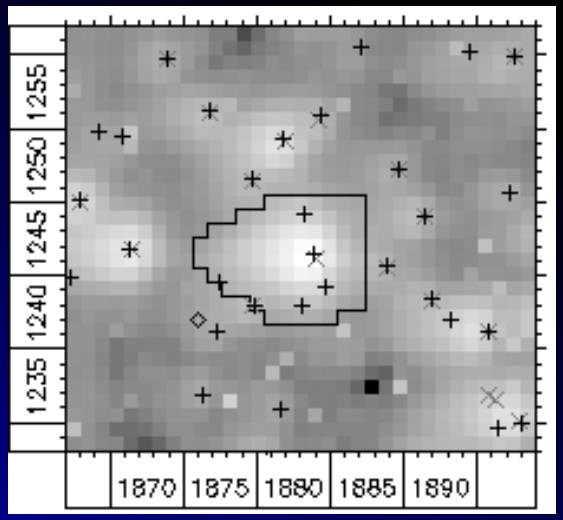
CoRoT Ground-Based Photometric Follow Up

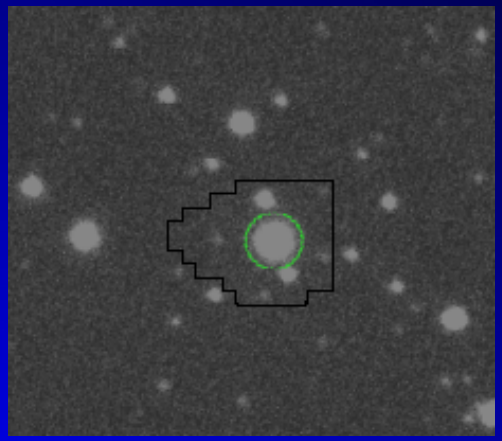
I. From launch to present
II. For the legacy of CoRoT

H. Deeg and the photometric follow-up team

With special thanks (in random order) to :
B. Samuel, B. Tingley, J.M. Almenara, A. Shporer, D. Rouan, E. Günter, L. Tal-Or, S. Carpano, R. Alonso, M. Gillon



Corot imagette with aperture



Ground-based data

- poorer photometric precision
- *but* higher resolution

Why photometric follow-up ('phot-fup')?

1. Measure variability of nearby contaminating stars -> detect false alarms

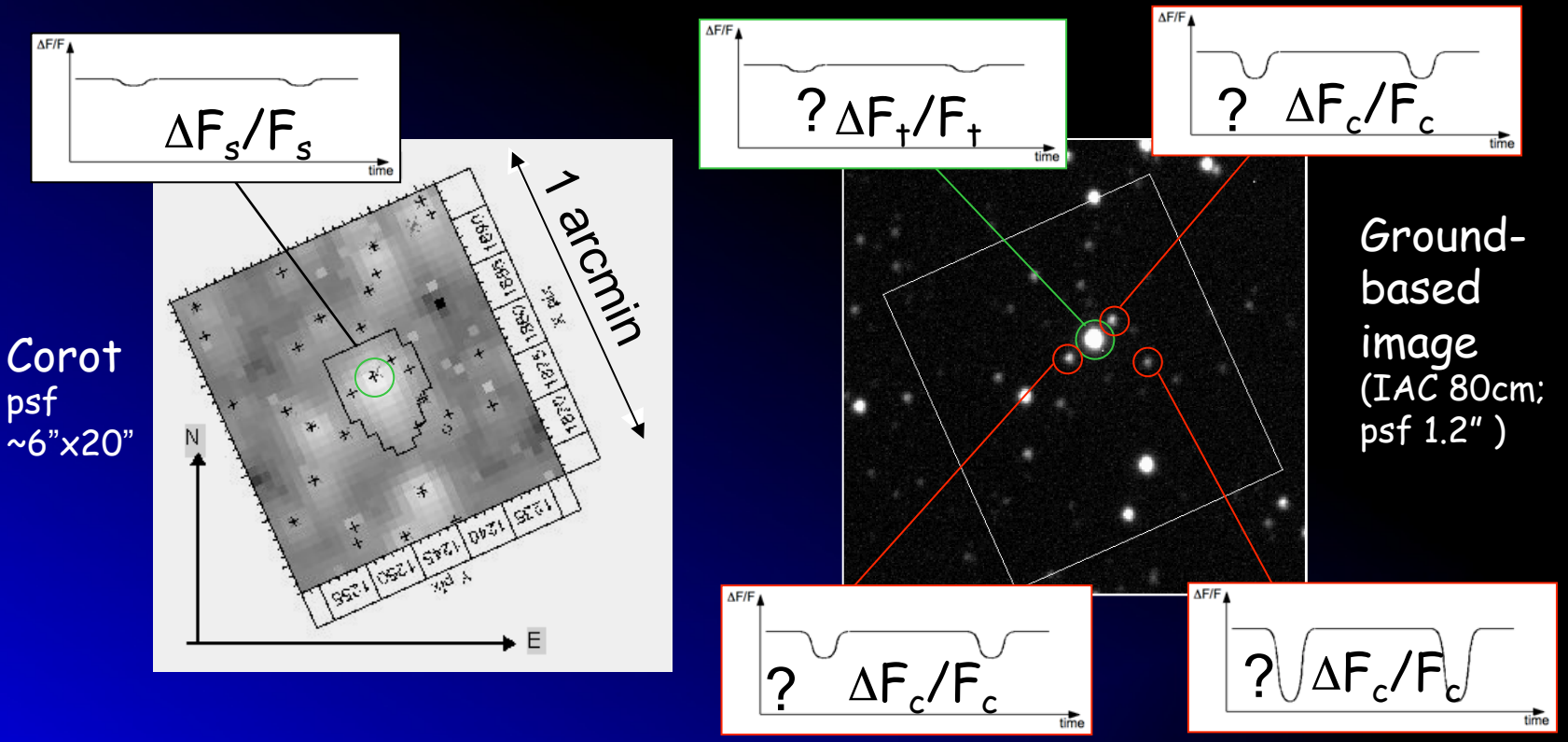
   Complementary to RV observations:

   distant contaminants will not produce any RV signal --> ambigous null-detection in RV : *low mass planet or contaminant?*

2. Follow-up of transiting planets -> part II

The precision is poorer but we can do nearly all of them

Faint contaminants need to have deep eclipses to generate CoRoT's signal.

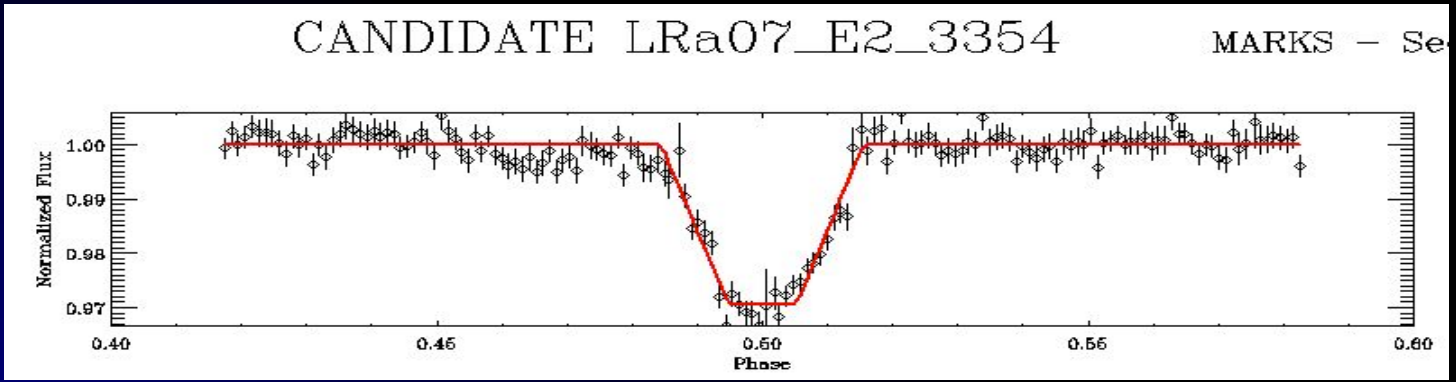


The absence of deep eclipses indicates absence of contaminating sources

BUT we need to be certain to observe during a transit/eclipse event!

-> Timing is important: reliable ephemeris with reliable errors

Most photFU done with 'On-Off' Photometry:
only short 'on' and 'off-transit' sections are observed

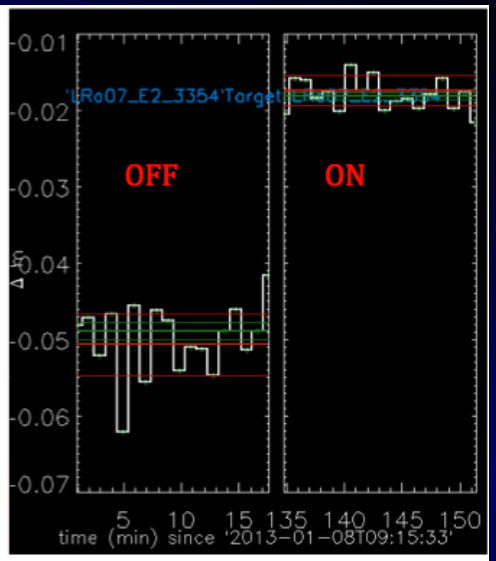


CFHT, 8 Jan 2013

Target:
Δm = 0.033 +/- 0.001

General conclusion:

The transit is ON TARGET with the expected ephemerids; the SNR of the detection is higher than 30.

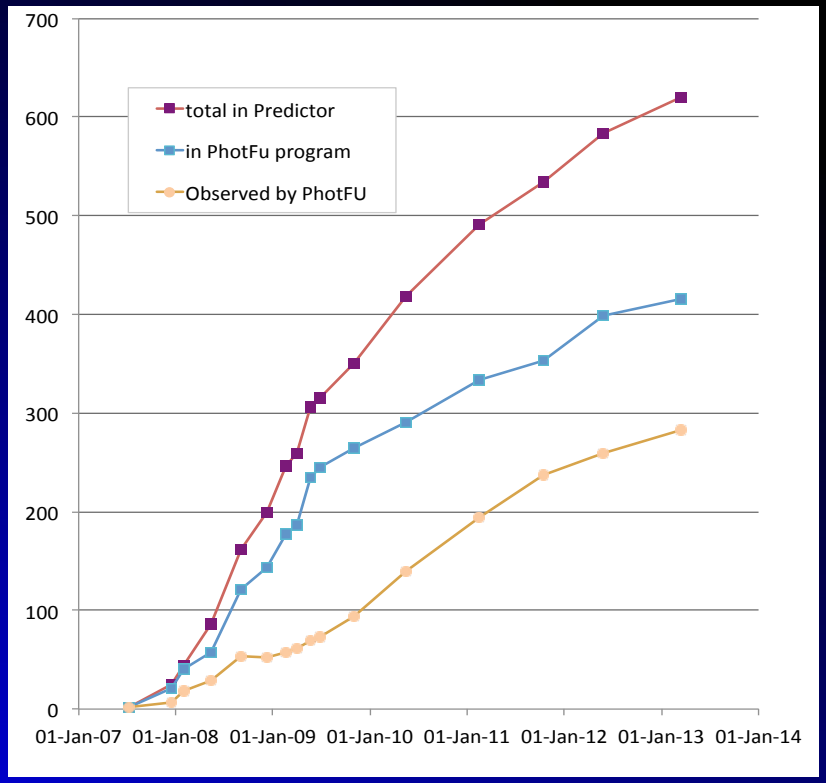


telesc.	Nr of Cands. obsvd.
IAC 80cm	127
Euler 1.2m	96
CFHT 4m	86
OGS 1m	38
WISE 0.5m & 1m	28
BEST I/II 0,25m	27
others *	37

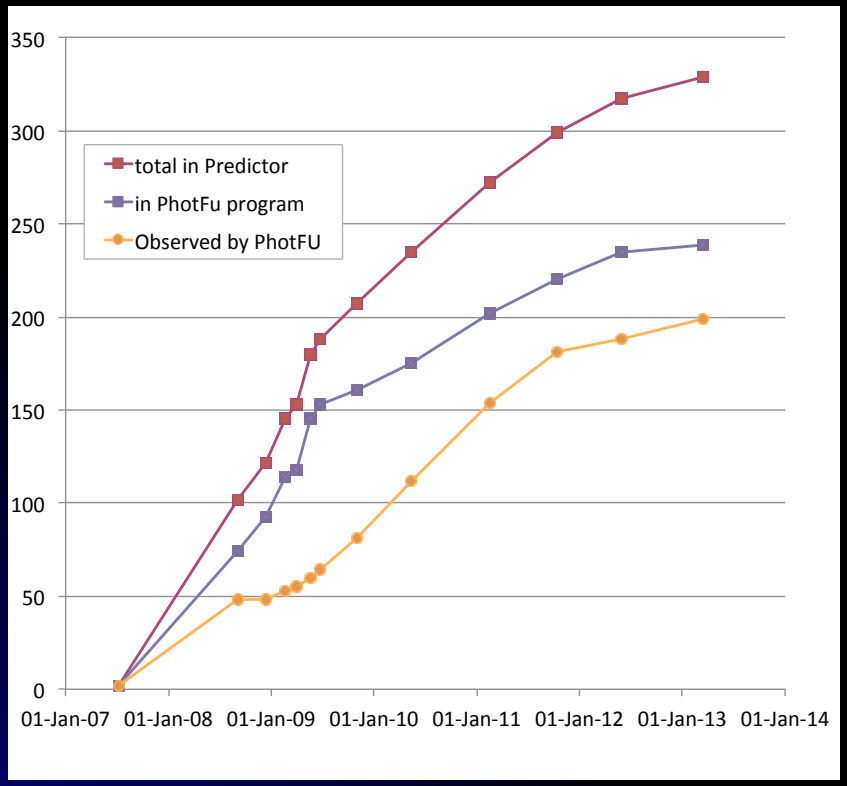
* TLS, LCOGT, Trappiste, MONET, OHP, INT, LT, NOT

Amount of cases observed by PhotFup

All candidates



High priority ones (Pri=1 or 2)



-obsvd. 35-40 candidates/semester (2009-11), ~25 cands./sem. since 2012

-70% of observed PhotFup cands. are high-priority ones
Down from 80% 2yrs ago: fewer hi-pri cases to observe

- Completion rate of observations for hi-pri. candiates has gone up however:
Now 83%; 2yrs ago: 76%

Results from photFu

Ground-based photometric follow-up has:

- 283 candidates observed (80% of pending hi-priority ones; 70% of all pending candidates)
- 227 with reliable results (39 ambigous, 17 reduc. pending)
- of these:
  - 147 (65%) on-target;
  - 80 (35%) false alarms from contam. eclipsing binaries
- improved ephemeris errors of several planets (9b, 32b,..)

II: Phot. Follow-up for the legacy of CoRoT planet detections

"For a long-lasting impact of the CoRoT planet detections, it is important that their transits can be observed reliably"

Timing uncertainties < 1hr desirable :

Observations can be planned with minor loss of time

Timing uncertainties > 3hrs bad:

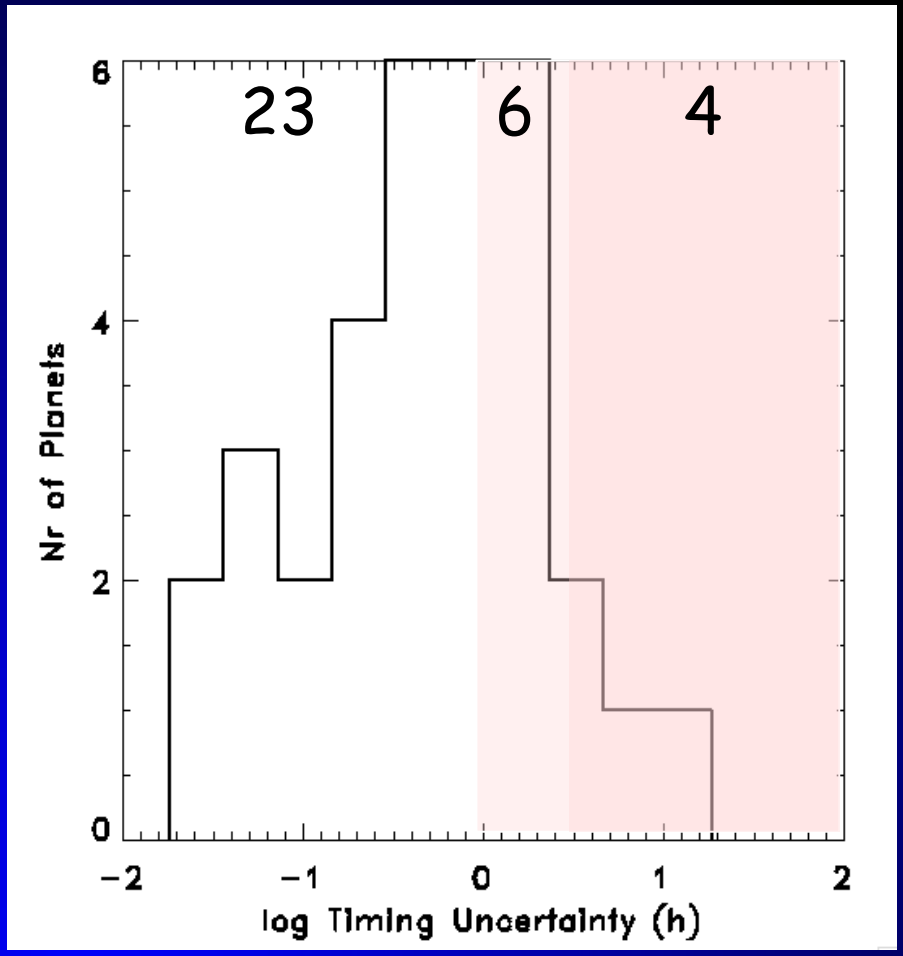
Ephemeris 'lost': uncertain if transit occurs in a given night

Multi-night/multi-telescope campaigns needed for recovery

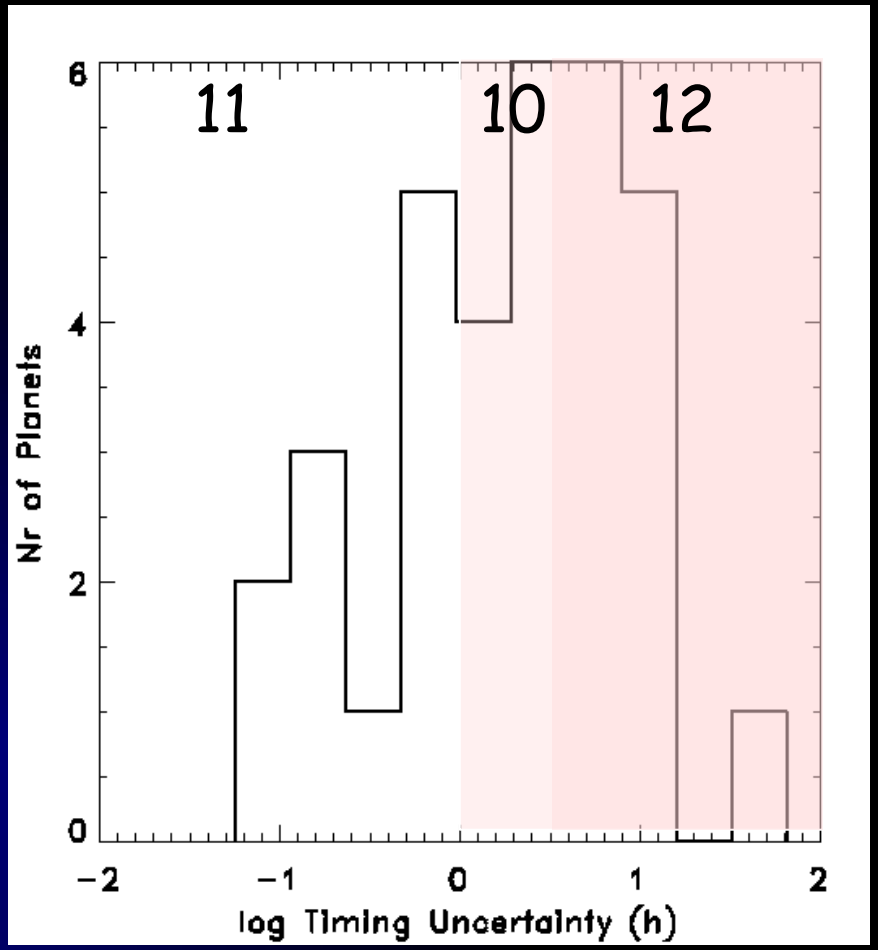
Timing uncertainty of CoRoT planets

Published/preprint/draft ephemeris-errors of C1b – 32b
(4 recent ones: errors estimated from basic parameters)

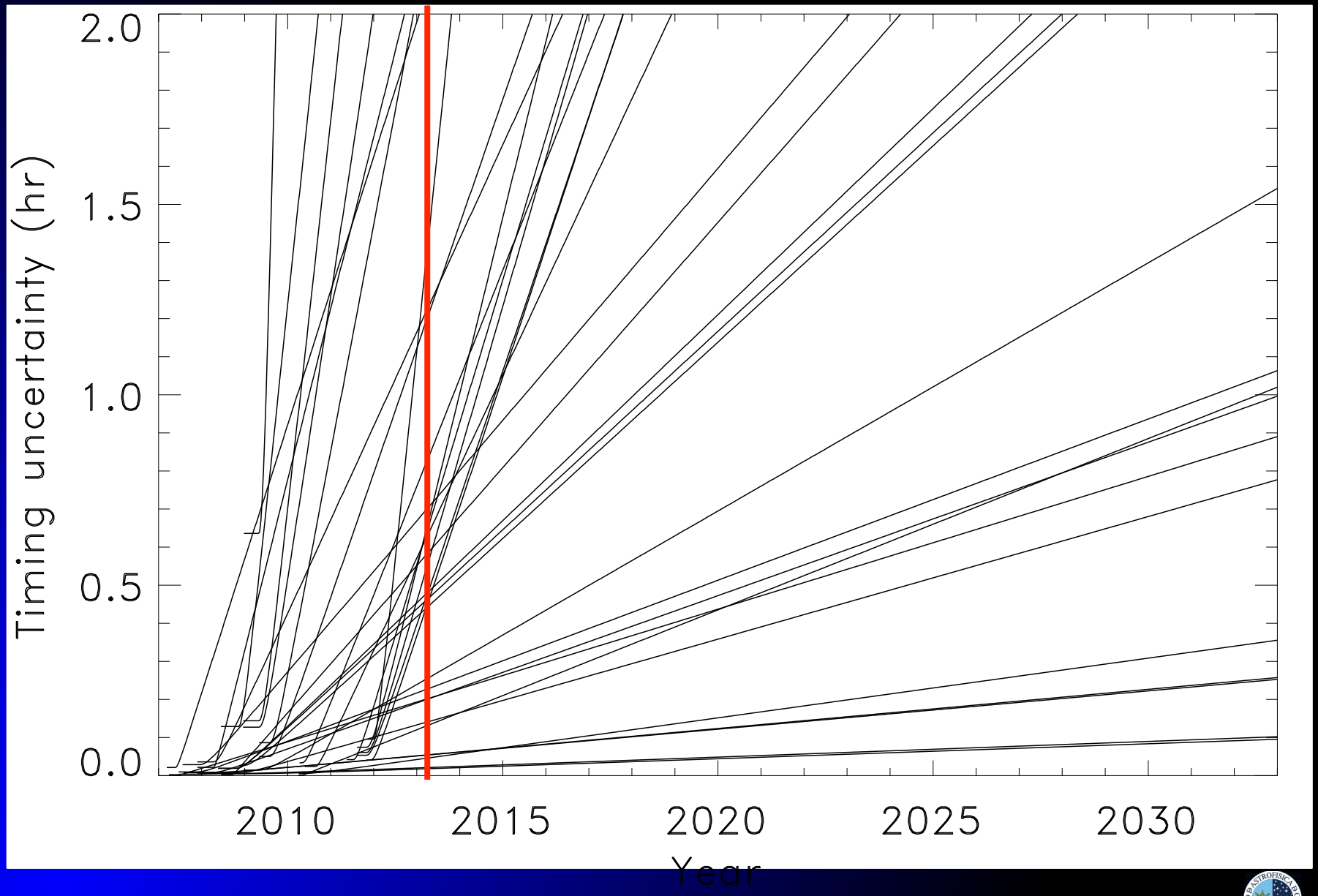
March 2013



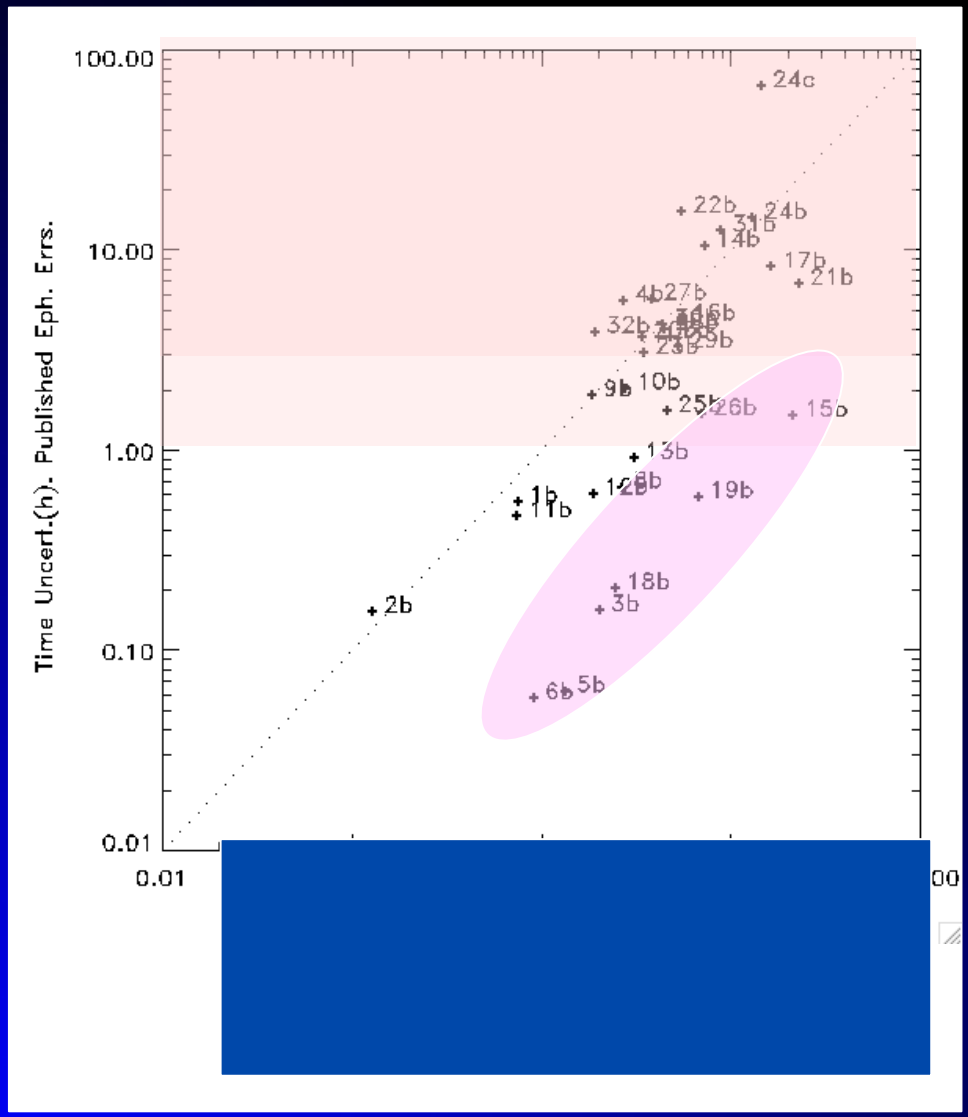
Mar 2023



Timing uncertainty over time



Timing errors in 2023, and what to do about them



- Re-check cases that appear to be 'too good' – why? (follow-up obs?) – They might also be worrysome!
- Plan systematic campaign to reobserve transits of all/most planets
- Priorizing by danger of 'loosing' the ephemeris; feasability
- Obs. with INT (WFC, UVES) and 1m-class telescopes.
- Further science: variations in period and/or transit parameters; planet charact. from multi-color or spectrophotometric obs.