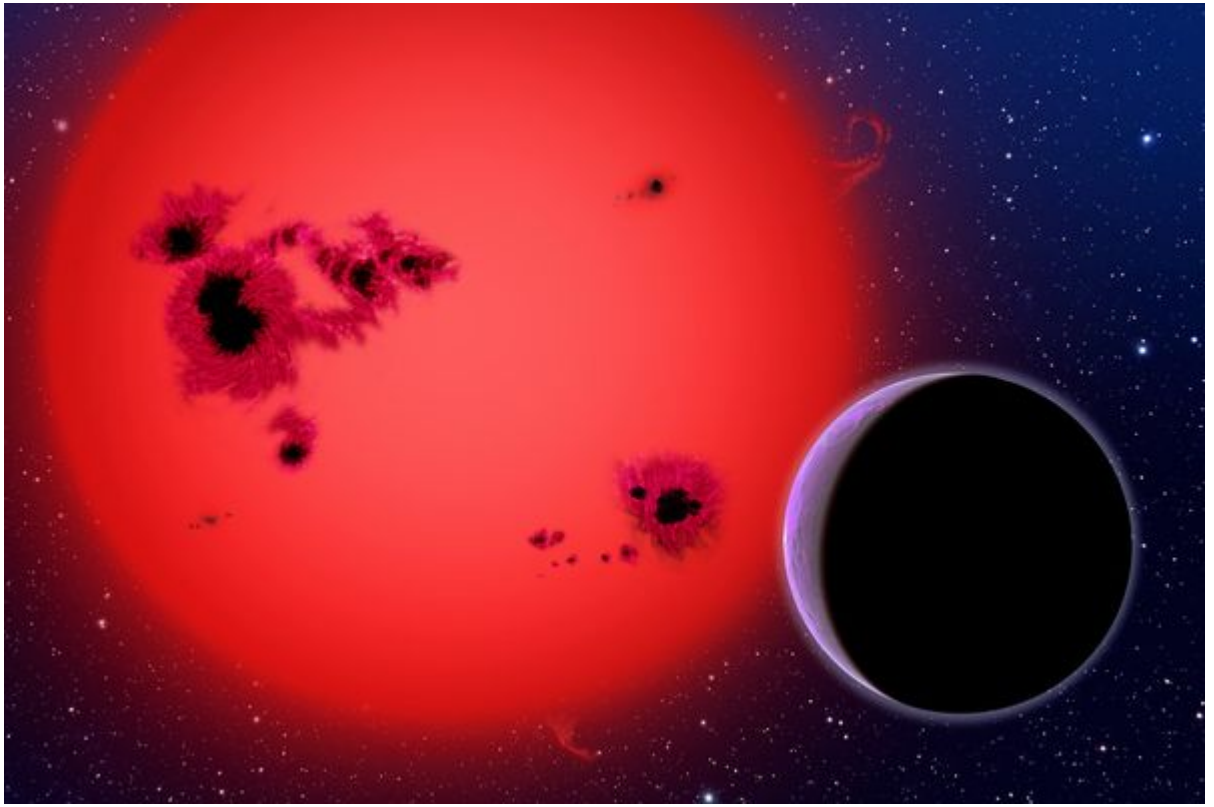
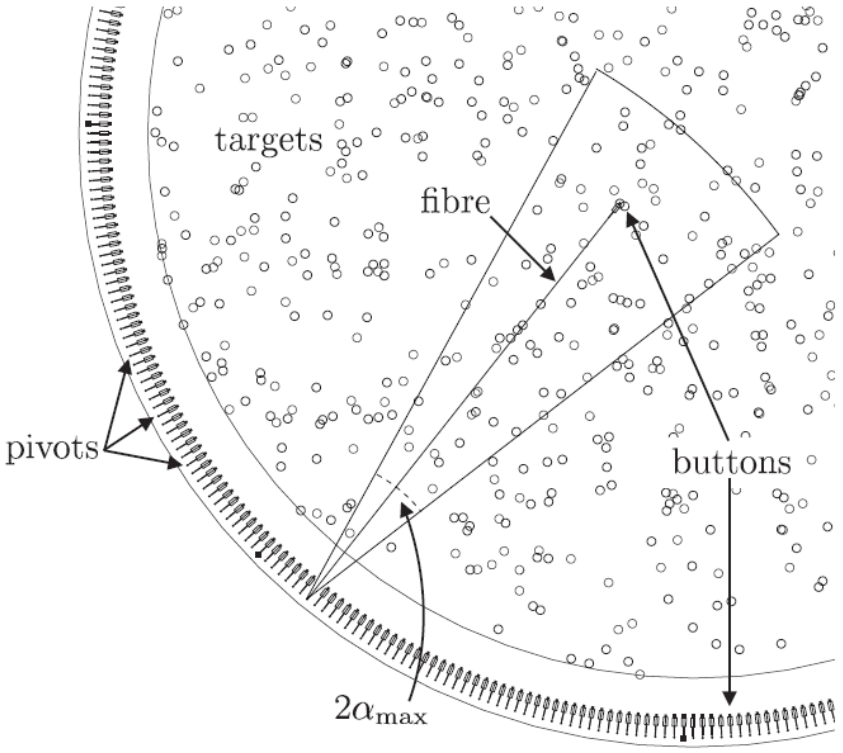
Analysis and new ideas for WTS

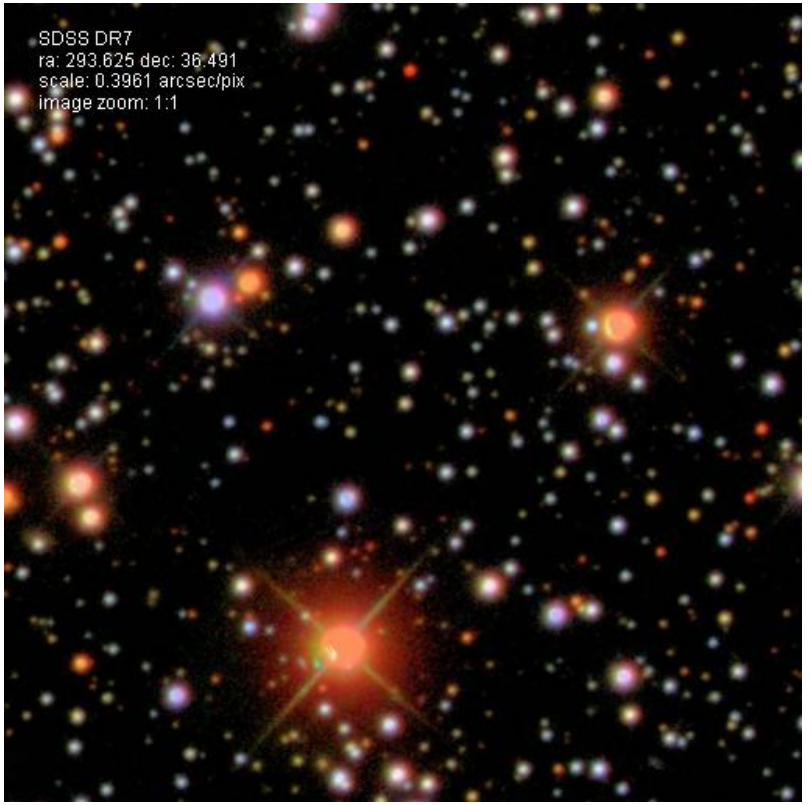
towards characterisation of the transiting M dwarf host star population



Bas Nefs – Leiden Observatory- Munchen meeting

Multi-fibre (low-res,wide field) M dwarf spectroscopy





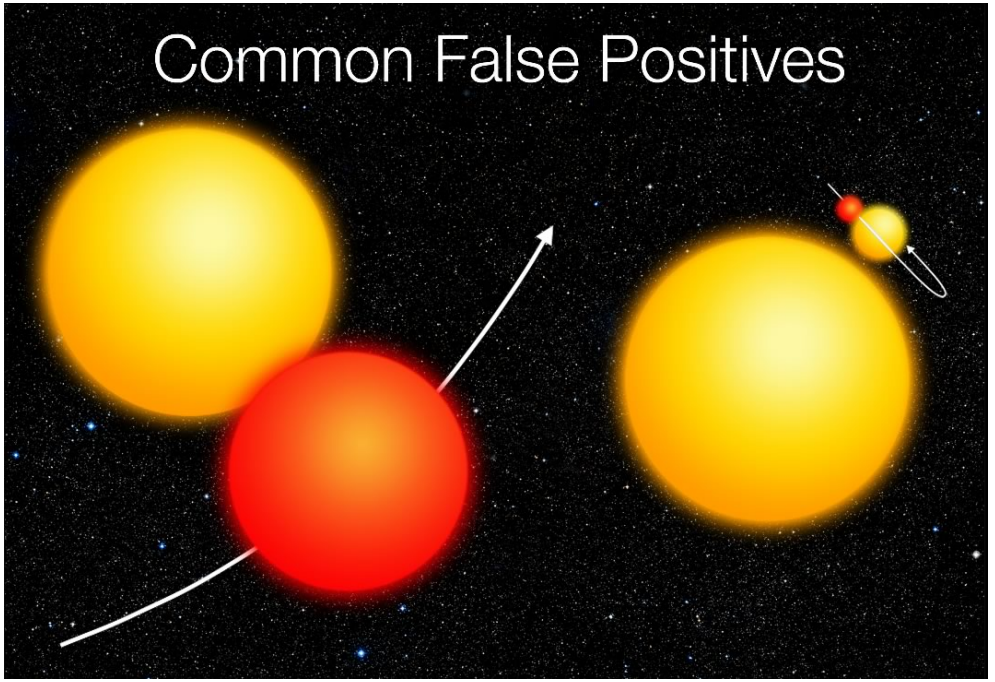
Granted 4 nights observing @ AAT

Why is this interesting?

- *Very Low Mass stars show discrepancies with theory.*
- *Exoplanet parameters limited by host star parameters (radius,mass).*
- *WTS data reveals **EBs** and **M dwarf variability***
- ***Relations** between rotation period, color, mass, age and activity measures for planet bearing stars.*

  Gauge the parent population & hot Jupiter freq.

(1) Excluding transit false-positives



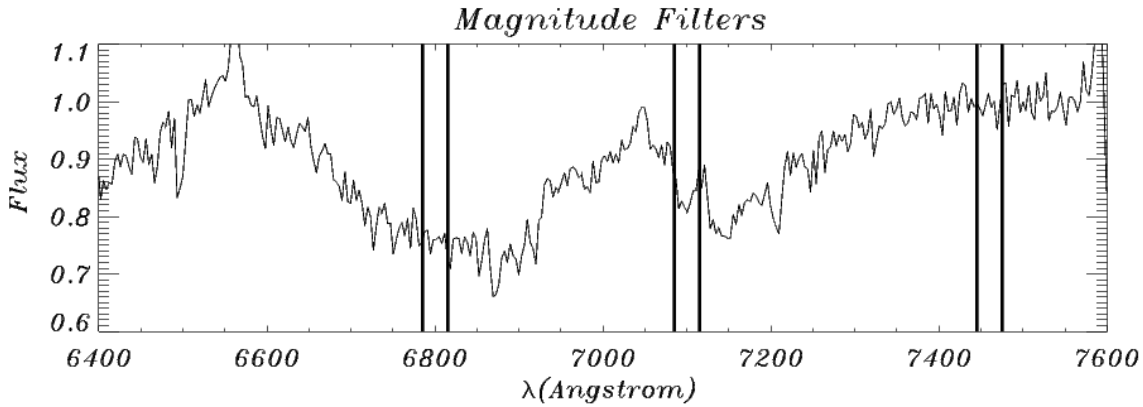
Grazing binaries: *Teff will match lightcurve density only for grazing configuration.*

Blends: *reddened third star; spectral type mismatch with colors.*

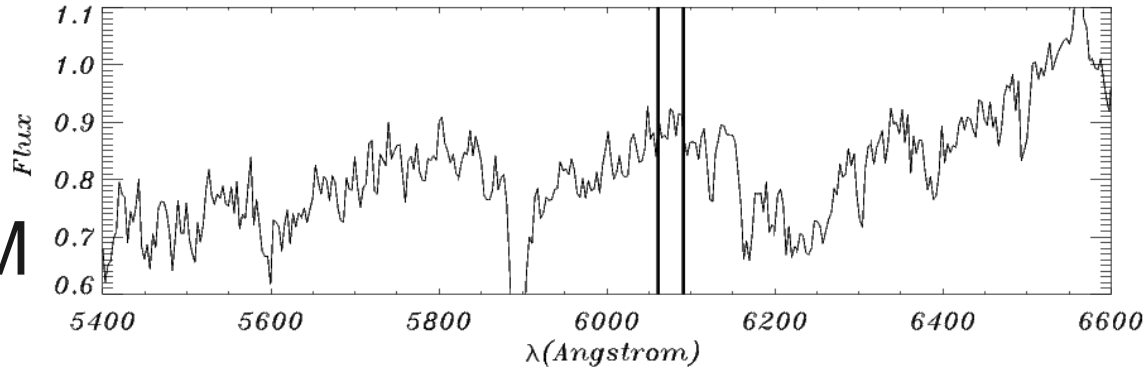
(2) Sort out dwarfs and giants...

Break the degeneracy in (Teff-reddening) and assess the giant fraction if proper motions are inconclusive....

(TiO/CaH) ratio vs continuum

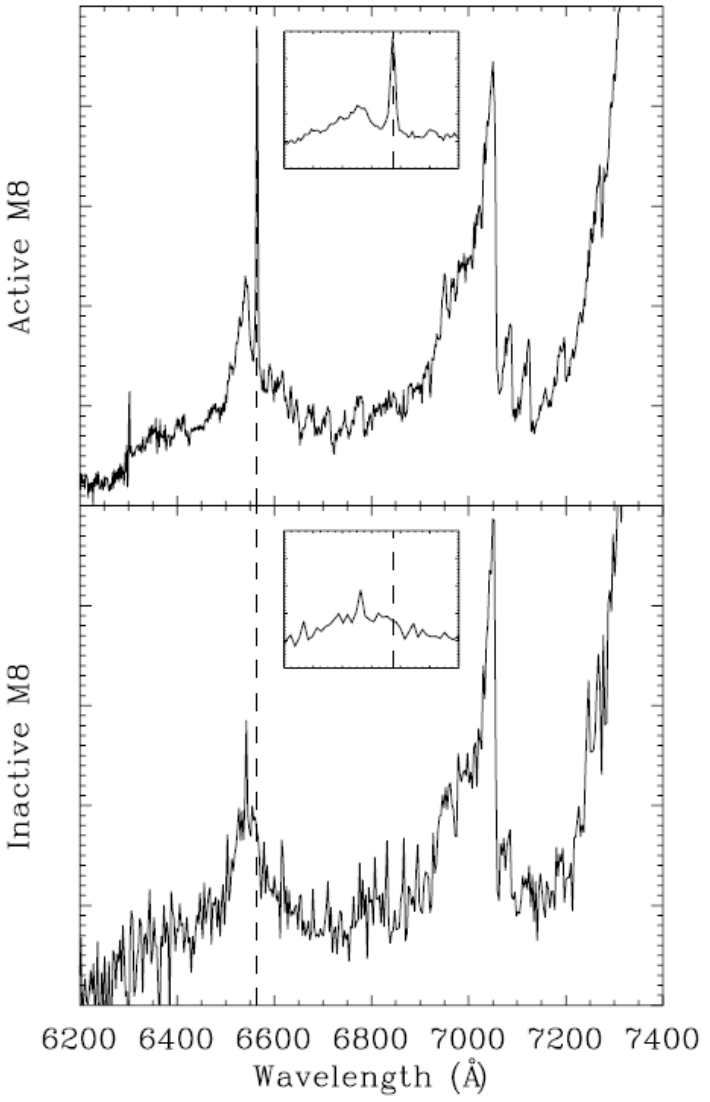


P1-2980 ACAM



(3) Pre-selection of med res. targets

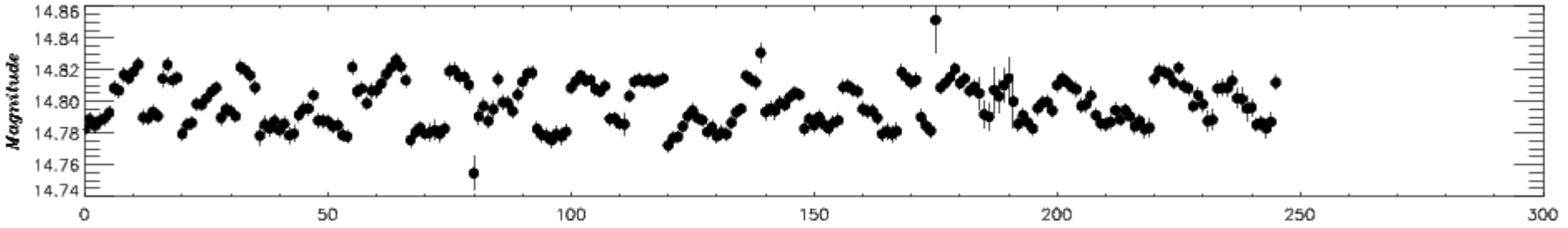
- *Spectral typing & selection of inte-resting medium resolution transit follow-up targets (active host; Hα)*
- *Constrain magnetic activity levels in planet bearing host star population.*
- *Mdwarf-white dwarf??*



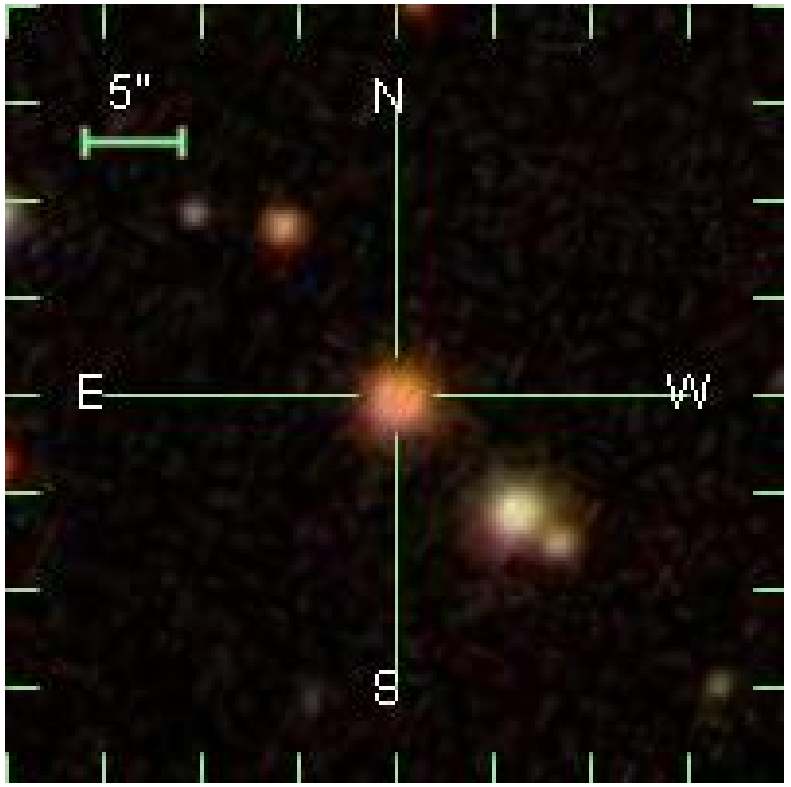
West et al. (2004)

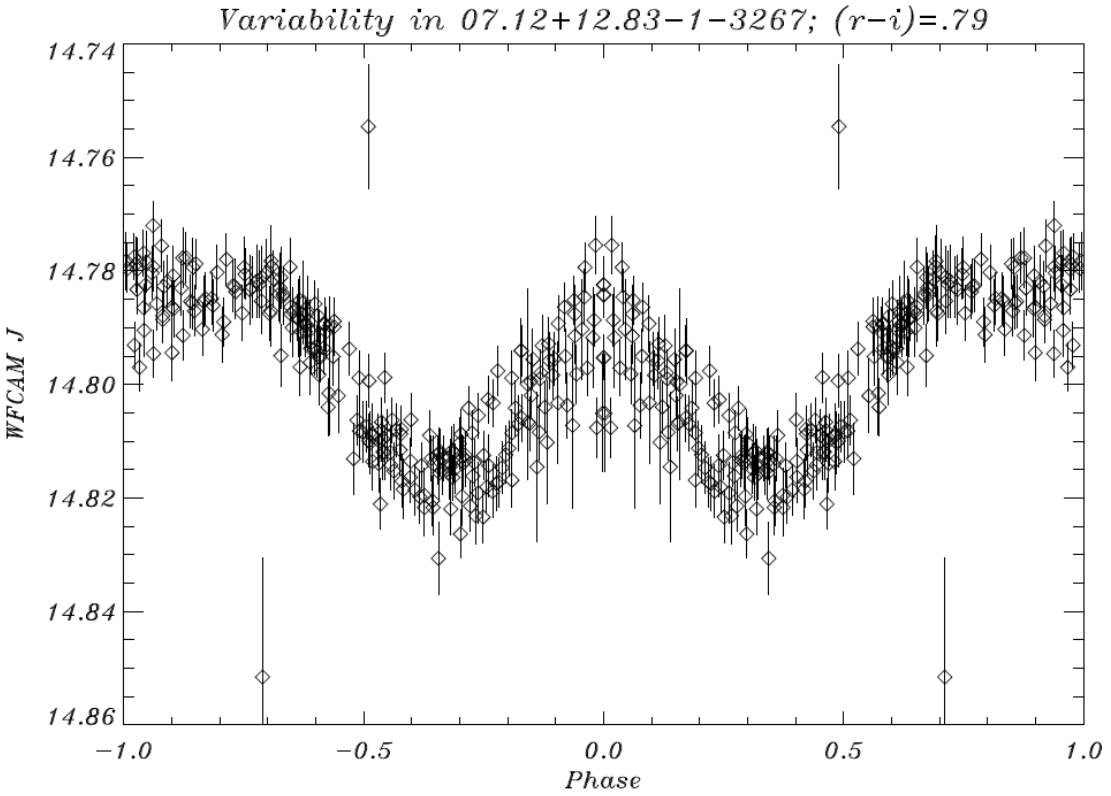
(4) M dwarf variability

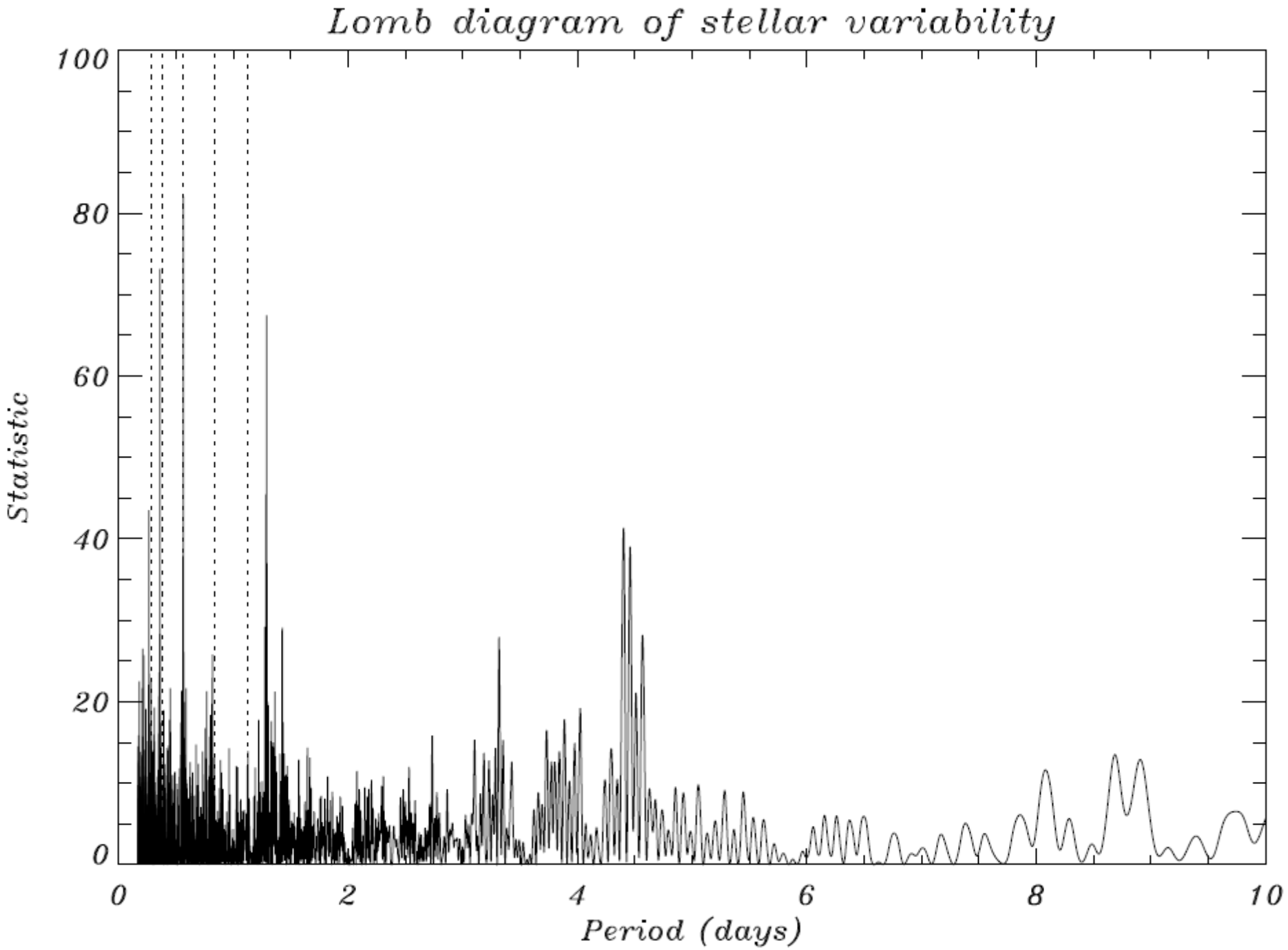
- *Relate photometric variability to M dwarf activity level (H) as function of color, binarity,period, perhaps even age, in a sample of medium-late type M dwarfs…*
- *Activity steeply rising function of stellar type (~100% for M7)*

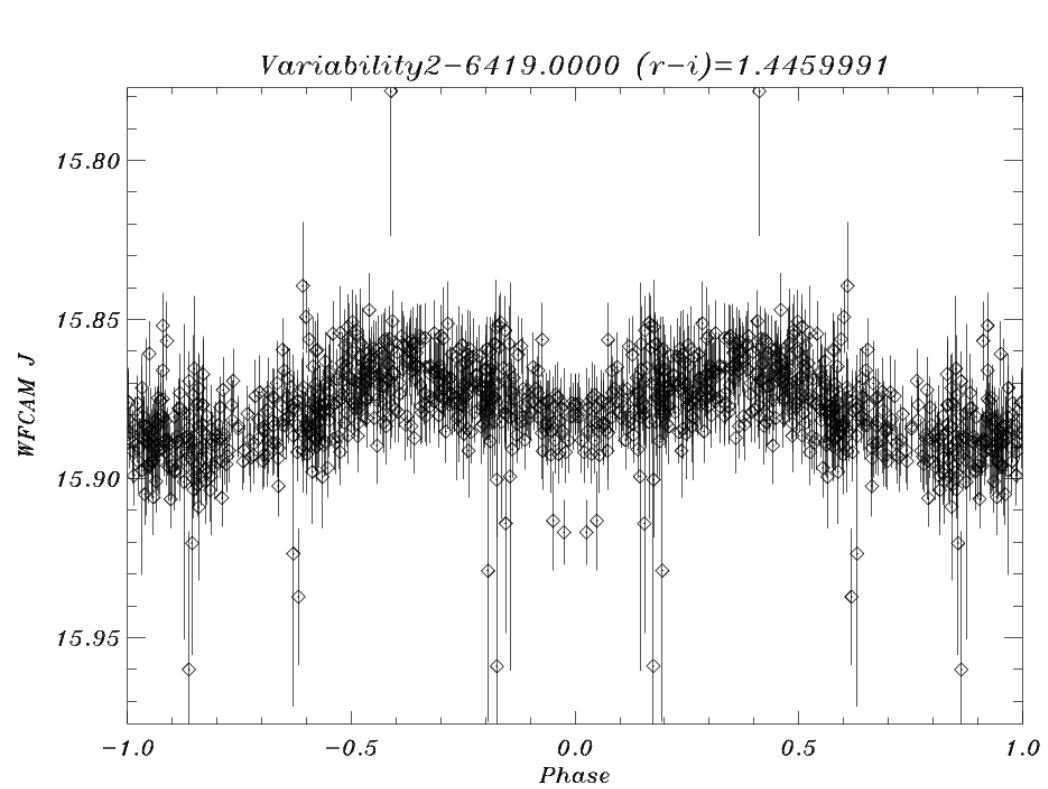


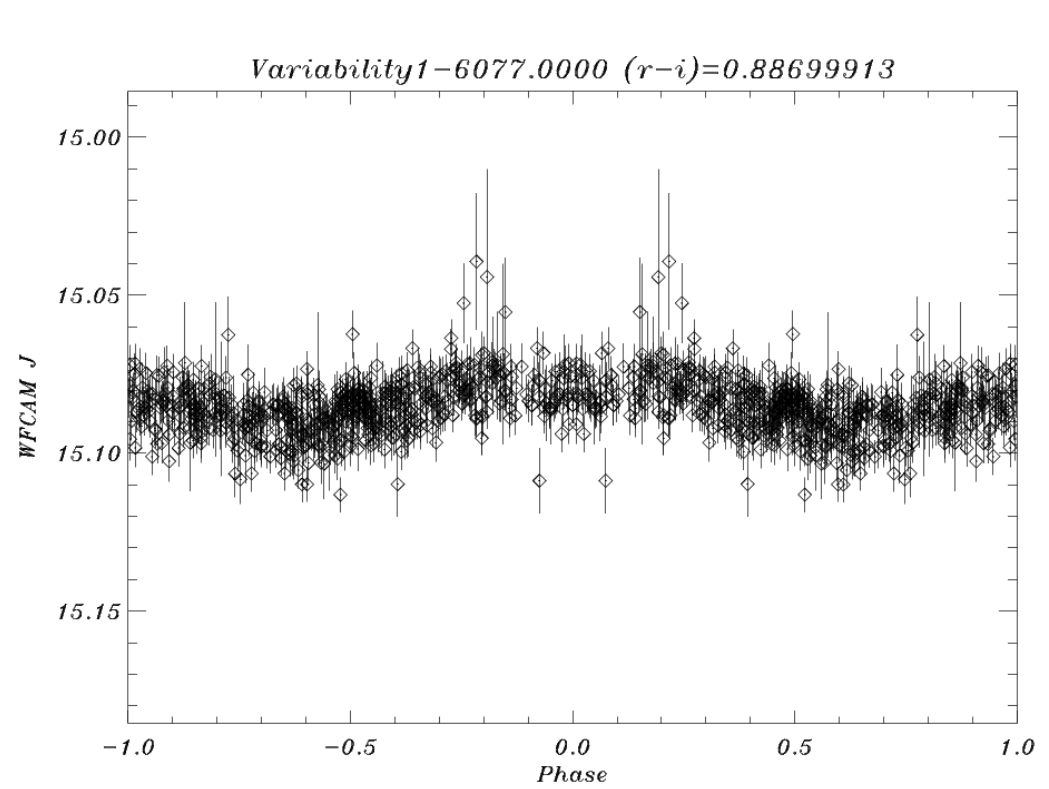
Connection with M dwarf star spots?

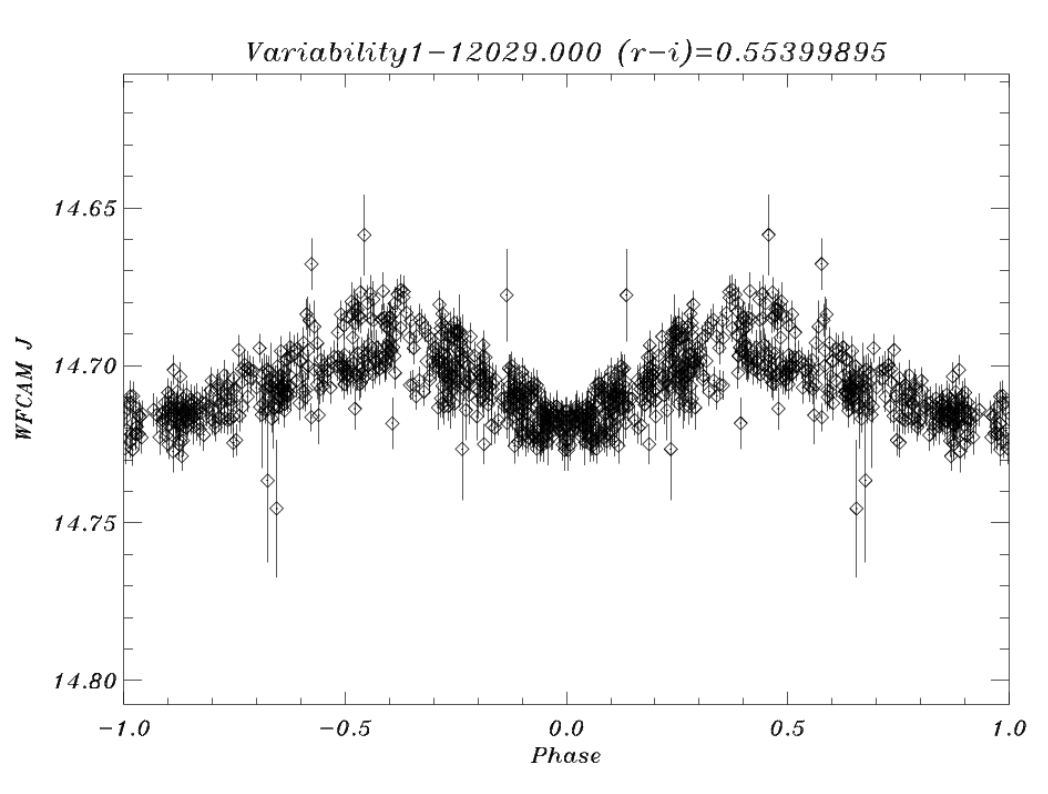


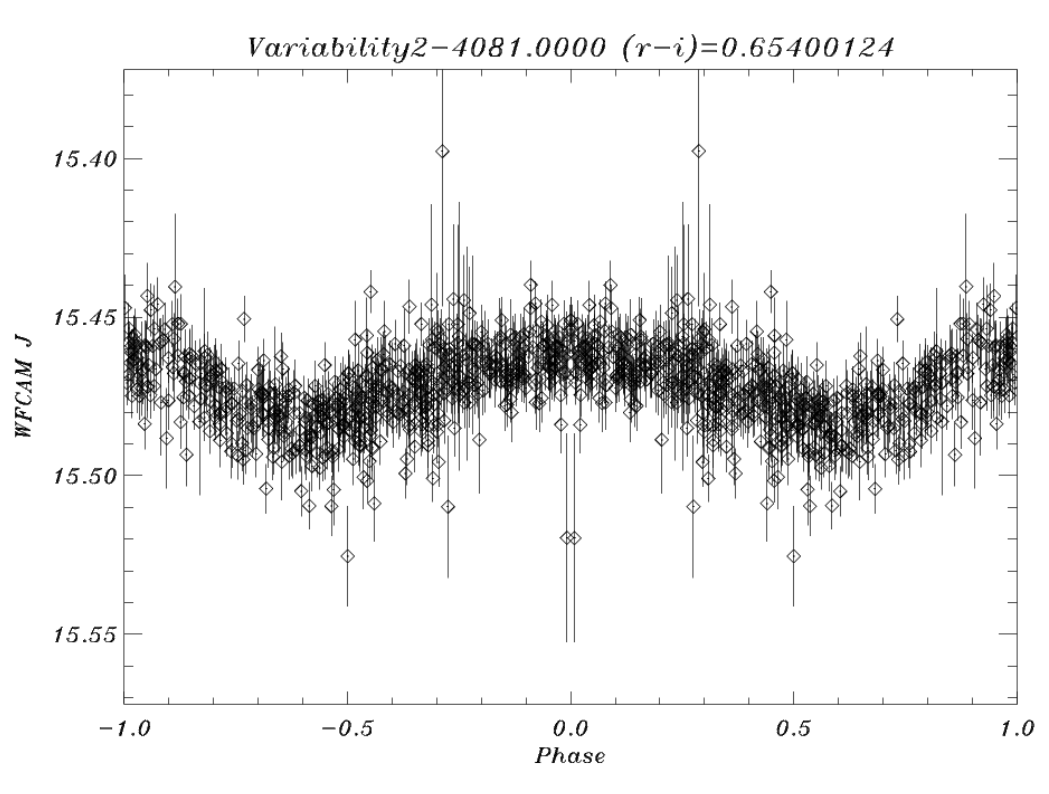



Lomb diagram of stellar variability
Statistic
Period (days)
0
20
40
60
80
100
0
2
4
6
8
10

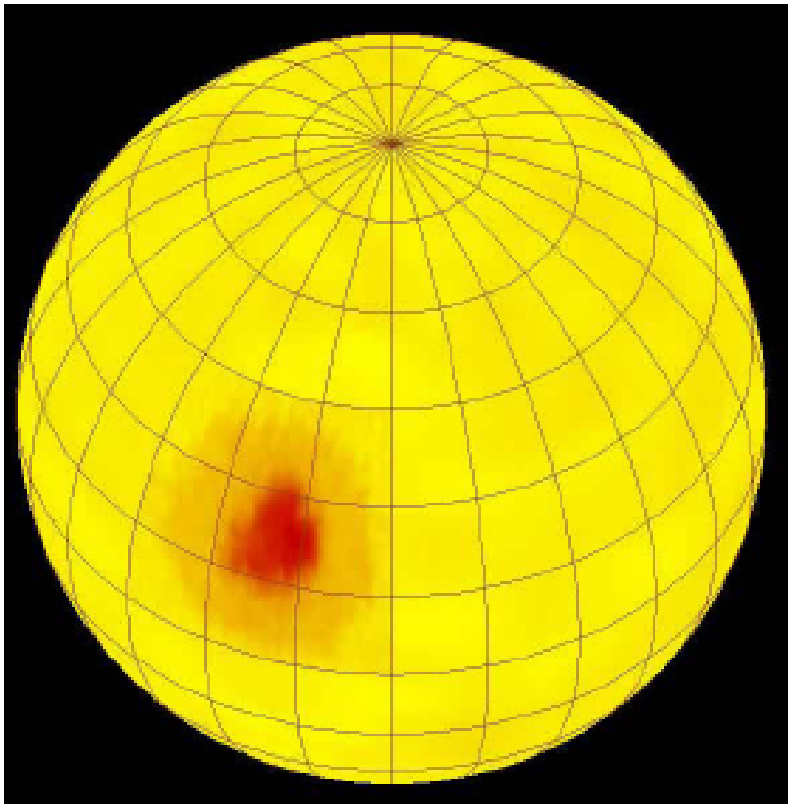

Variability2-6419.0000 (r-i)=1.4459991
15.80
15.85
15.90
15.95
WFCAM J
-1.0
-0.5
0.0
0.5
1.0
Phase


Variability1-6077.0000 (r-i)=0.88699913
15.00
15.05
15.10
15.15
WFCAM J
-1.0
-0.5
0.0
0.5
1.0
Phase

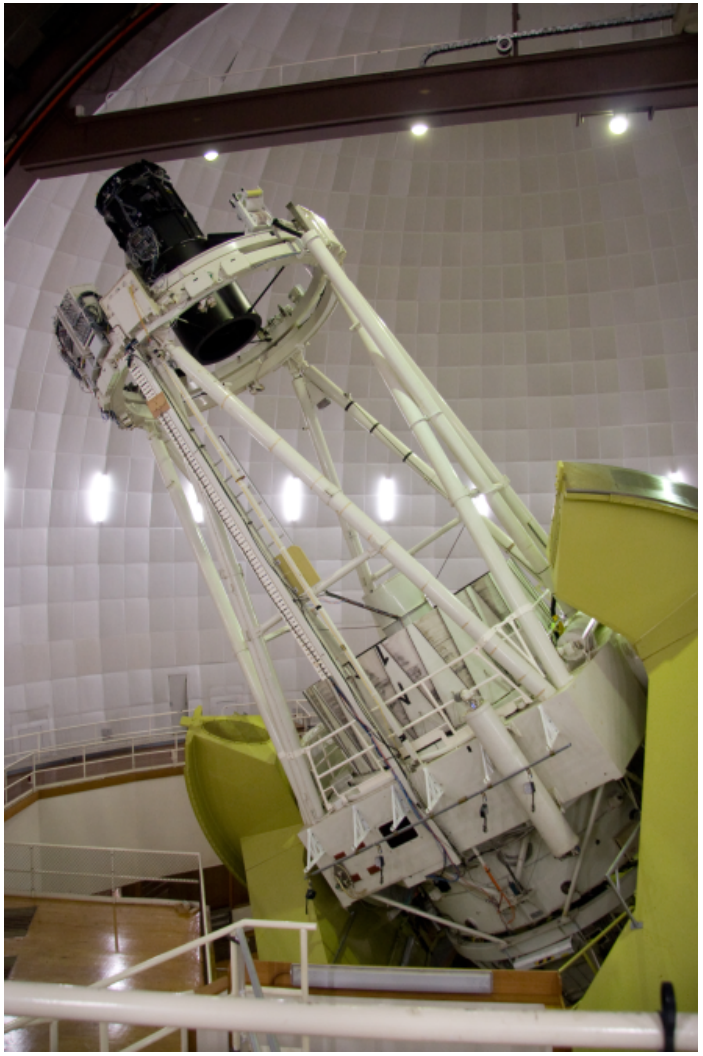

Variability1-12029.000 (r-i)=0.55399895
14.65
14.70
14.75
14.80
WFCAM J
-1.0
-0.5
0.0
0.5
1.0
Phase


Variability2-4081.0000 (r-i)=0.65400124
15.40
15.45
15.50
15.55
WFCAM J
-1.0
-0.5
0.0
0.5
1.0
Phase

Spot or not?

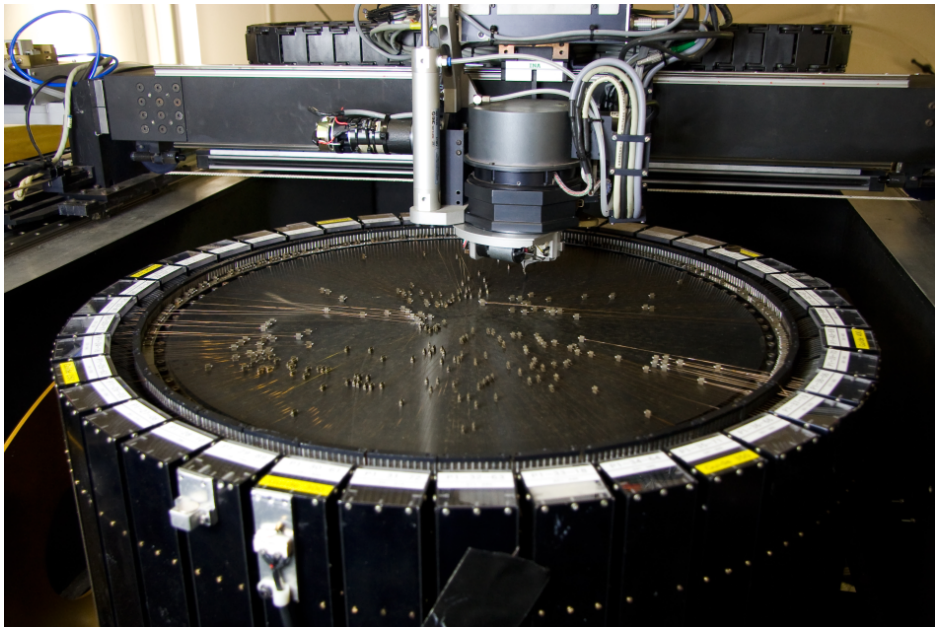


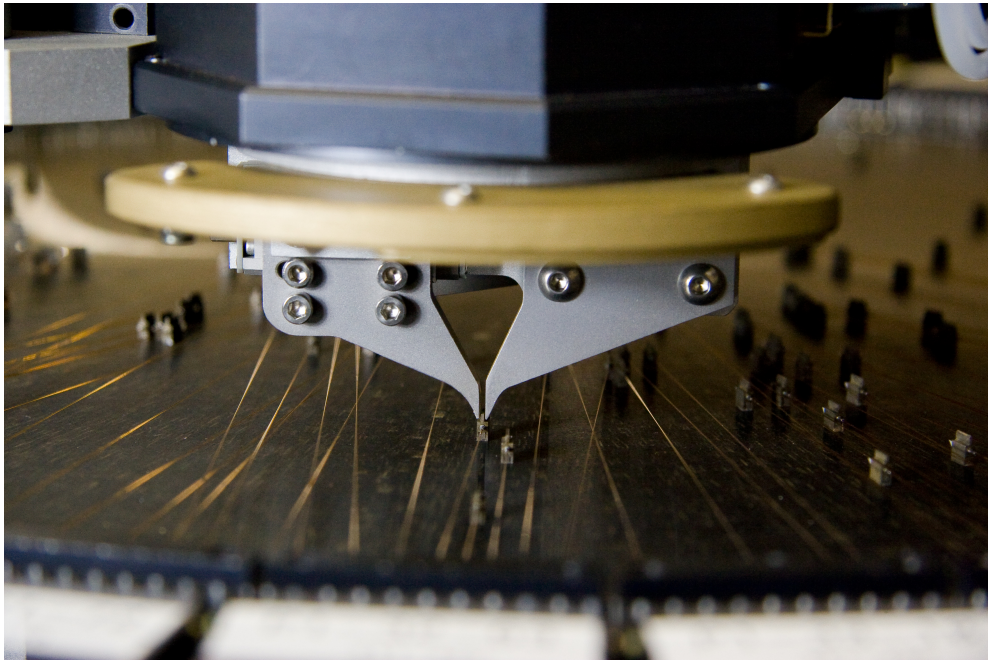
Multi-fibres with AAOmega+2dF...



- *3.9m **Anglo-Australian Telescope***
- *2 deg. field with ~300 science fibres.*
- ***Proposal**: low-res. M dwarf spectra of two full WTS fields (7hr+17hr)*
- *Likely awarded 4 partial nights.*

Robotic fibre-positioning...

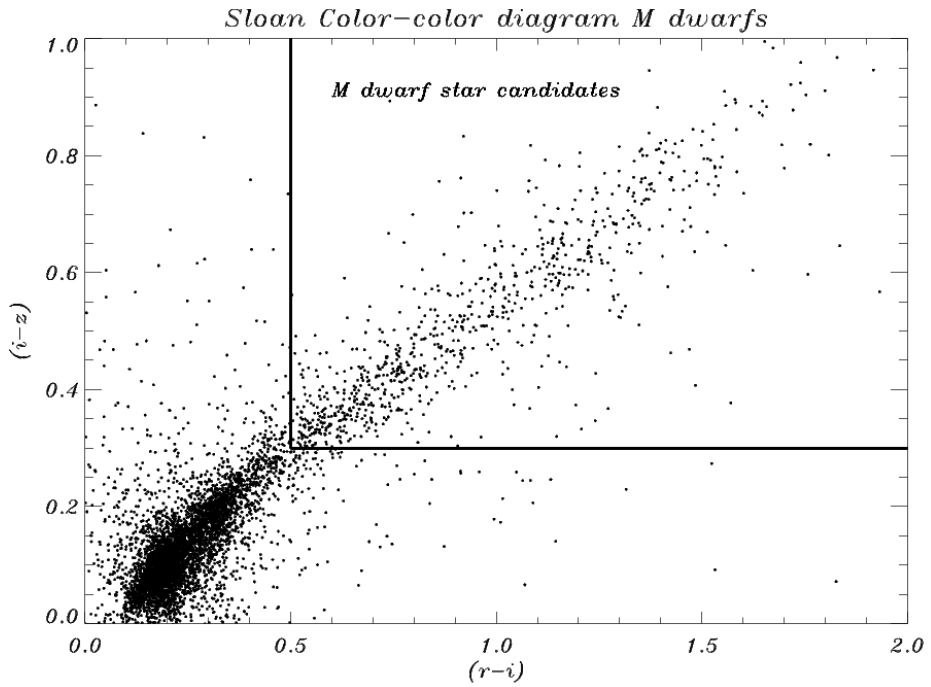




Challenges...

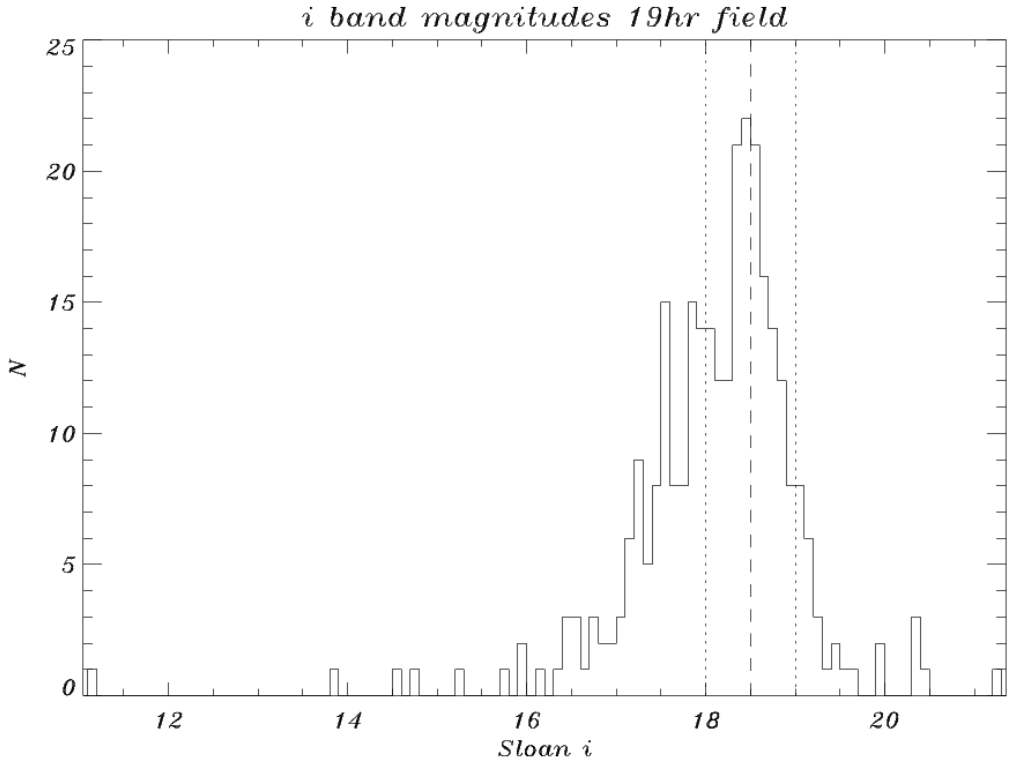
- Background subtraction & faintness of sources
- Target fields up for part of the night
- Non-uniform target sampling; avoiding fibre collisions...

Target selection...

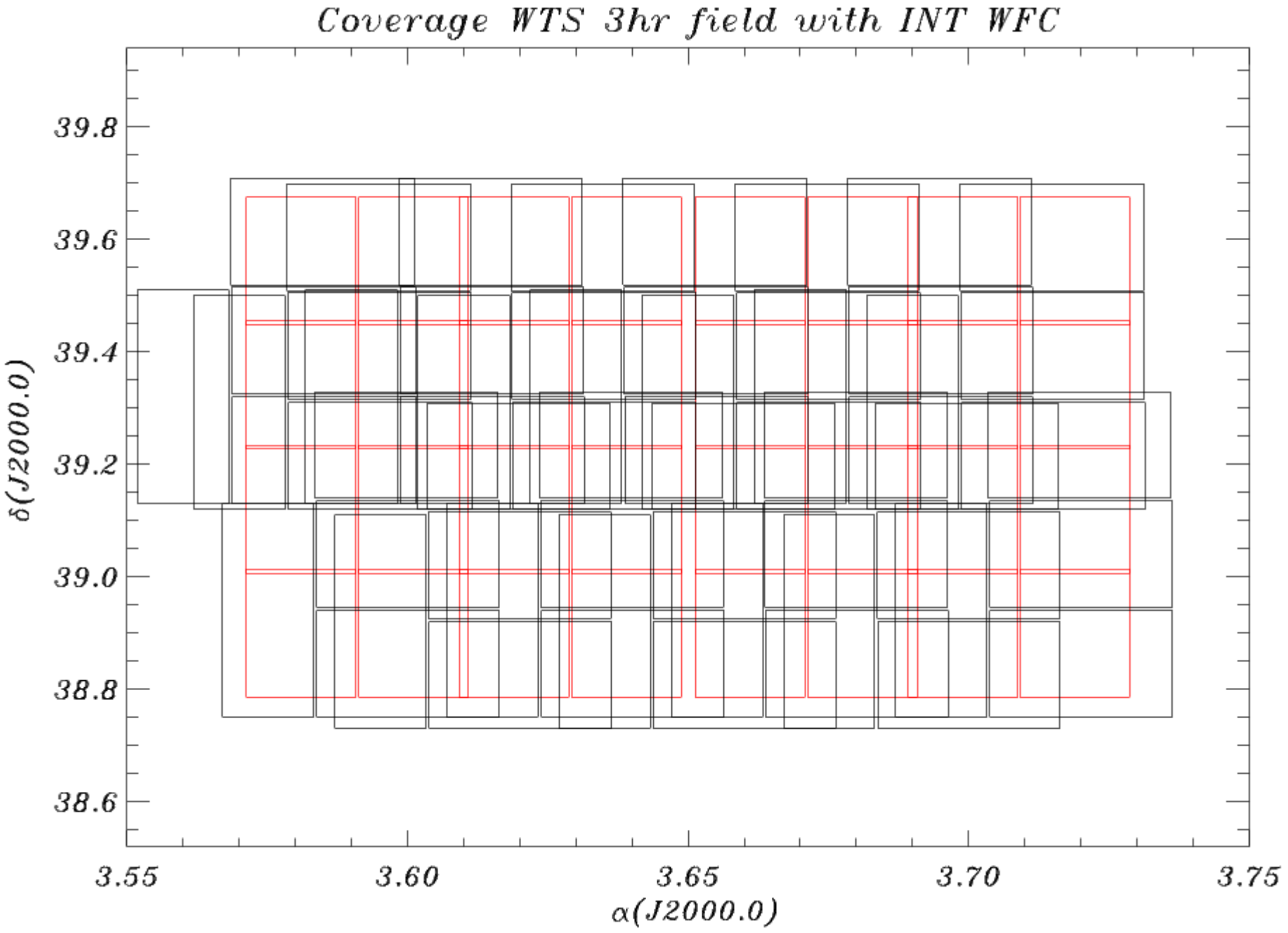


Sloan/INT colors...

Group bright/weak targets



Host star colors with the INT...



Thank you ;)!