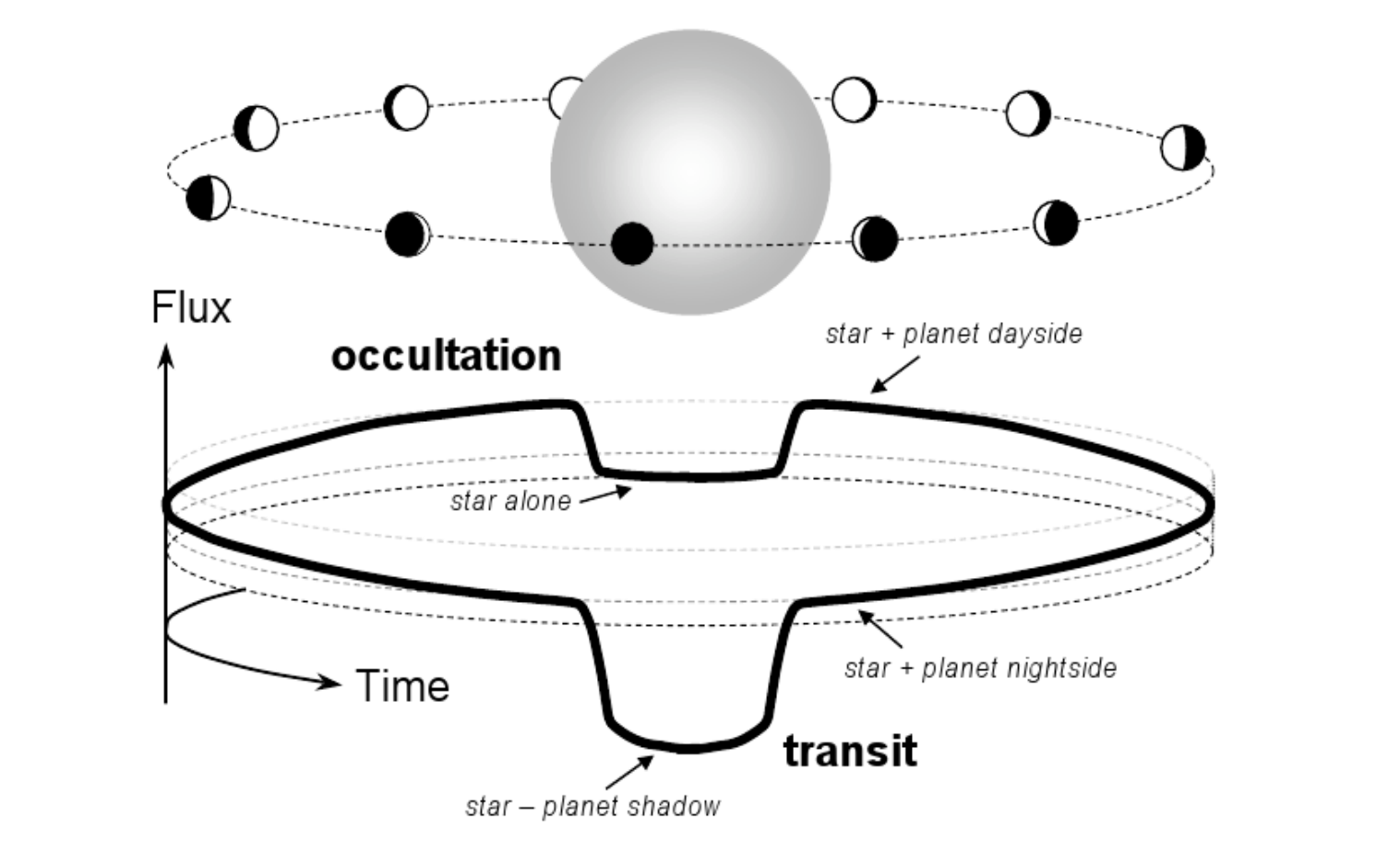
Some update on WTS data



J. Winn: Transits and occultations, astroPh, 2010

Gábor Kovács

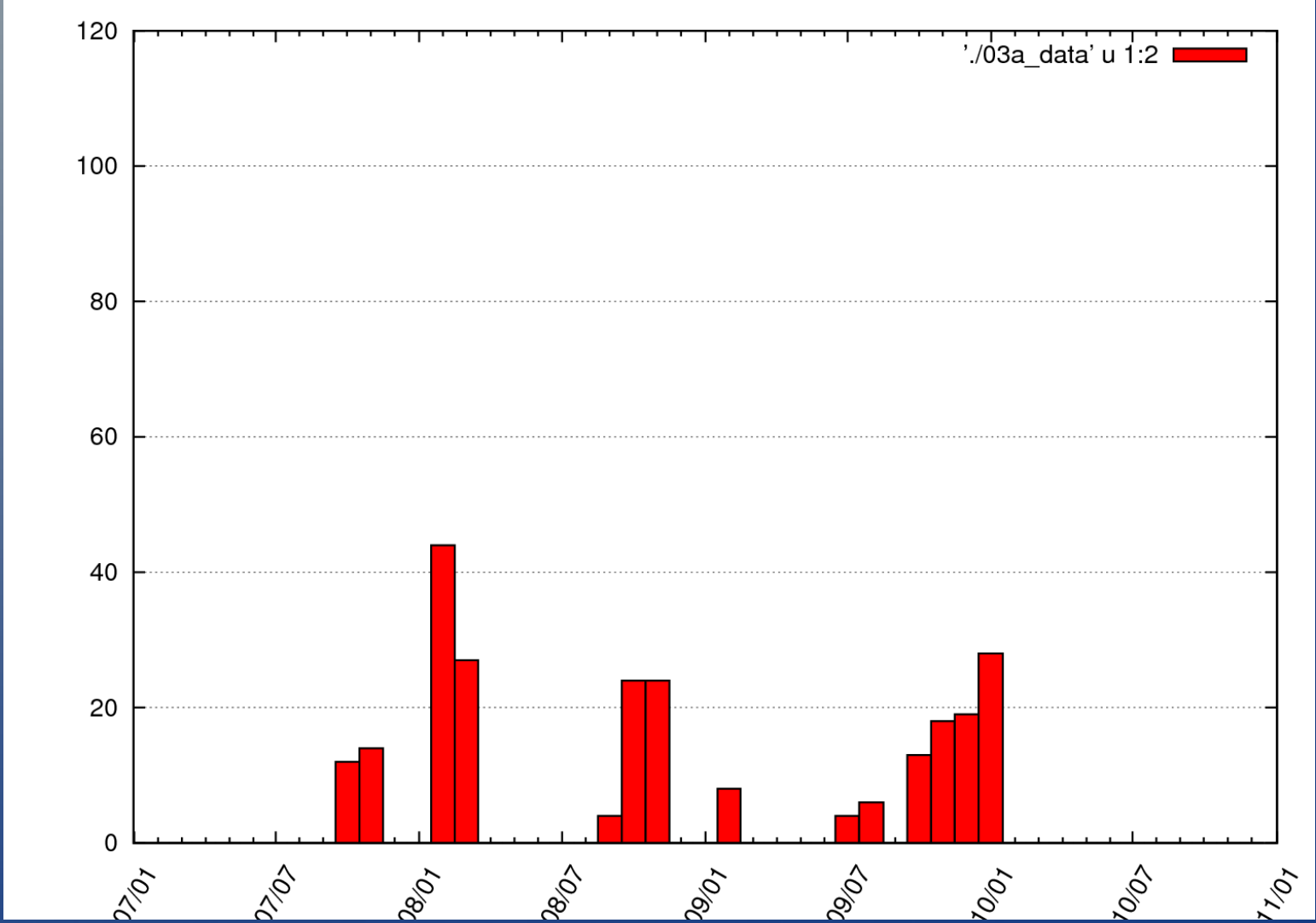
Overview

- Data accumulation
- Sensitivity analysis
- Problems
  - Outliers
  - Signal to red noise
  - Technical
- Release 3.0 plan ?

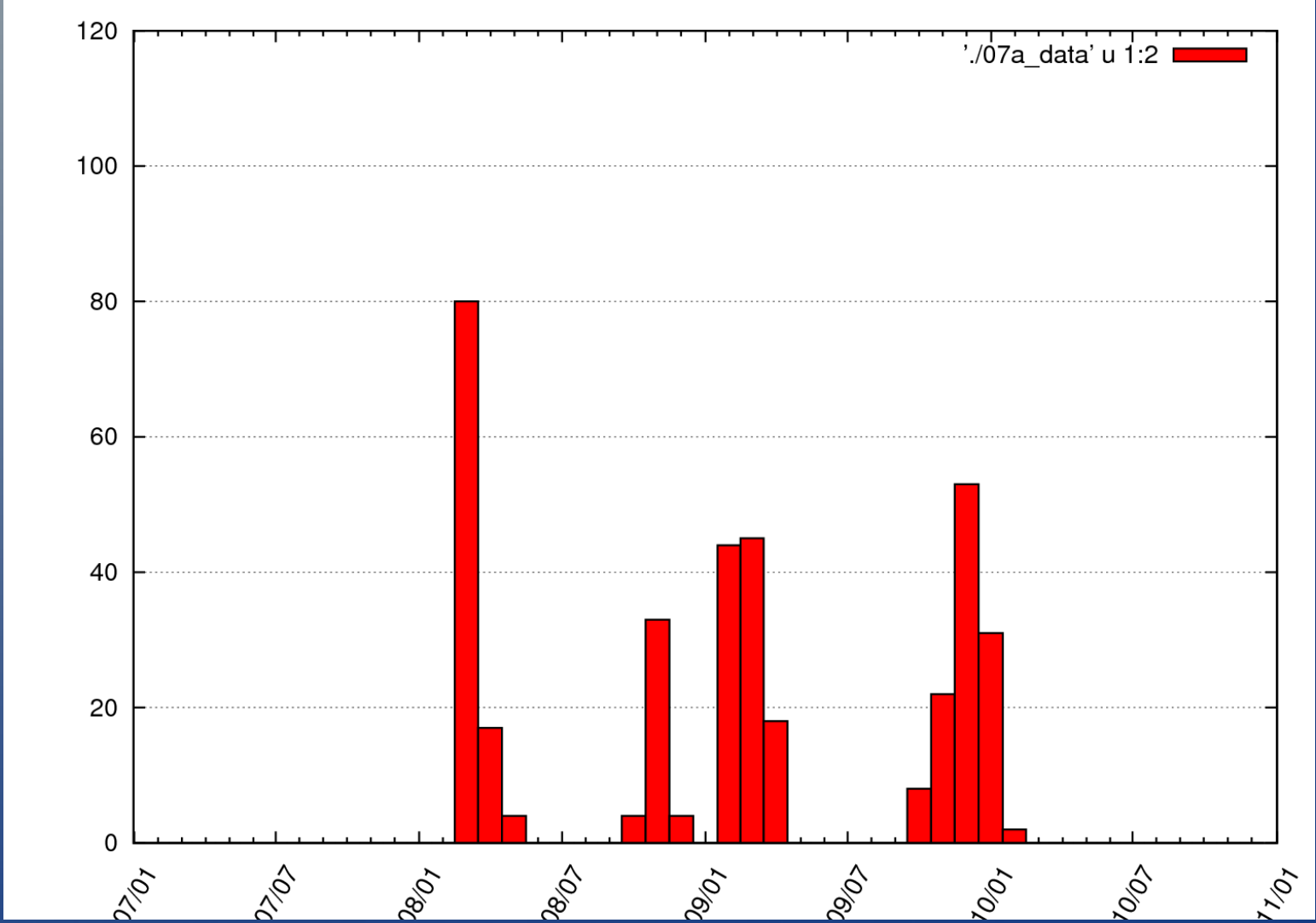
Data accumulation

- UKIRT operation
  - almost became victim of budget cutting
  - 40 nights from 2010
- priority:
  - finish big surveys: (even) lower priority for WTS
- 2010: not too many new epochs

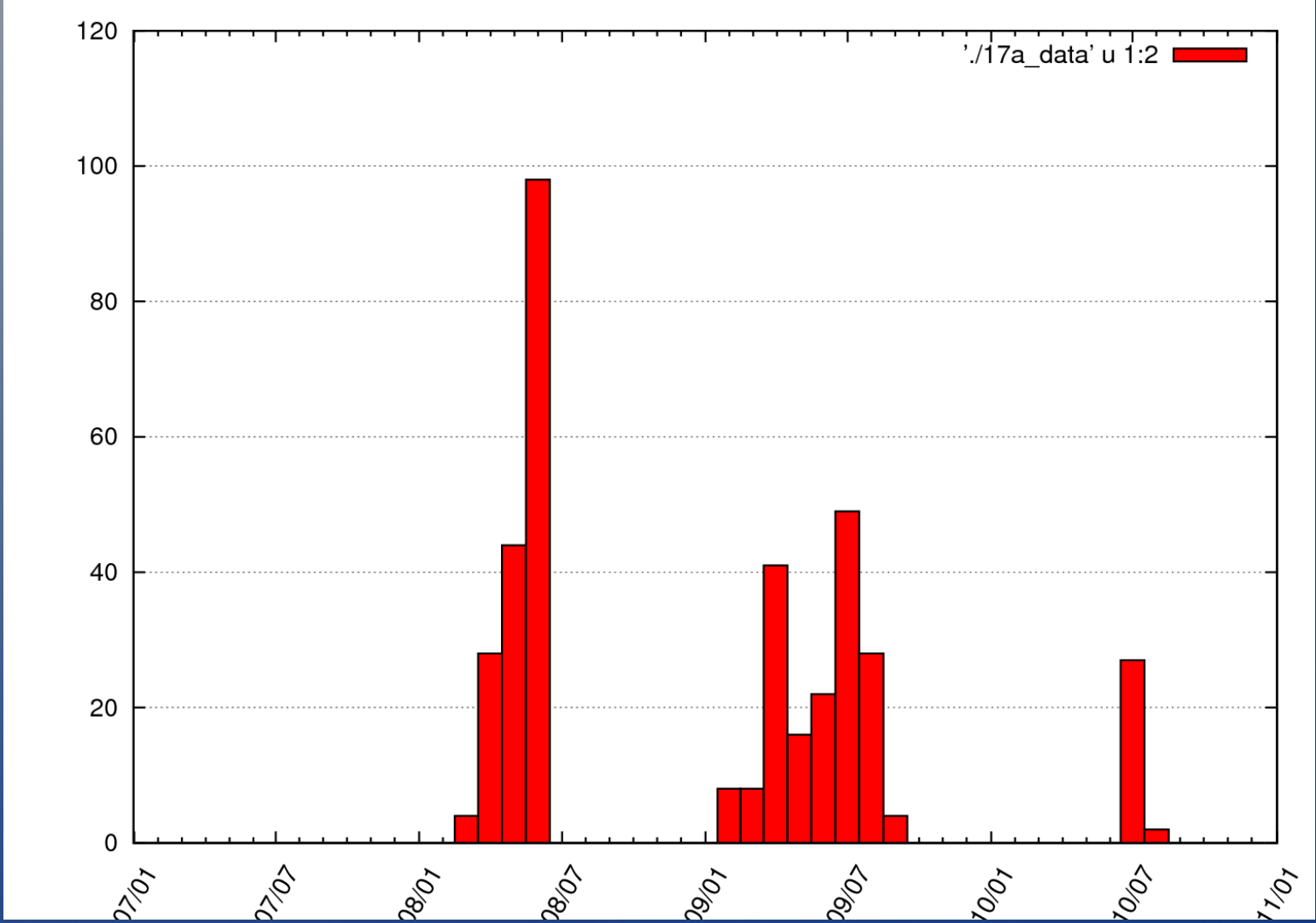
Monthly data accumulation
03h: 245



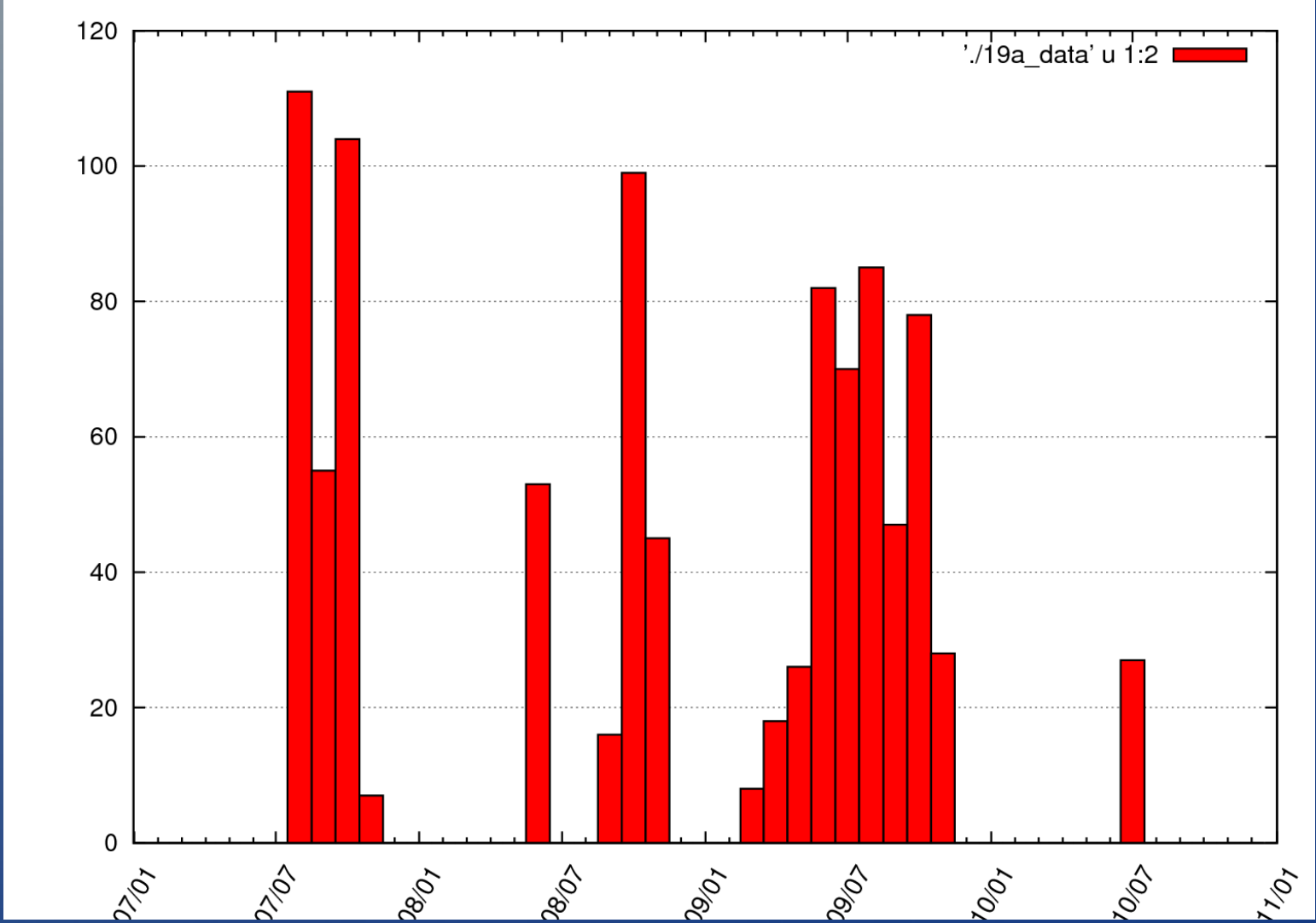
Monthly data accumulation
07h: 365



Monthly data accumulation
17h: 379

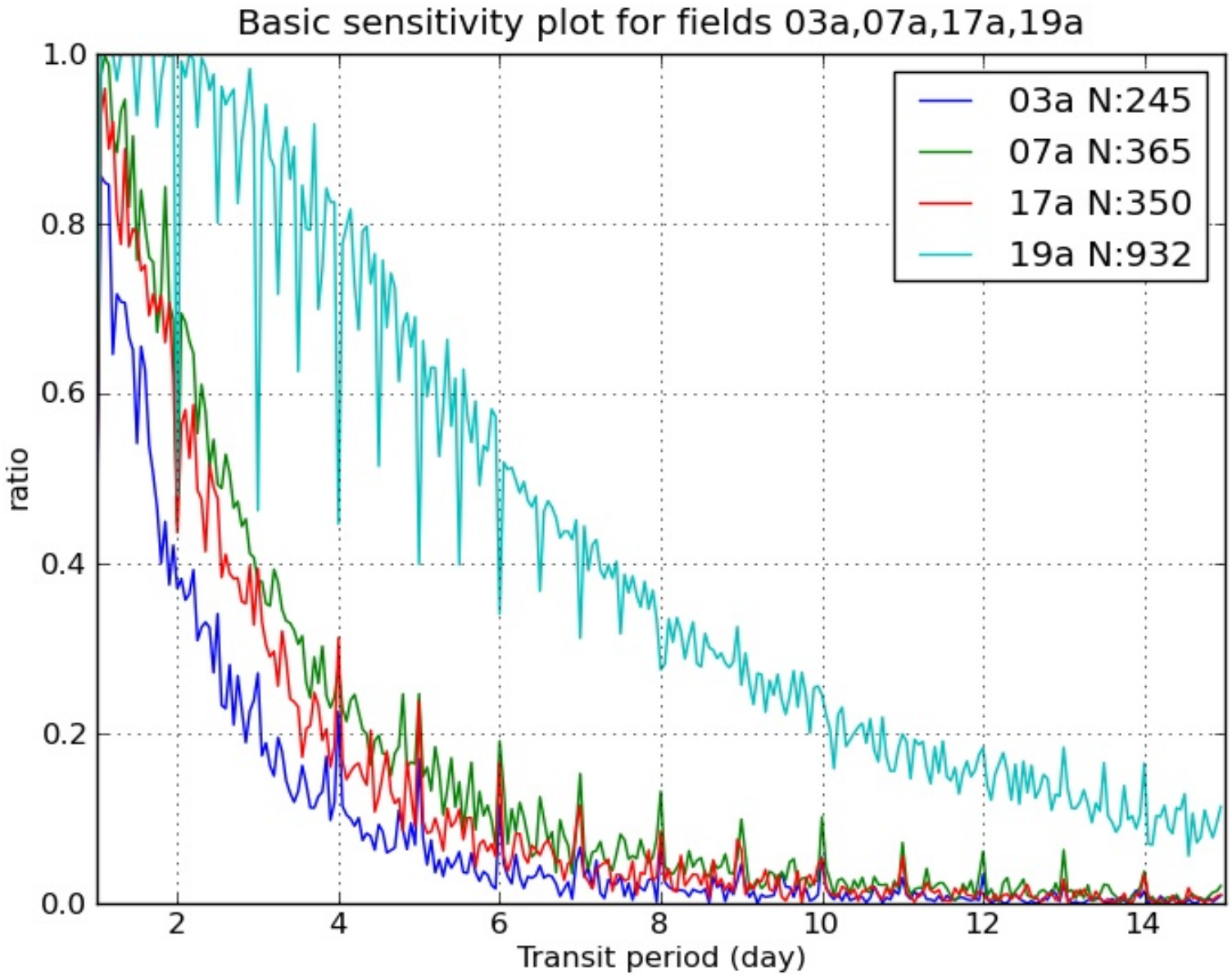


Monthly data accumulation
19h : 959



Basic sensitivity analysis

- Depending on observation schedule, what is the ratio of detection of a transit in random phase
- Optimistic approach
  - At least one point in 3 different transit events
  - Box shape
  - Perfect detection (no noise, systematics...)
- Tells nothing about the detection probability of a certain system


Basic sensitivity plot for fields 03a,07a,17a,19a
03a N:245
07a N:365
17a N:350
19a N:932
ratio
Transit period (day)
1.0
0.8
0.6
0.4
0.2
0.0
2
4
6
8
10
12
14

Signal to red noise

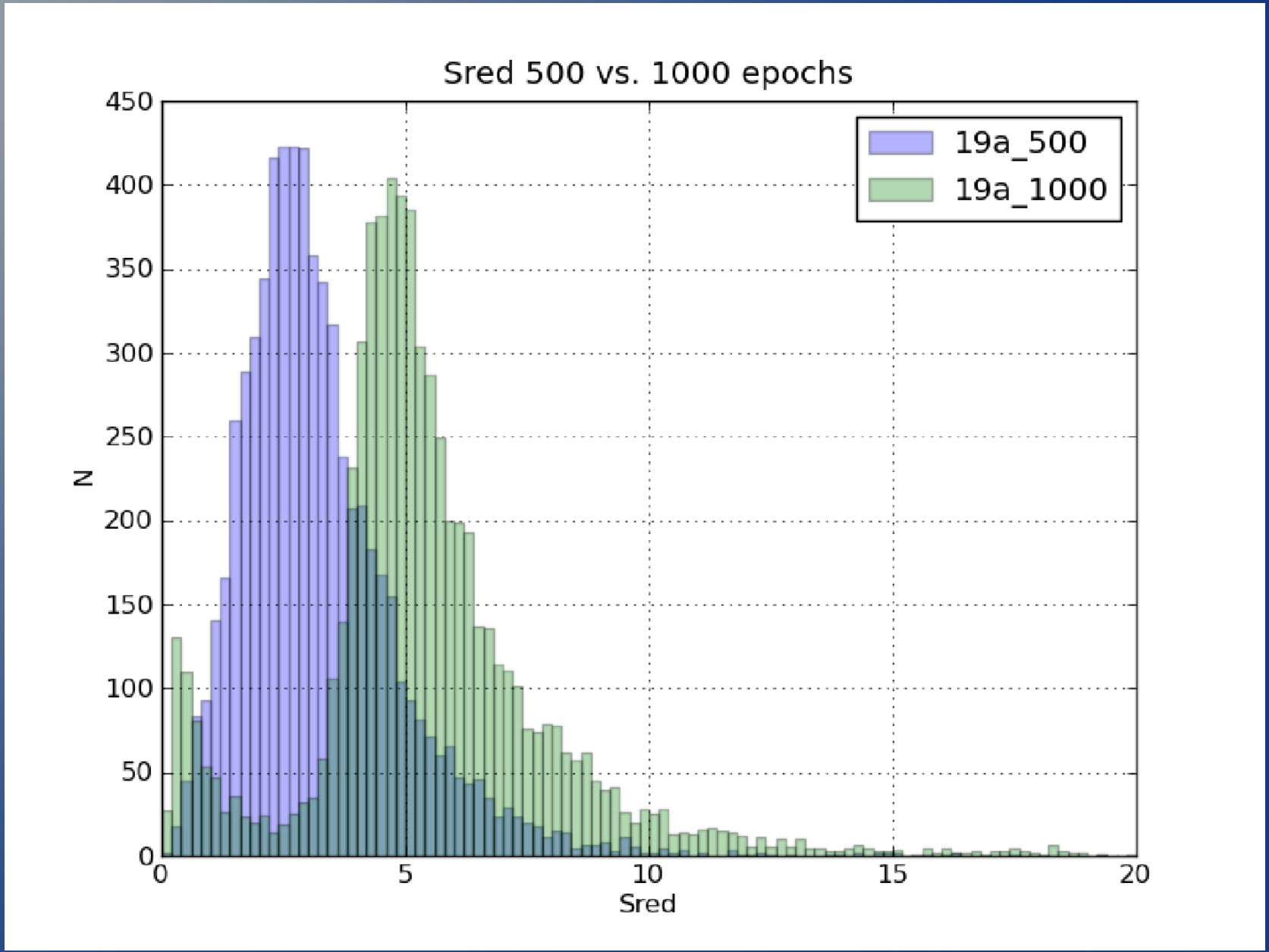
- Idea and method inherited from the Monitor pr.
- Correlated noise
  - block diagonal matrix assumption: independent nights
  - estimation by a sliding interval

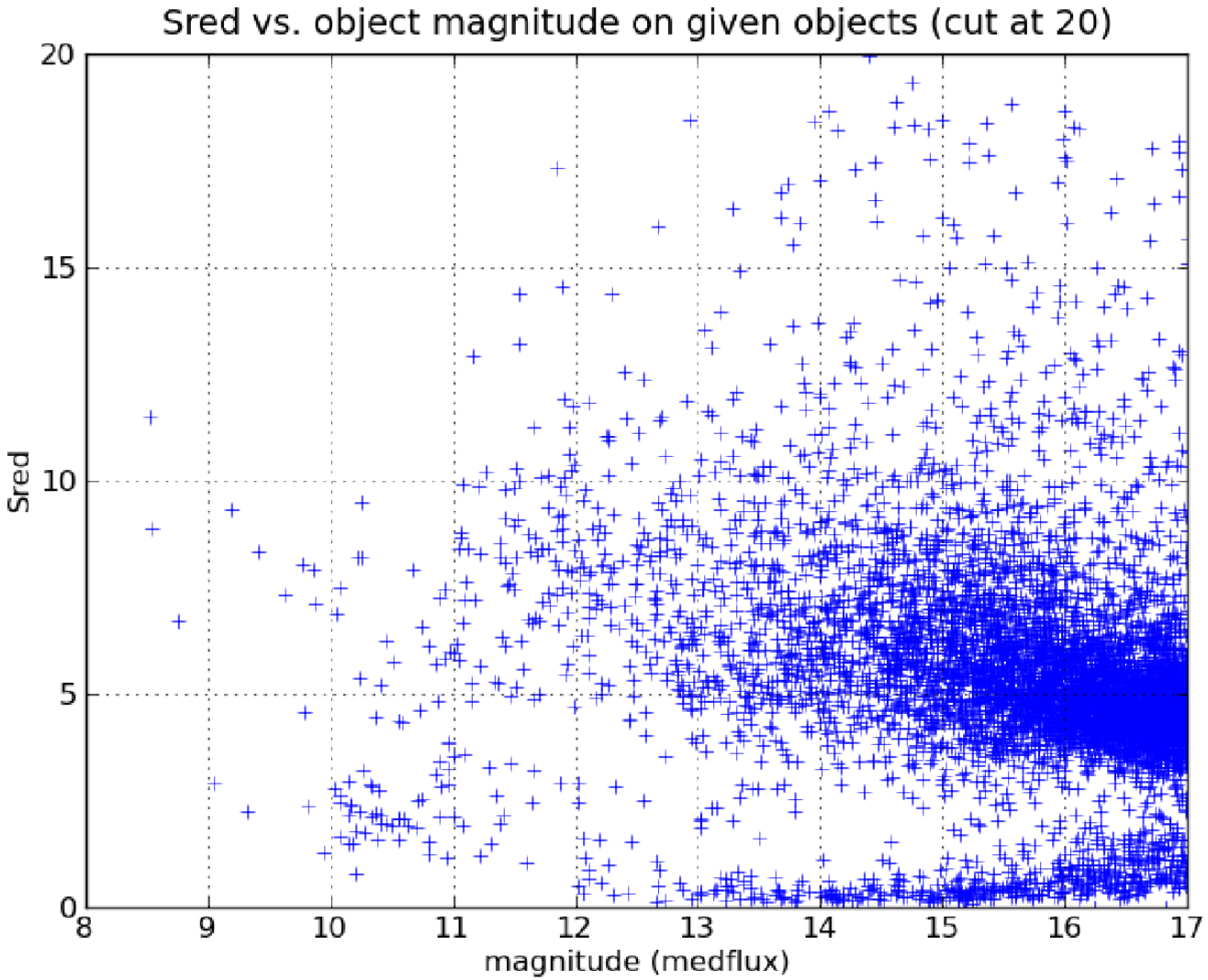
$$S_r = \frac{d}{\sqrt{\frac{\sigma_0^2}{n} + \frac{1}{n^2}\sum_{i \neq j} C_{ij}}}$$

- Algorithm may not be suitable for our dataset

Outliers

- Values off by 1 magnitude
  - Distracts transit detection: including this point in the “signal” rules out every other possibility
  - Adds a big offset to signal to red noise detection statistic: contaminates statistical analysis


Sred 500 vs. 1000 epochs
19a_500
19a_1000
N
Sred
0
50
100
150
200
250
300
350
400
450
0
5
10
15
20


Sred vs. object magnitude on given objects (cut at 20)
Sred
magnitude (medflux)
0
5
10
15
20
8
9
10
11
12
13
14
15
16
17

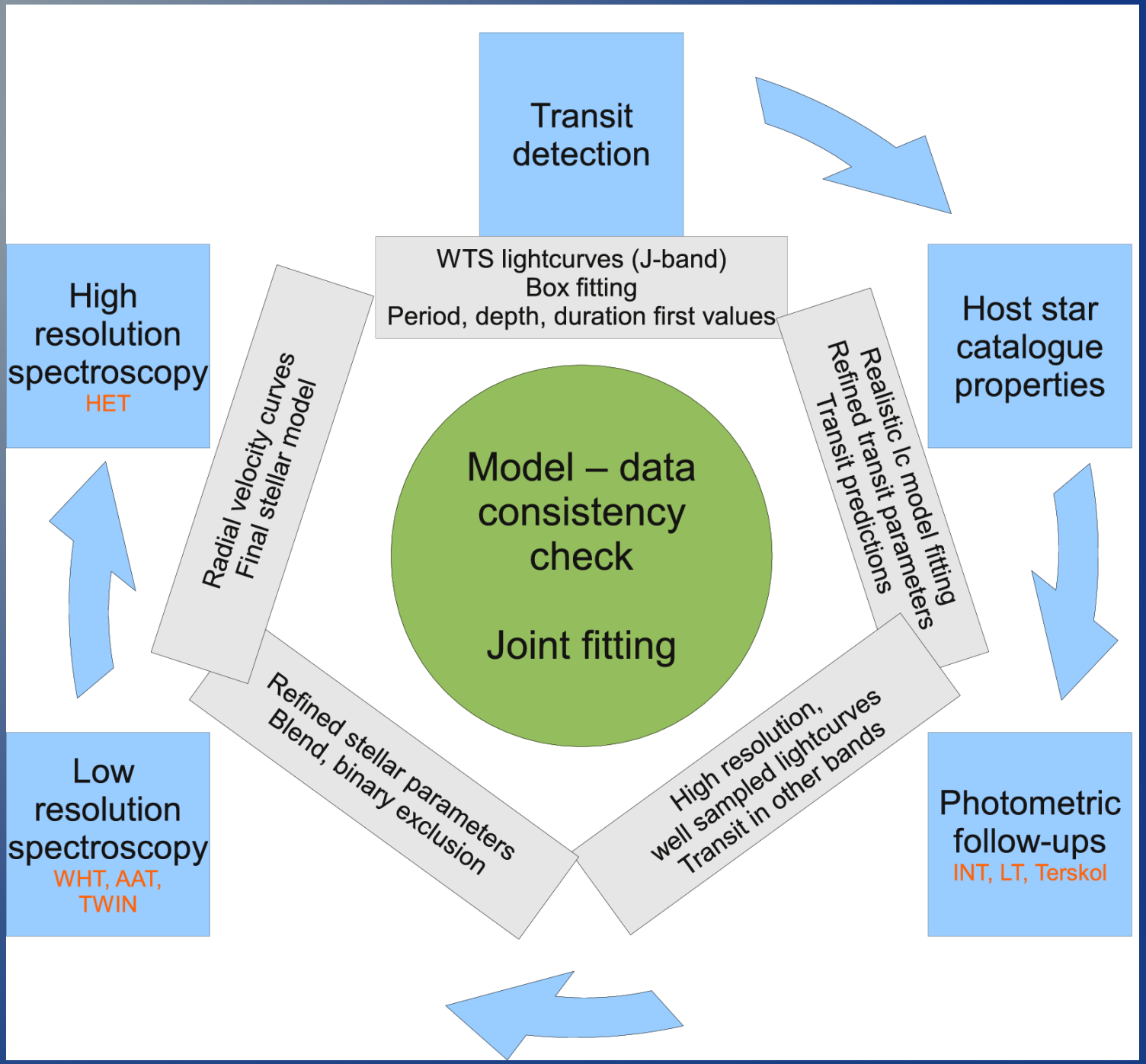
Advanced simulation

- Goals:
  - sensitivity to certain systems
    - significance of null detection
  - sensitivity to pipeline options (false -/+ ratio)
    - thresholds
    - including/excluding steps
- How:
  - adding simulated transit data to “flat” light curves
  - running real pipeline

Release 3.0

- Catalog fixed
- Lightcurves: probably more editions
  - raw
  - outlier filtered / “distilled”
- Candidate list: resolved technical issues
- Timing: end of year?

Thank you !


Transit detection
WTS lightcurves (J-band)
Box fitting
Period, depth, duration first values
Host star catalogue properties
Realistic lc model fitting
Refined transit parameters
Transit predictions
Photometric follow-ups
INT, LT, Terskol
High resolution, well sampled lightcurves
Transit in other bands
Low resolution spectroscopy
WHT, AAT, TWIN
Refined stellar parameters
Blend, binary exclusion
High resolution spectroscopy
HET
Radial velocity curves
Final stellar model
Model – data consistency check
Joint fitting