



From CoRoT light curves to candidates & planets

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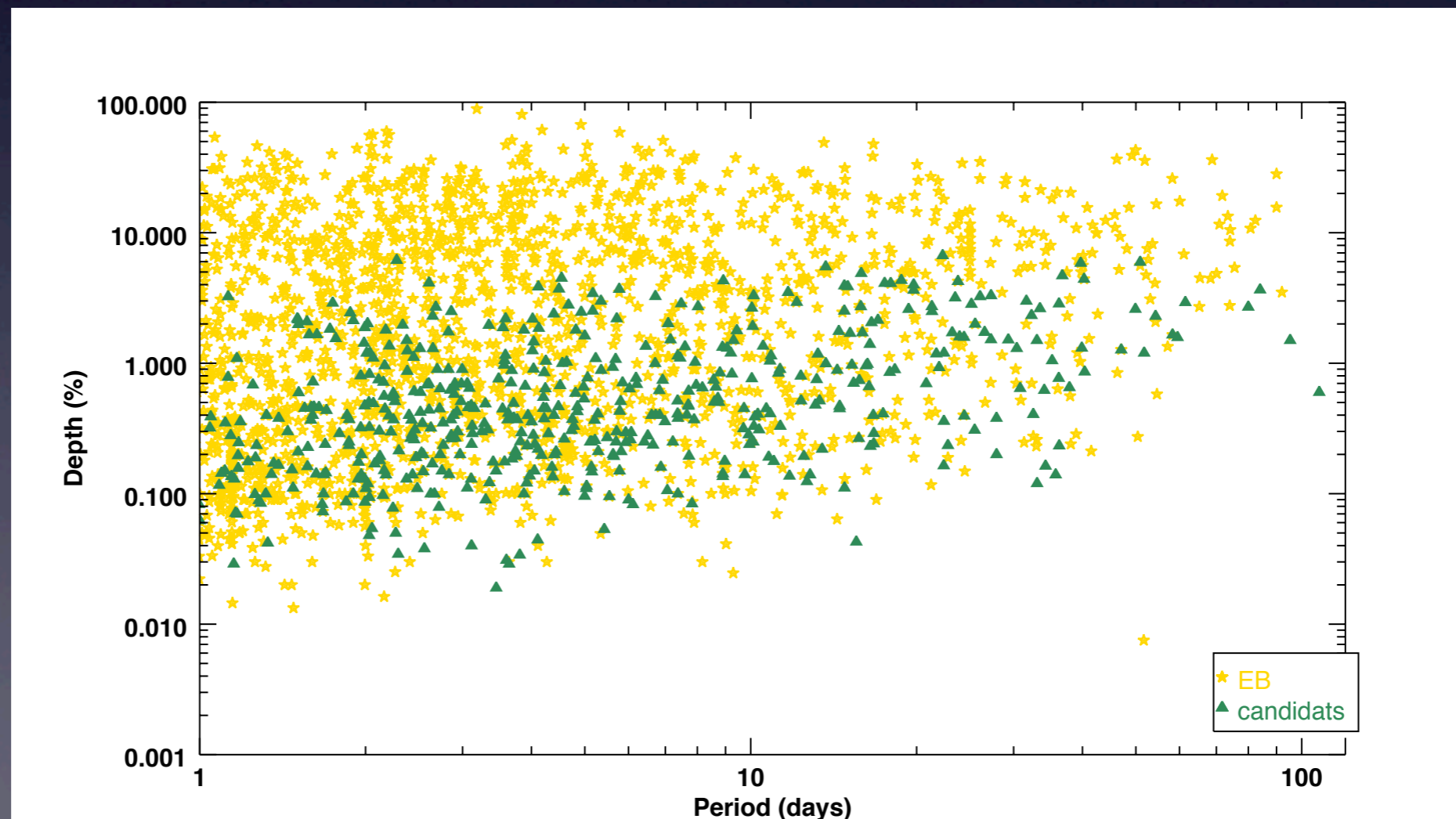
Transit signals in CoRoT light curves

No official CoRoT pipeline in charge of the transit detection but different teams in labs

Different filtering techniques and detection algorithms

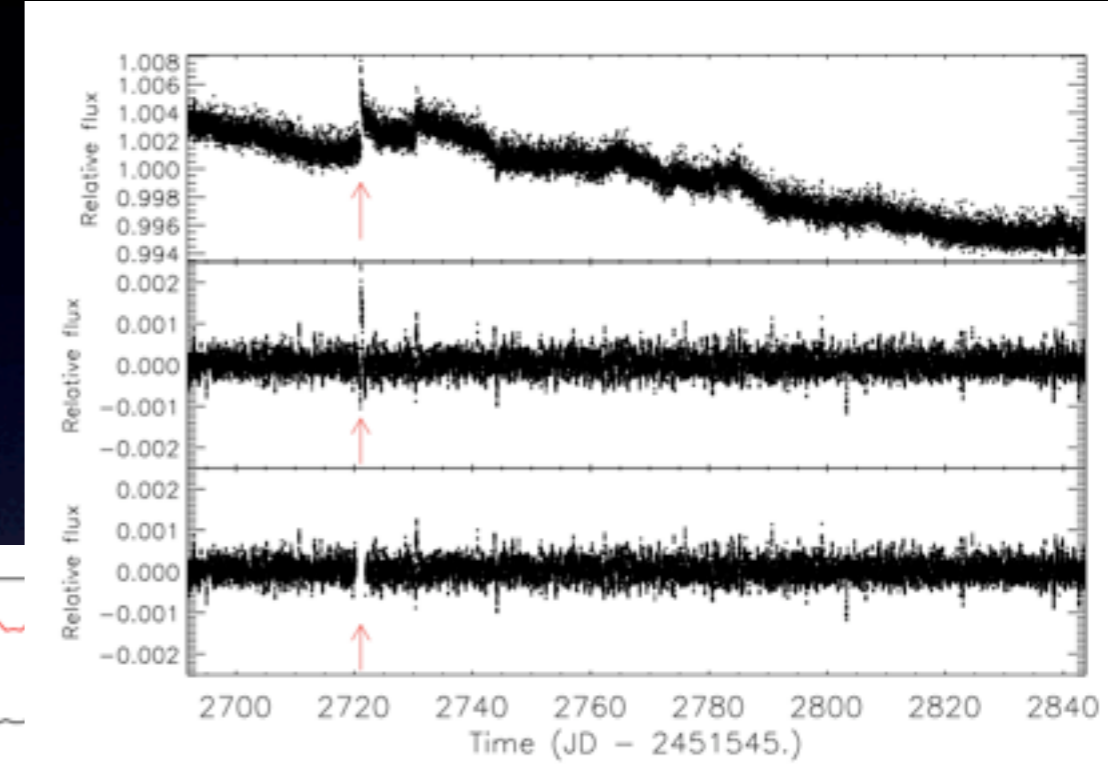
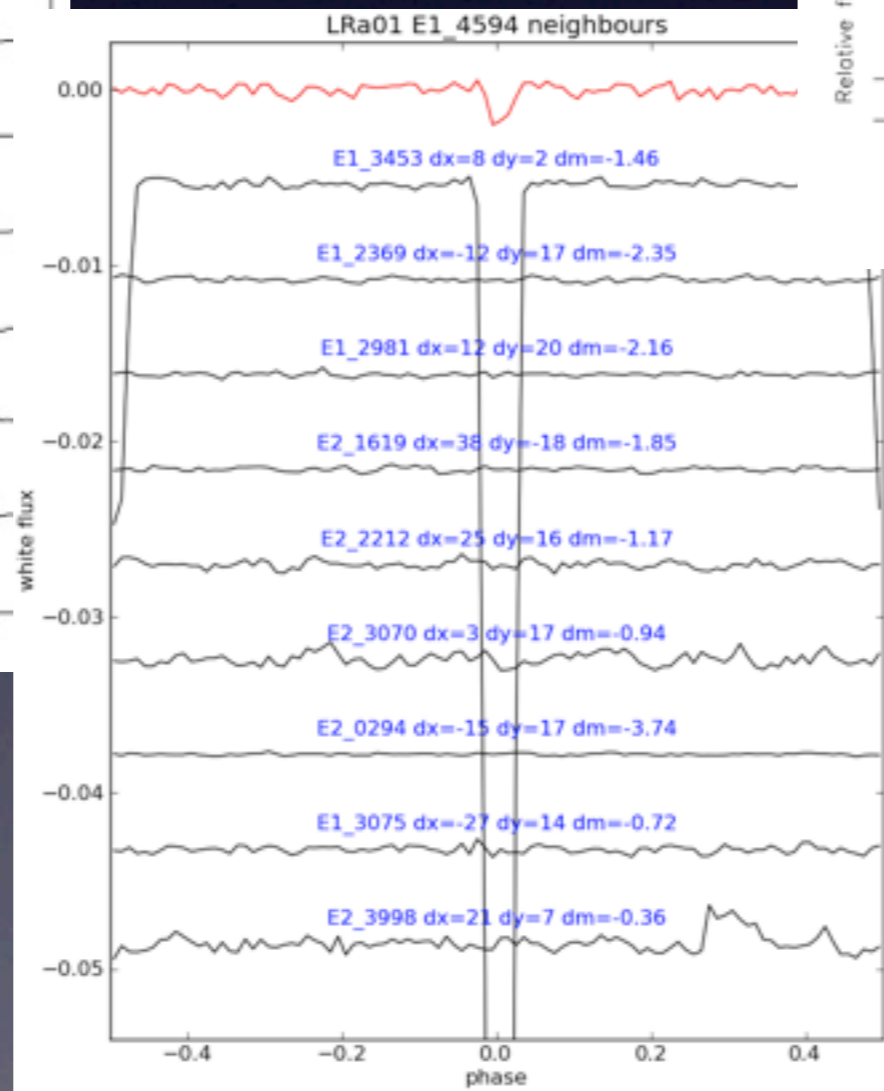
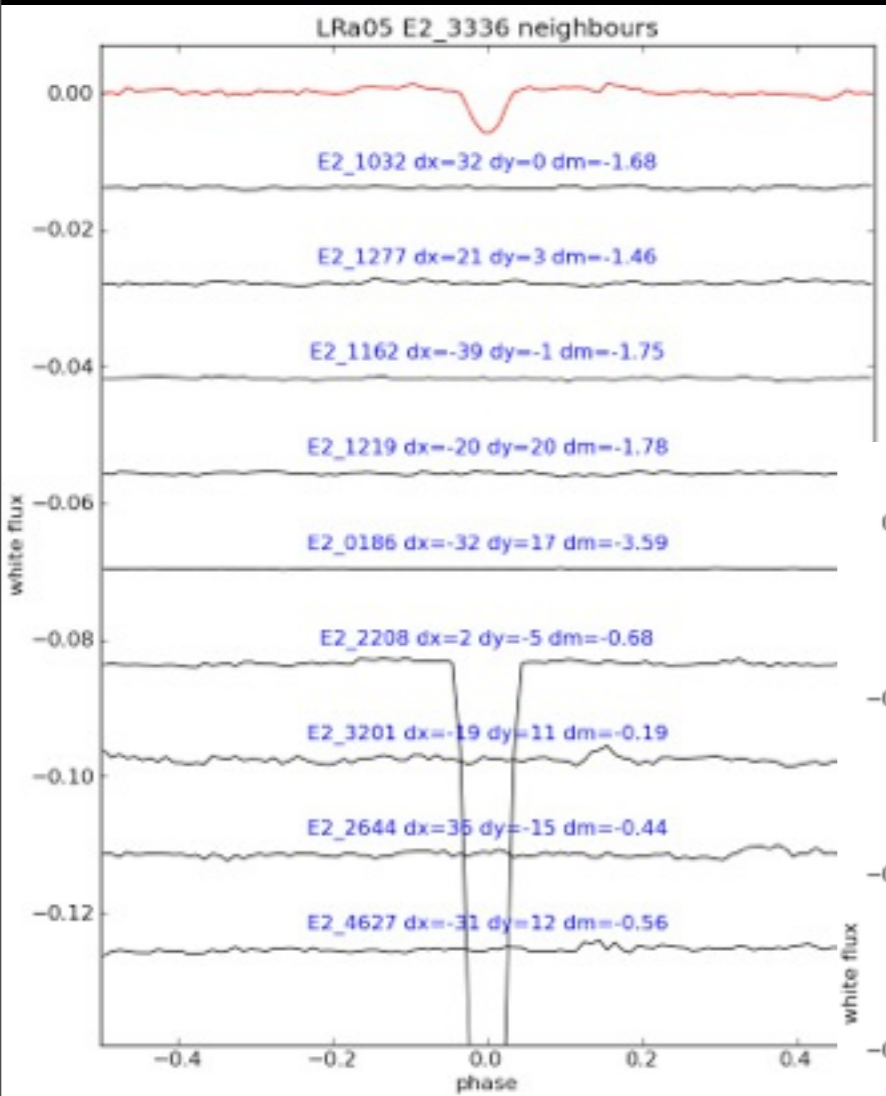
3451 transit-like signals in the 19th first runs:

- 2886 obvious eclipsing binaries - 83%
- 565 candidates flagged for follow-up observations
 - 27 single transit events - 5%



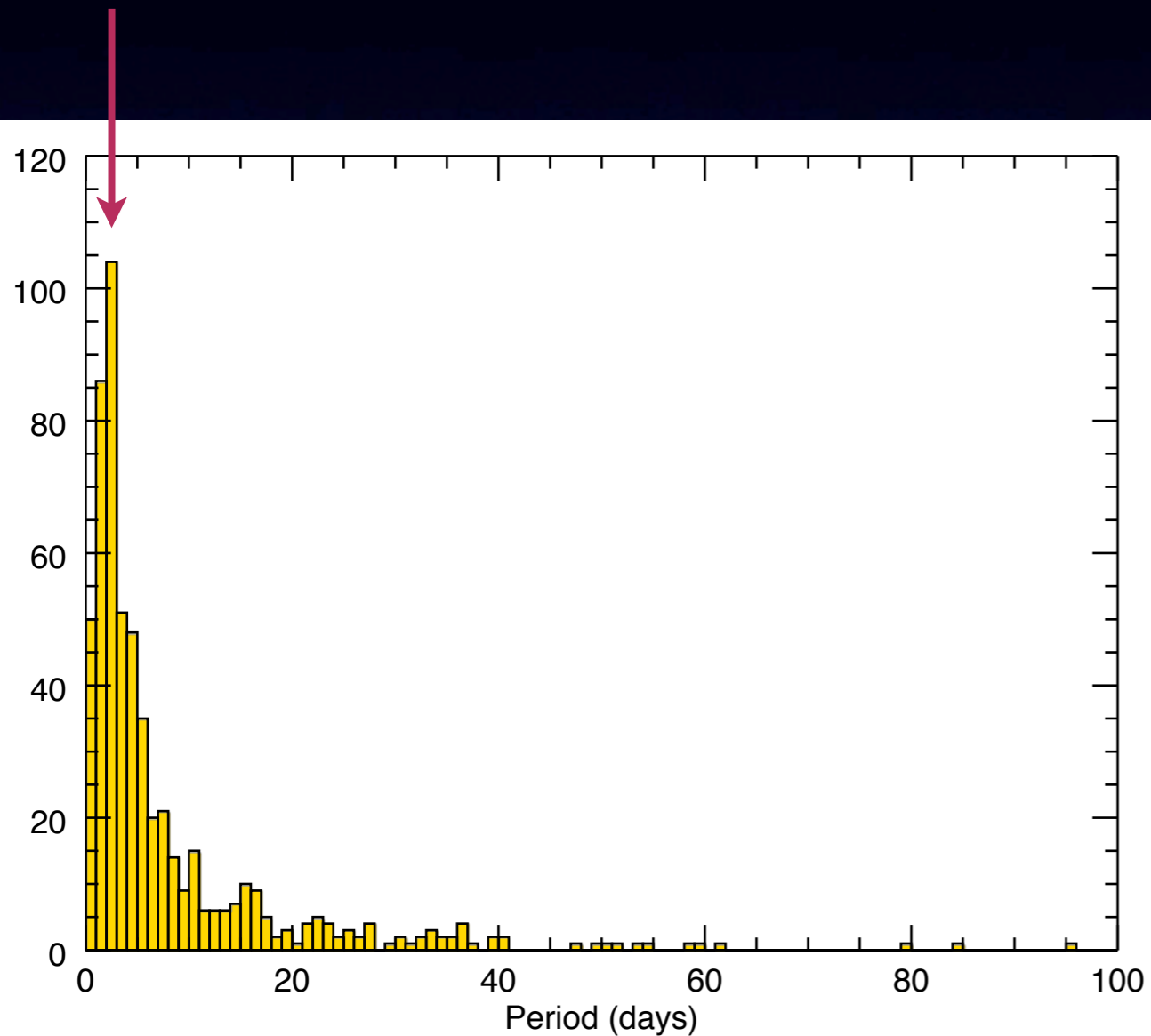
Transit ghost signals

20 candidates excluded as false positive
11 candidates are false detection

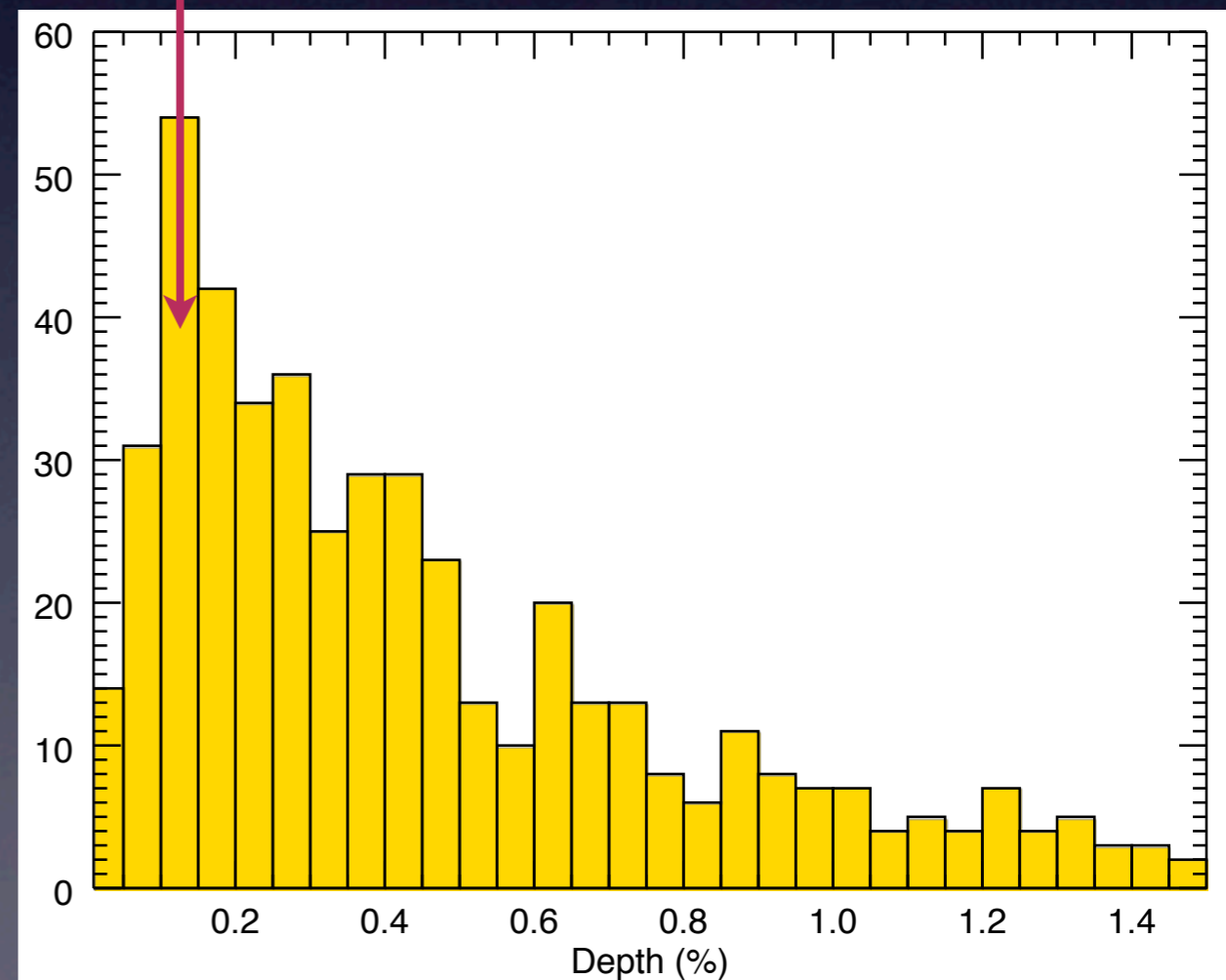


Candidates properties

2.2 days

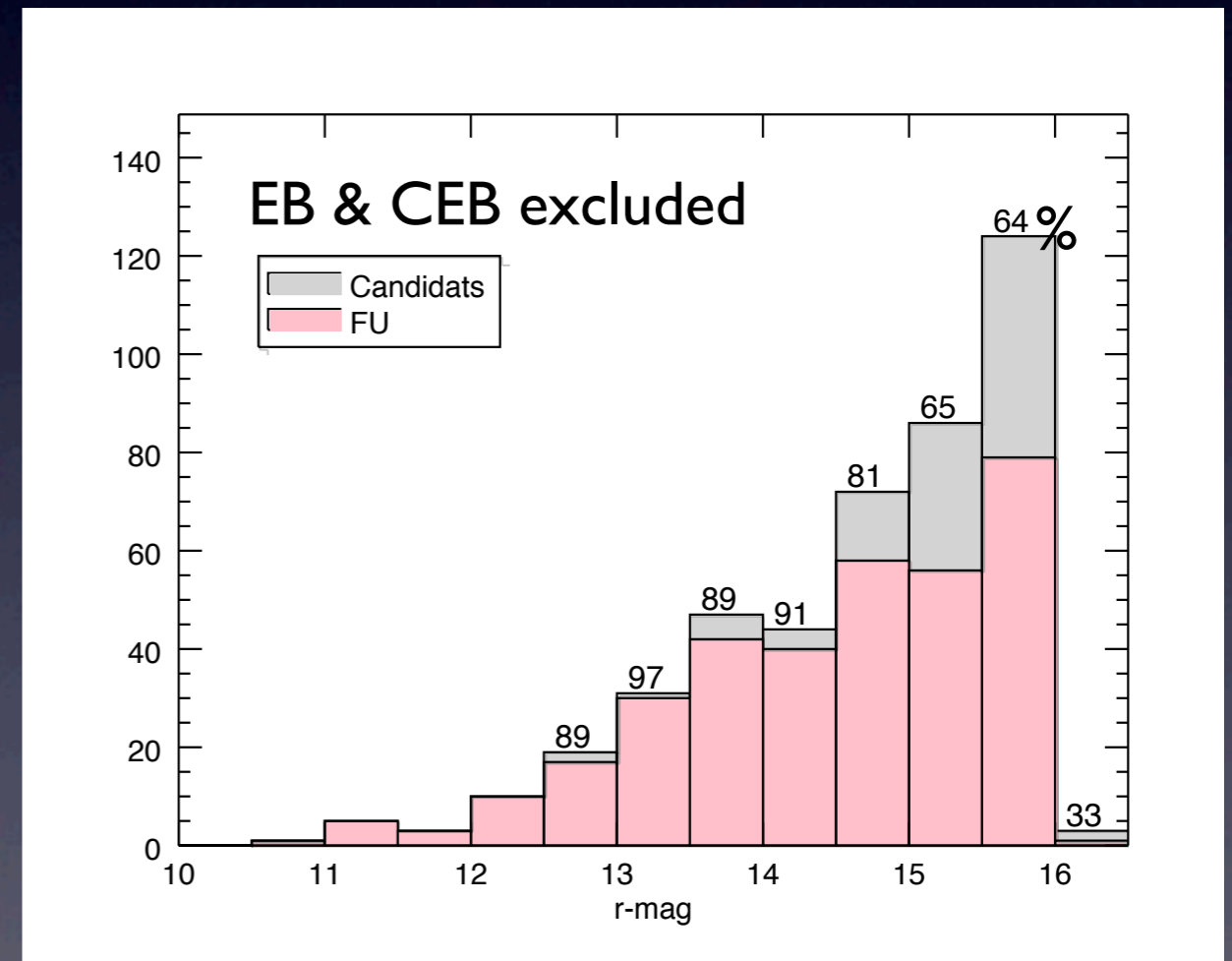
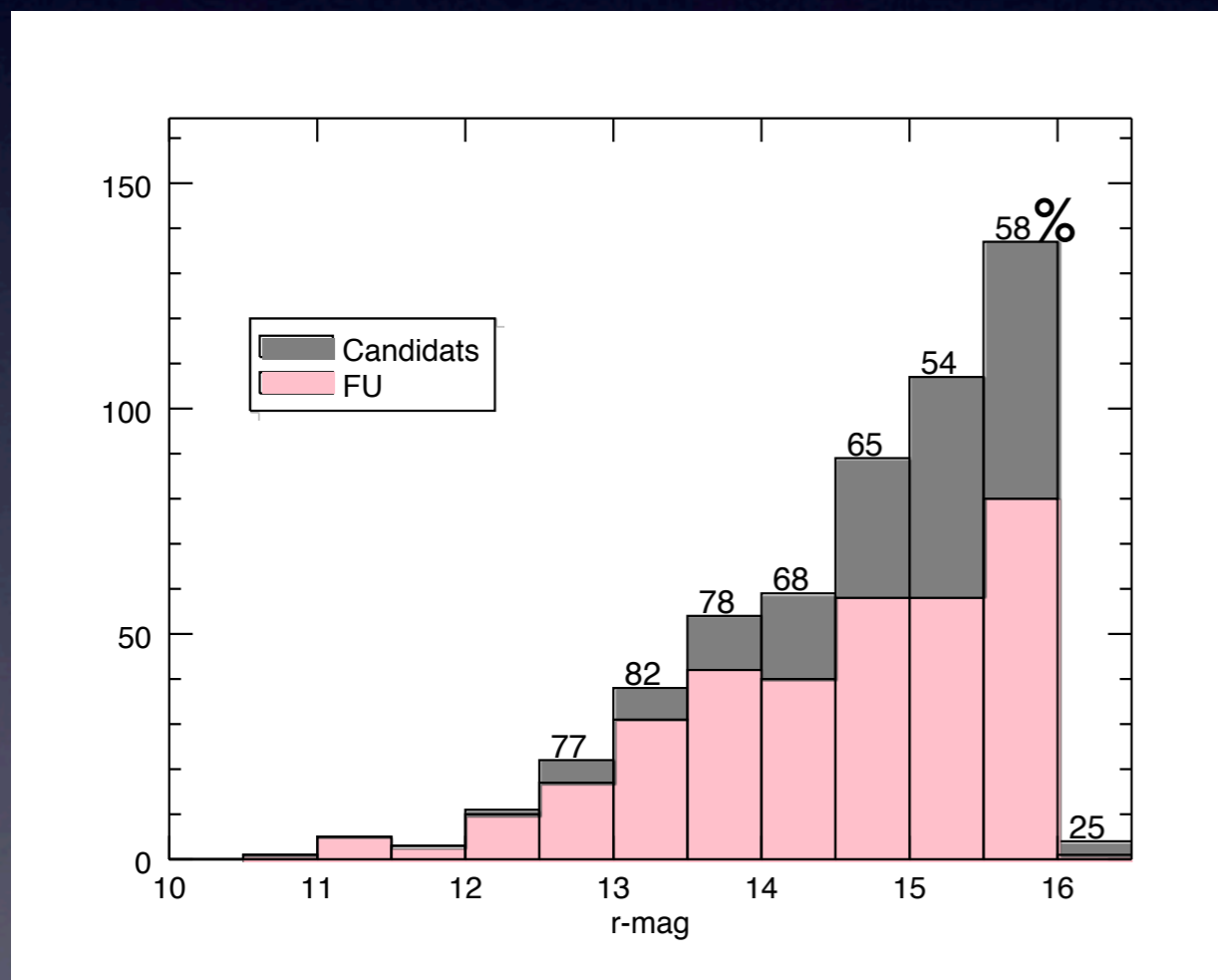


0.125 %



Follow-up observations

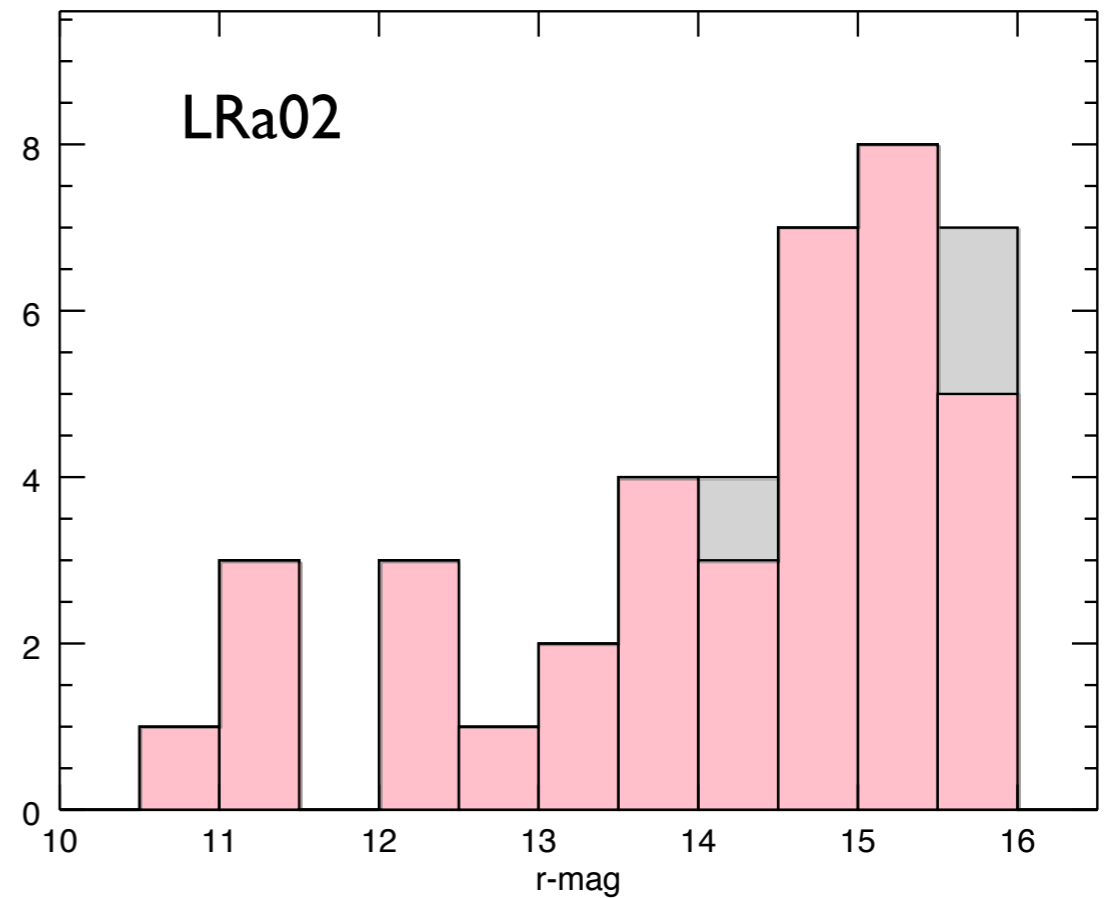
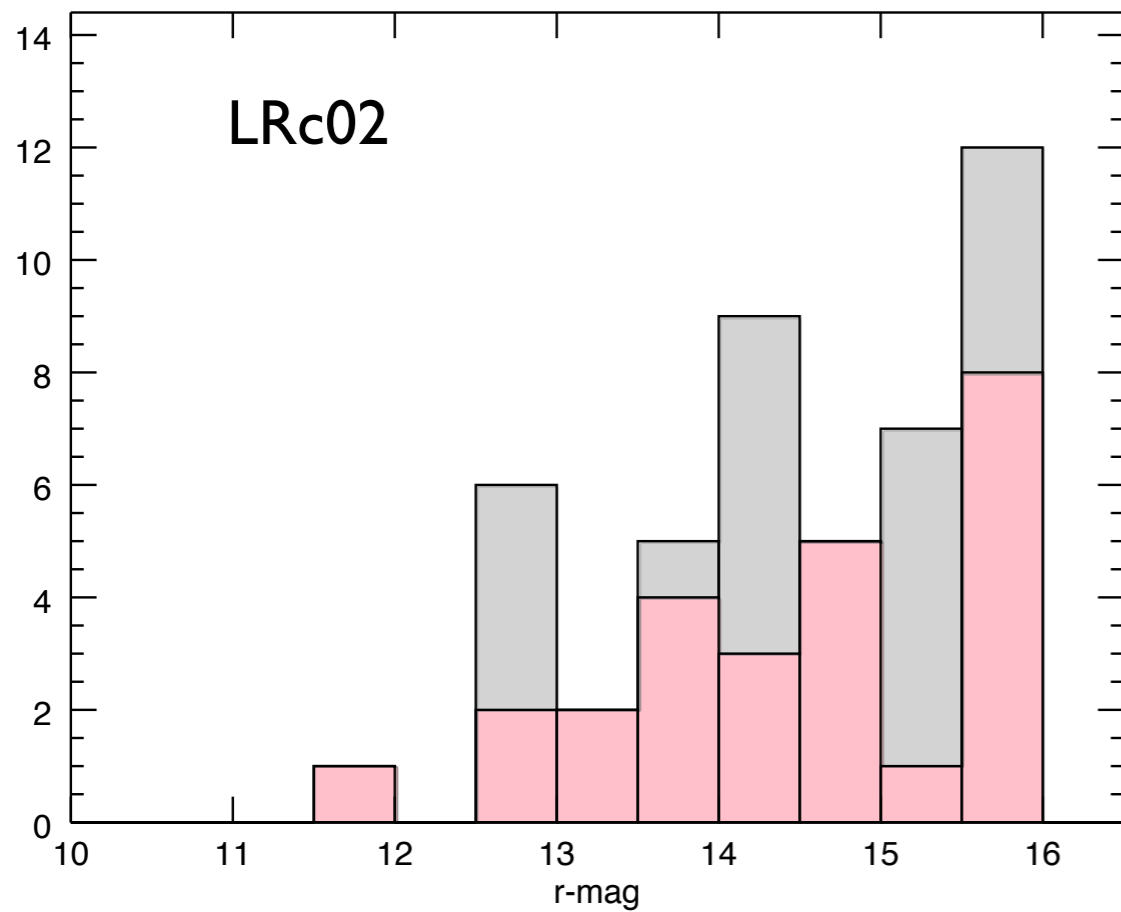
66 % of the candidates observed by ground-based facilities (354 out of 533 candidates) : high contrast imaging, radial velocity, spectroscopy ...
77% in the anti-center and 59 % in the center fields



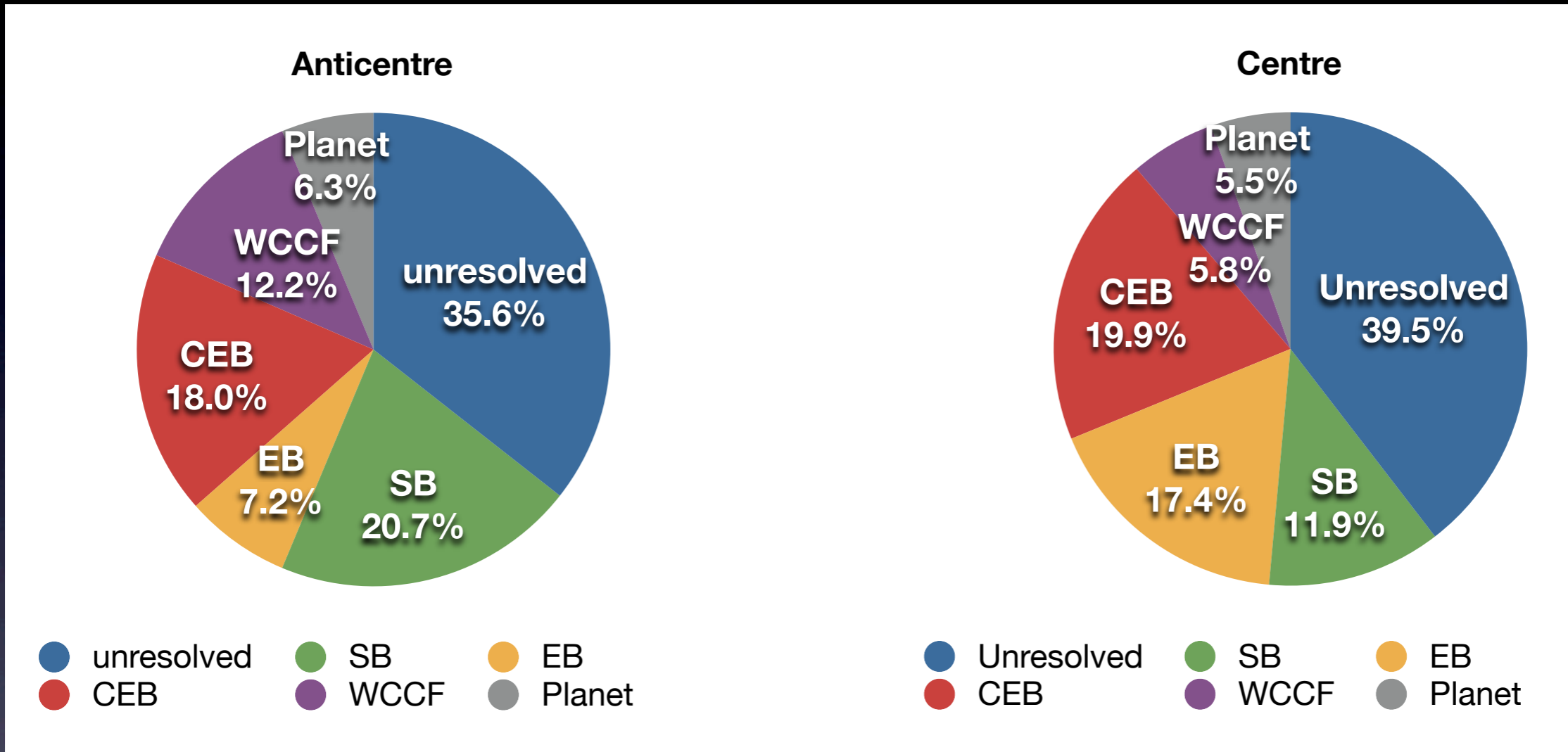
69 EB and CEB identified through LC analysis
→ Completeness of FUp observations is 77 %

Follow-up “completeness”

LRc02 : 65% of the candidates followed up, 98% in the LRa02
some bright candidates added recently
otherwise EB or diluted EB identified through a second order LC analysis



Outcomes of follow-up observations



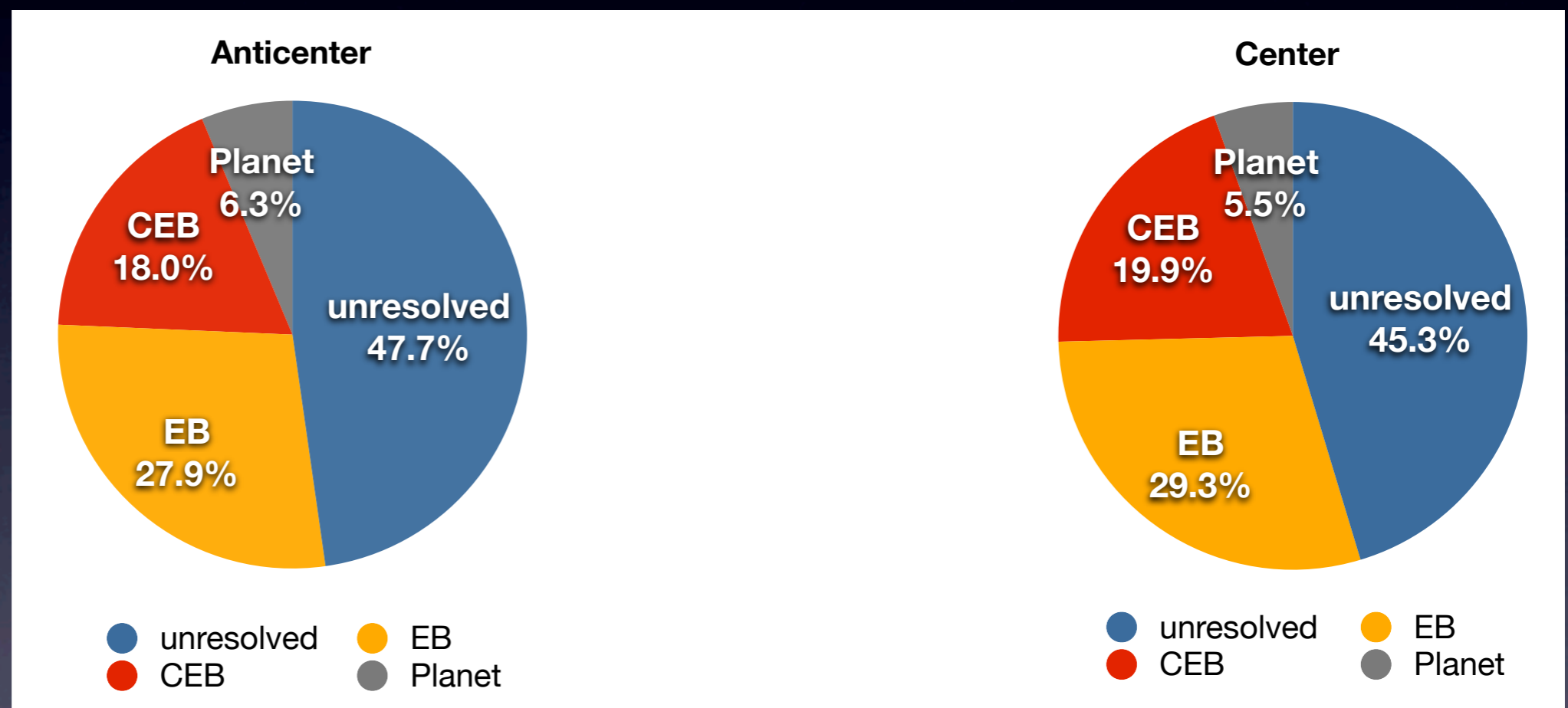
unresolved : no follow-up observations or inconclusive observations
Planets : ~ 6%

False positives

SB = eclipsing binary

Hot/Fast : transits could be those of a small star, a planet or due to a contaminating EB = unresolved cases

No major difference between the center and the anti center



resolved cases :

53 % are EB account for 53% ; 36% are CEB account and 11% are planets

Assuming unresolved distributed as planets, EB and CEB, false positives would be 89 % of the total number of candidates

→ not all the planets have been identified as such (~20 planets)

number of confirmed planets limited by performances of complementary observations

Candidate flagging

Automated software developed by Suzanne Aigrain

Need a first screening of the candidates with period, T_0 , depth & duration pre estimates

Transit model fit to the white LC.

Mandel & Algol formalism

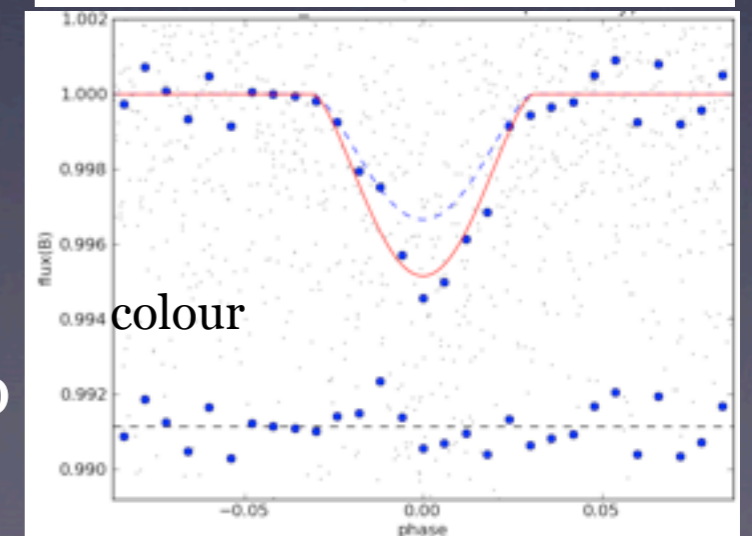
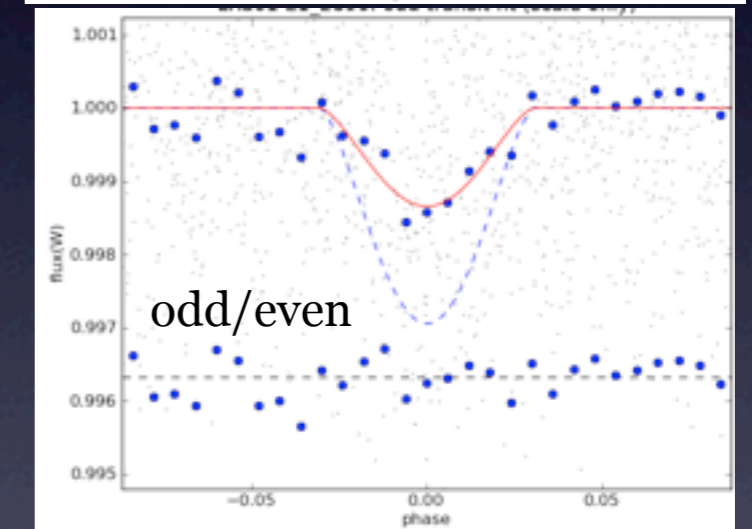
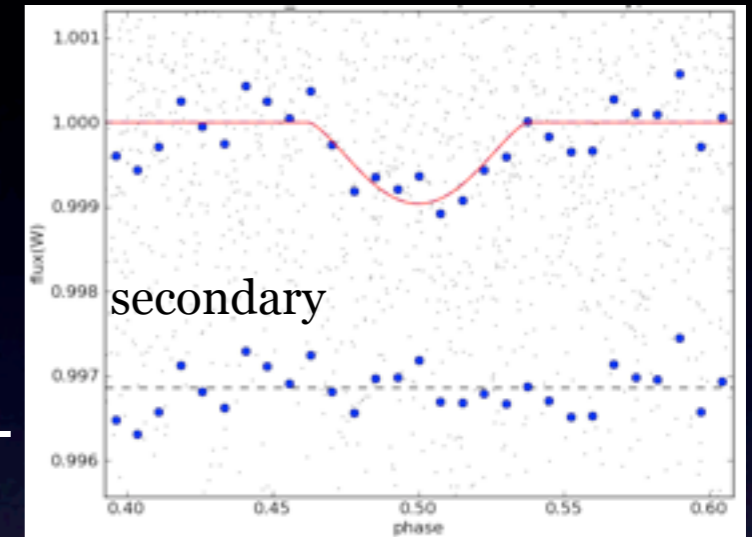
limb darkening coefficients fixed at the values for a Sun-like star (Sing 2010)

+ additional physical parameters

6 binary flags :

- low confidence detection
- secondary detection
- odd/even depth differences
- depth differences in color LC
- long transit
- v-shaped

analysis or re-analysis of all the candidates from IRa01 to LRco8 done.



Flagging versus Follow-up

62% of the candidates have 0 or 1 flag

→ Planets have 0 or 1 flag

C-1b : secondary

C-10b : V-shape

C-17b : duration

C-22b : color-depth

C-24b : secondary

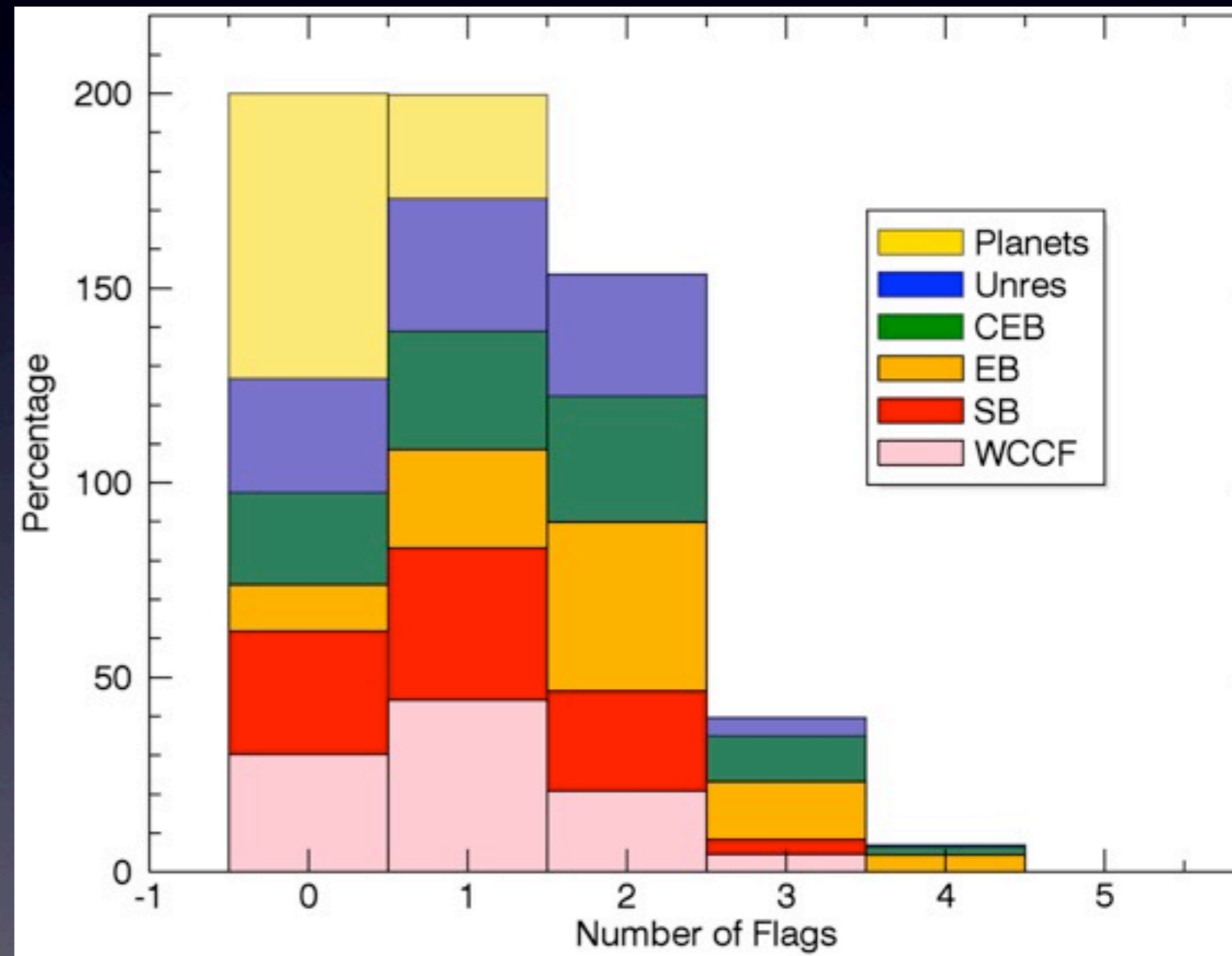
C-25b : V-shape

C-26b : duration

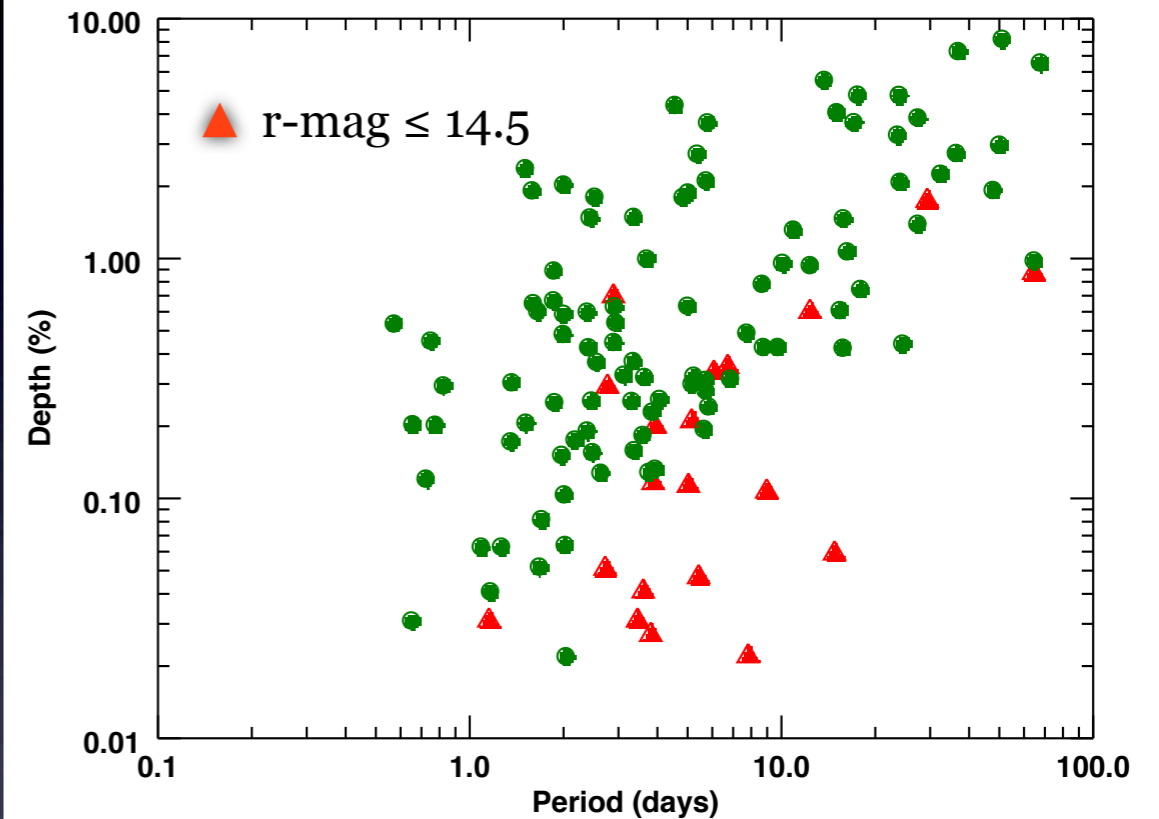
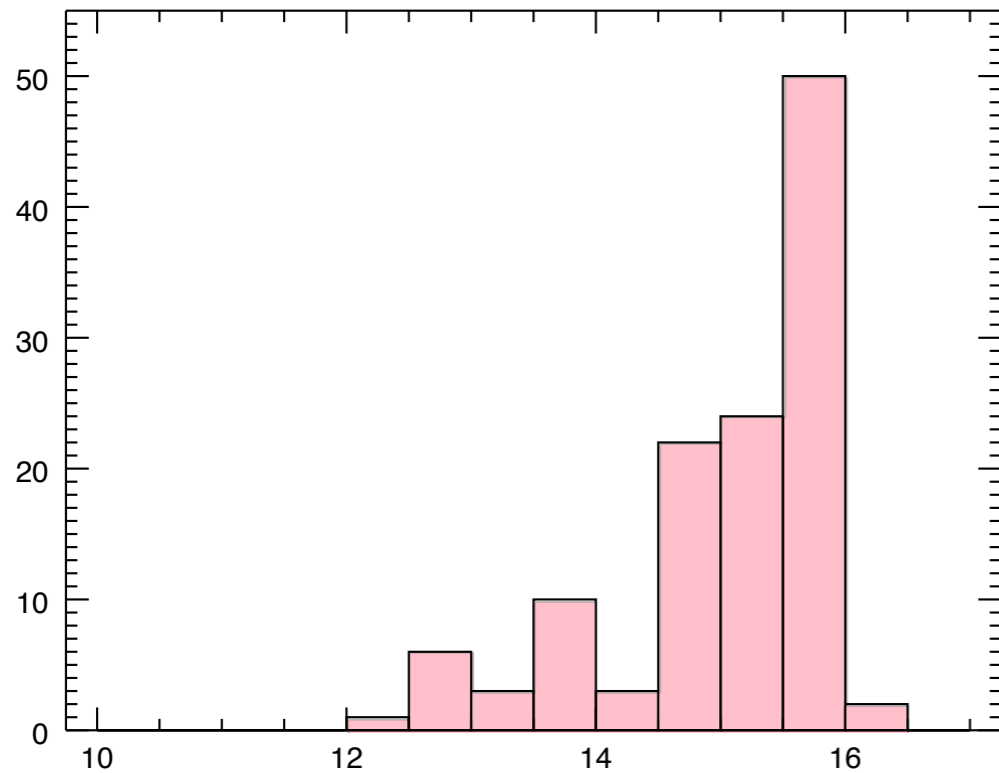
C-28b : duration

→ follow-up observations could concentrate of these candidates

→ $\sum \text{flags} \leq 1$: 121 unresolved cases.



Unresolved candidates



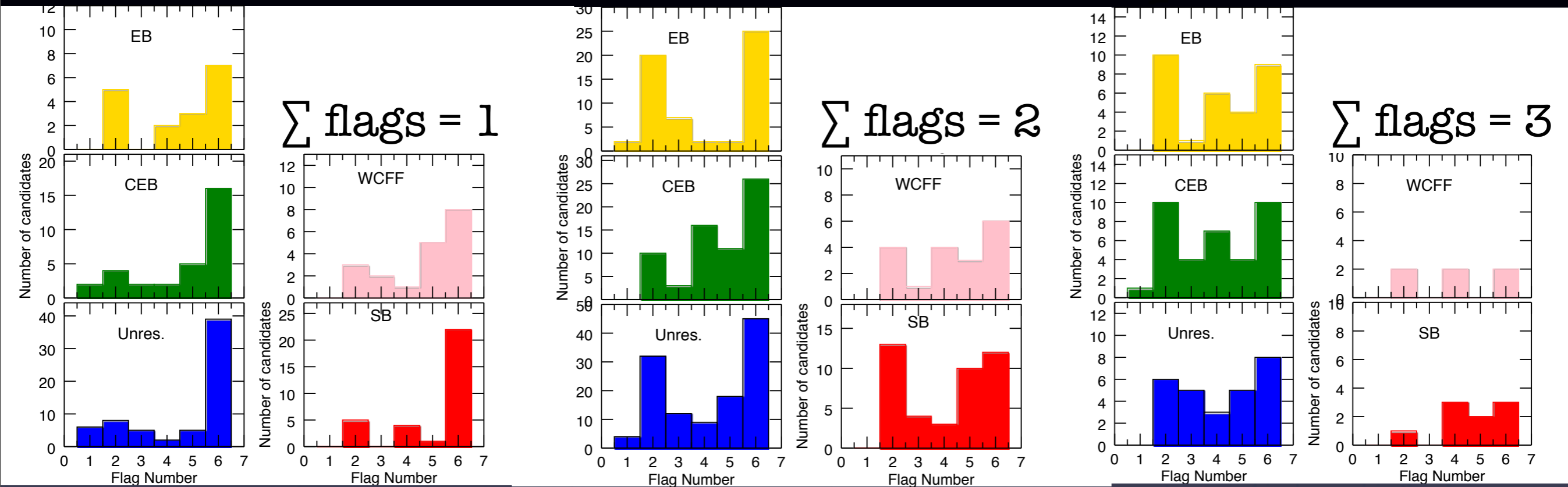
→ $\sum \text{flags} \leq 1$: 121 unresolved cases.

Assuming unresolved spread over EB, CEB and planets,
FP are 82% and ~ 20 planets should be still hidden in the data....

6 years of CoRoT

- 163 664 light curves collected; 3451 transit-like signals detected, 533 candidates assigned to follow-up observations
- Analysis of candidate light curve has improved in time. Better ranking and better identification of false positives.
- Huge effort in follow-up observations
 - 2 third of the candidates were followed up (75% of the list)
 - planets : 6% of the candidates
 - FP are 89% of the resolved configurations
 - unresolved : ~ 40 % Among these unresolved cases, planets are still to be identified as such
 - candidate flagging + follow-up observations : 533 candidates \rightarrow 121 planetary candidates
 - detection of new planets limited by complementary observations performances for faint targets
- a more robust spectral classification of the exoplanet targets could have improved the flagging.

Flagging distribution



→ number of candidates have flags on the duration and shape triggered. Improvement on the star's parameters might help to secure these 2 flags

→ some candidates (but very few) might be false detection and should be excluded from the list