Situation on the exo-side

in operation for 1793 days;
22 runs, 3 considered as closed : IRa01, SRc01, LRc01, 3 on “alarms” and 2 recently provided to CoIs

145 074. LC up to LRc06 --> 3769 transits detected --> 625 assigned for FUp observations --> 24 planets

22 233 dwarfs with R ≤ 14.0 up to LRc08 among which 18 333 are FGKM dwarfs
~58. deg sq covered - with ~ 10% overlap

duration ranges from 21 days (SRc02) to 152 days (LRc01)

Candidates versus planets

- Transits detected per run:

268 +/- 61 --> LRa02
177 +/- 60 --> LRc03 to LRa04

- Candidates to FUp per run :

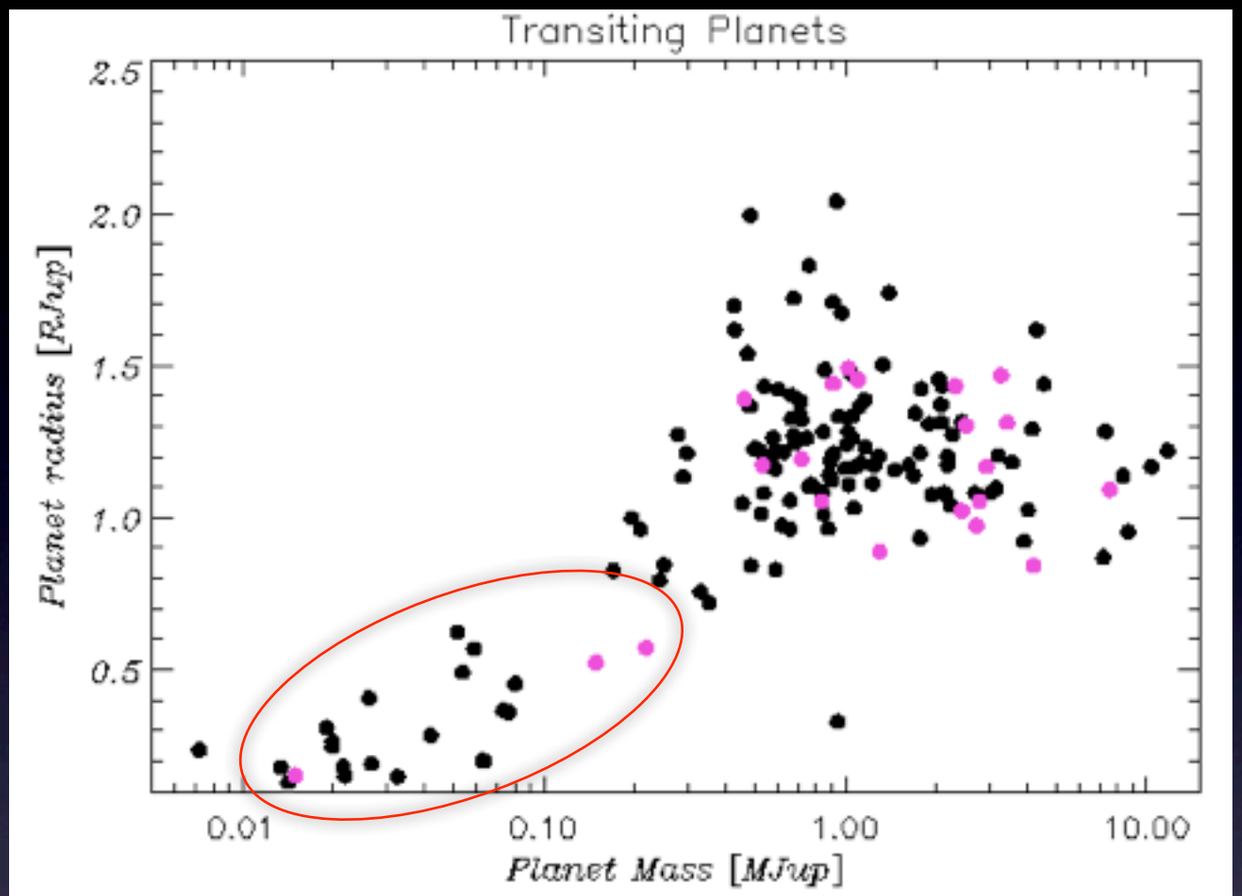
45 +/- 17 --> LRa02 and a mean of 2 planets
31 +/- 19 --> LRc03 to LRa04 and a mean of 0.85 planet
1 CCD lost and candidates ranking has improved so false positives are better filtered out

- Longer runs seem to provide the highest number of planets but no real trend.

- Challenging candidates need also several observation campaigns to be secured

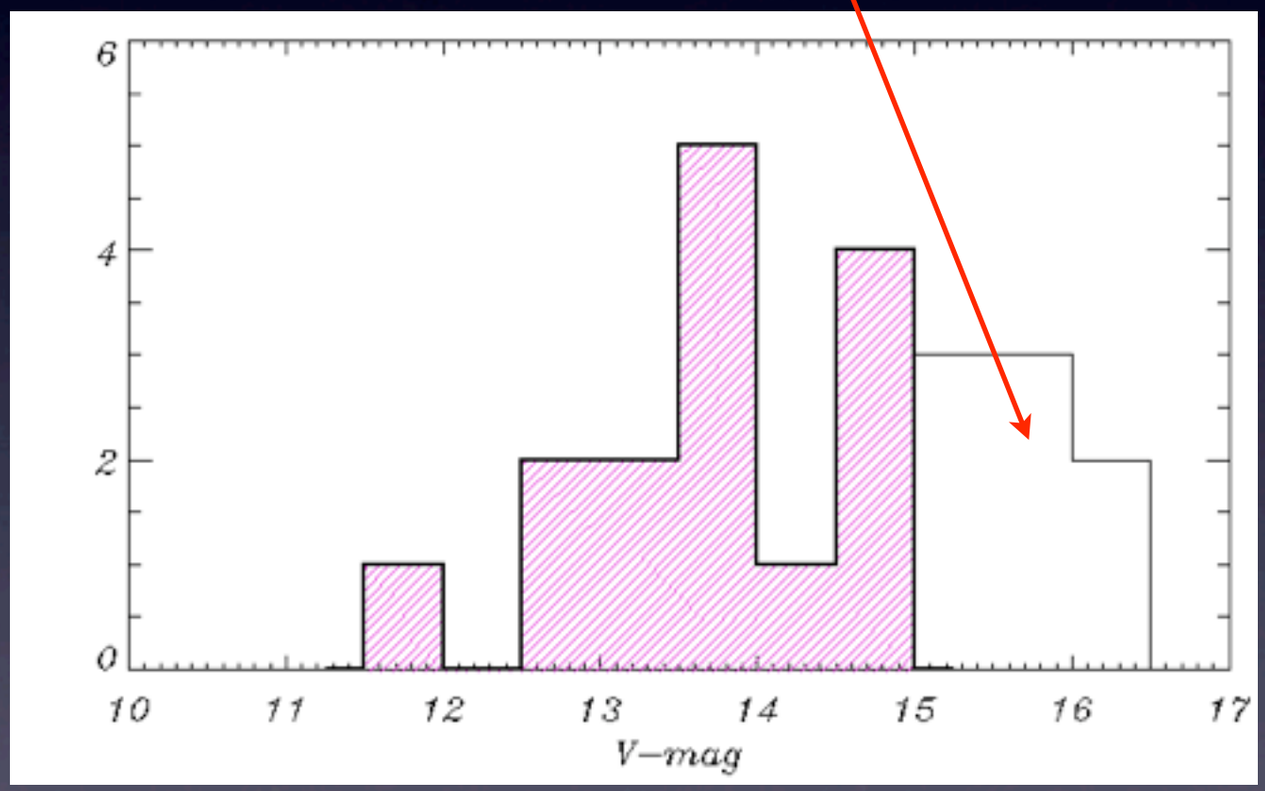
e.g. C-22 or C-7. LRc02, SRc02, LRc03, LRc04 , LRc05 fields have been still observed last summer

CoRoT planets



Sub-Jupiter planets, high cost but high scientific value

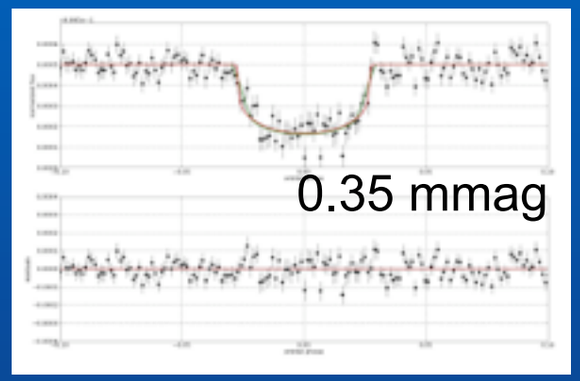
Giants, high cost and poor characterization



- candidates at the fainter end of the magnitude range have a high cost in terms of FUp whereas they could provide giant planets only. Not very well characterized.

CoRoT planets - highlights - Small sizes

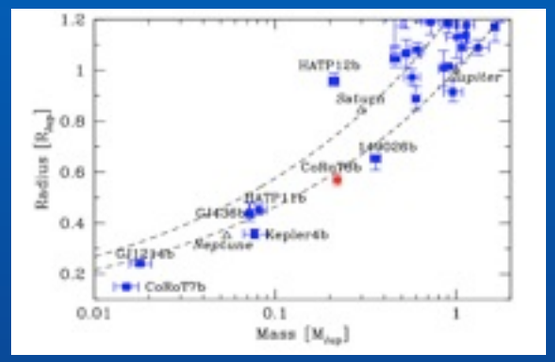
CoRoT - 7b



G9V
Period = 0.85 days
M_p= 7.42 ± 1.21 $M_\oplus$
R_p = 1.58 ± 0.1 $R_\oplus$
ρ= 10.4 ± 1.8 g/cm³

Léger et al., A&A 2009
Hatzes et al., A&A 2011

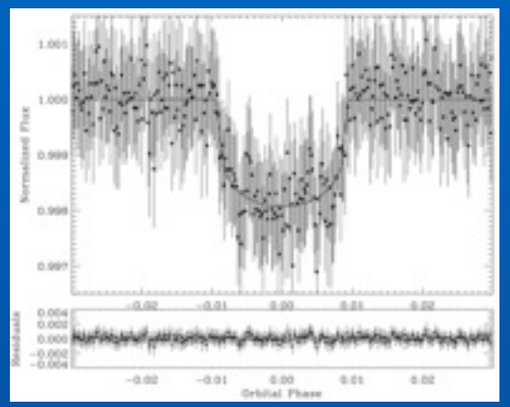
CoRoT - 8b

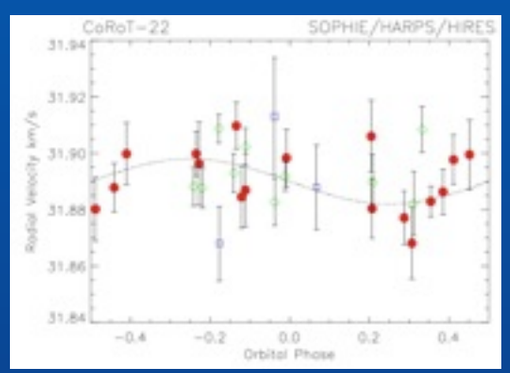


K1 V
Period = 6.21 days
M_p= 0.22 ± 0.03 M_{jup}
R_p = 0.57 ± 0.02 R_{Jup}
ρ= 1.6 ± 0.10 g/cm³
[Fe/H] = 0.30 ± 0.10

Bordé et al., A&A 2010

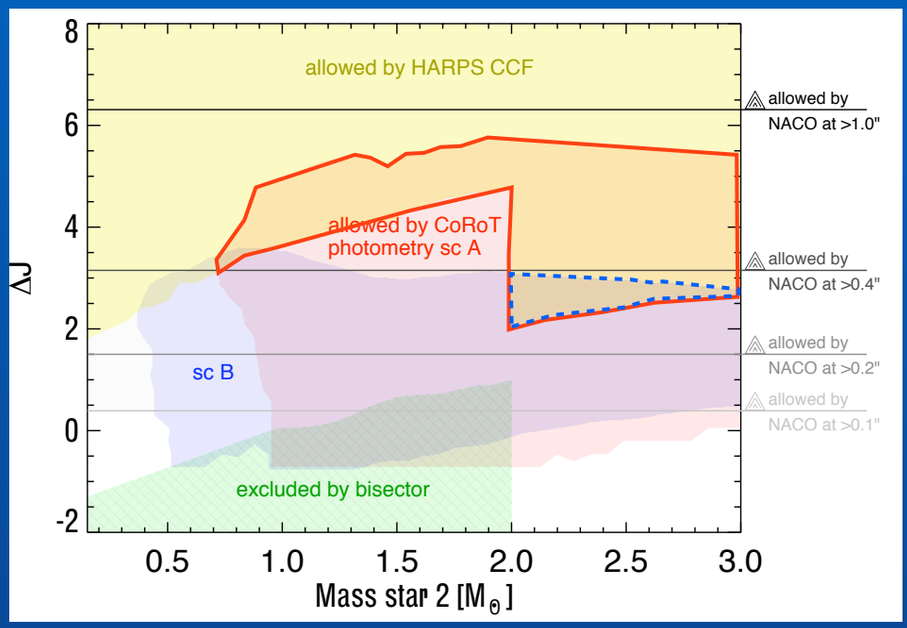
CoRoT - 22b



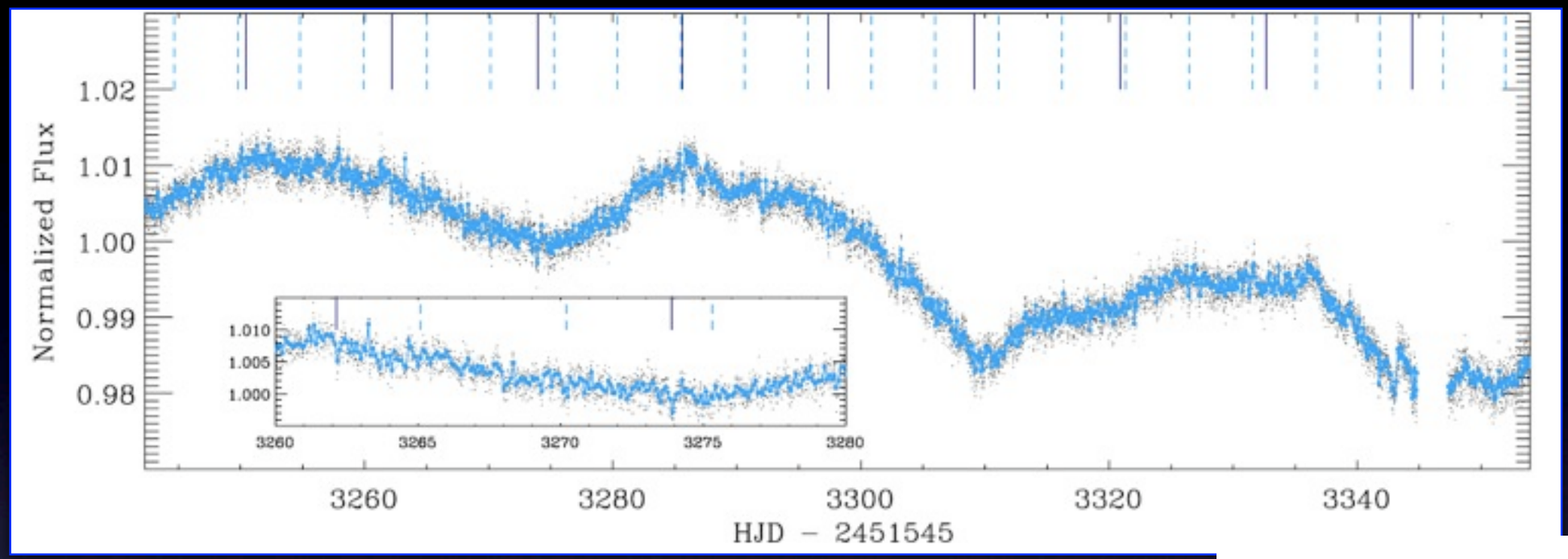


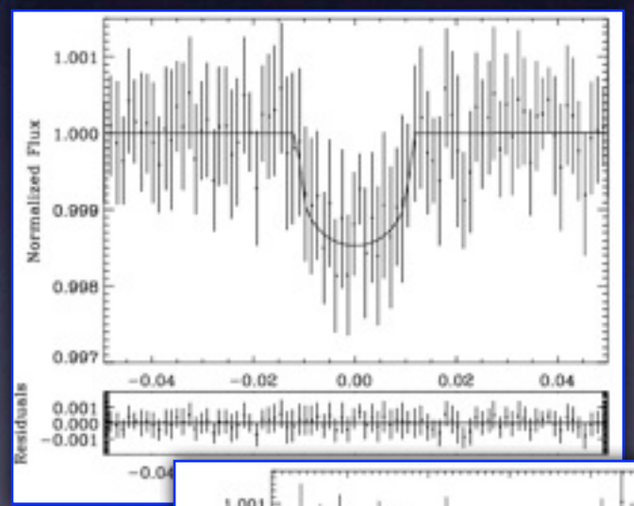
Go IV
Period = 9.756 days
M_p= < 0.15 M_{jup}
R_p = 0.52 ± 0.12 R_{Jup}
ρ= < 1.3 g/cm³

Moutou et al., A&A 2011



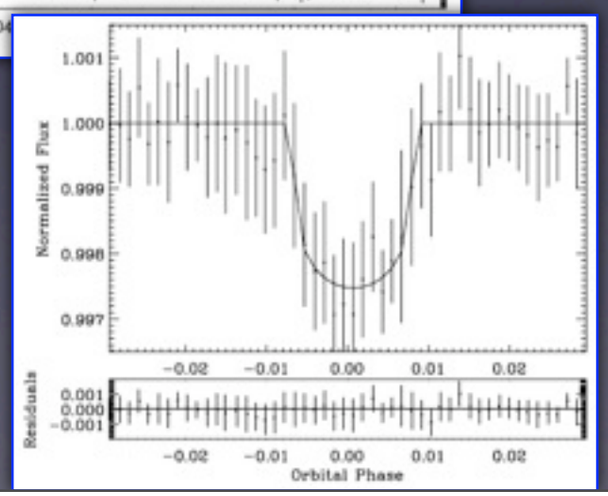
CoRoT planets - highlights - Multiple system



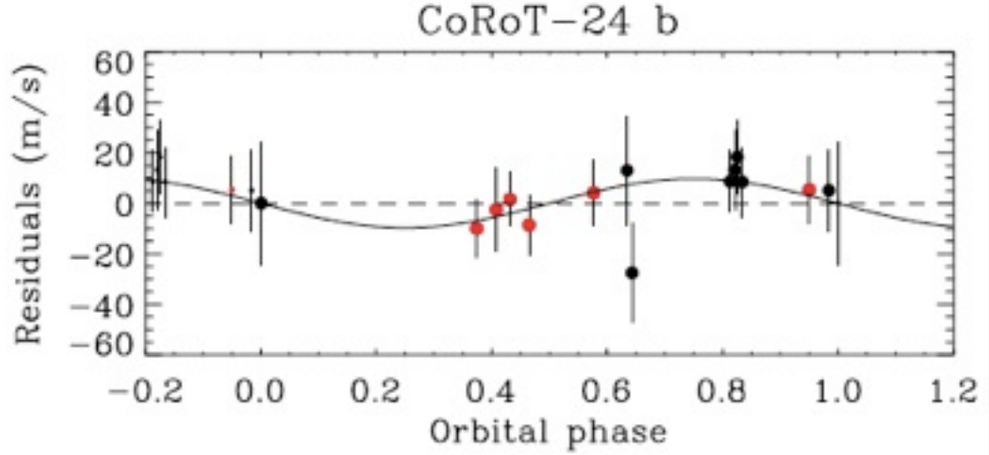


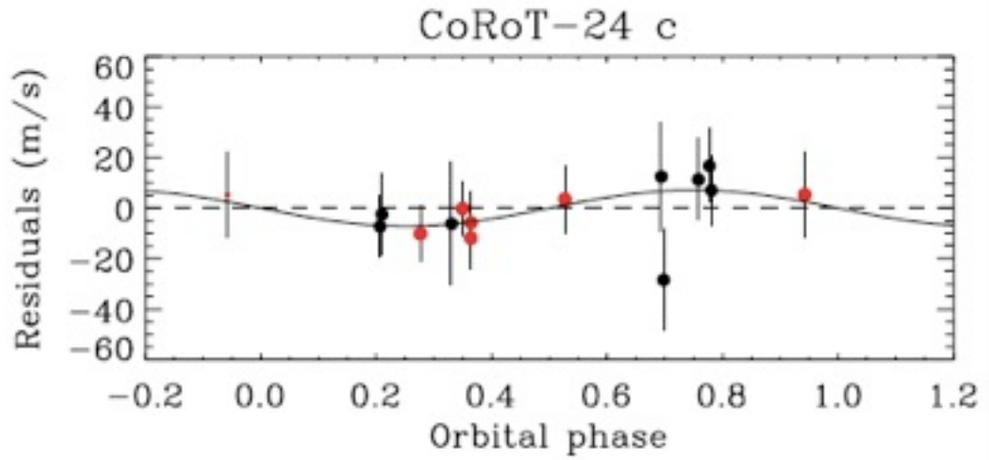
K1V
Period = 5.11 days
$M_p < 33\ M_\oplus$
$R_p = 3.7 \pm 0.4\ R_\oplus$

Alonso et al., A&A



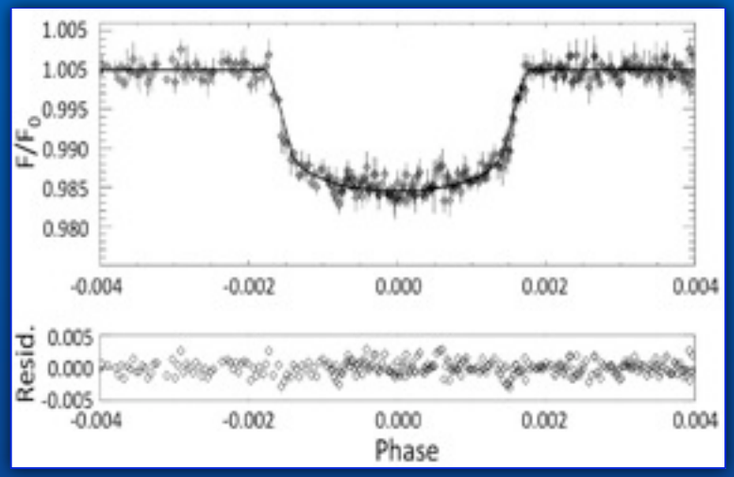
Period = 11.76 days
$M_p < 44\ M_\oplus$
$R_p = 5.0 \pm 0.5\ R_\oplus$





CoRoT planets - highlights - Giants

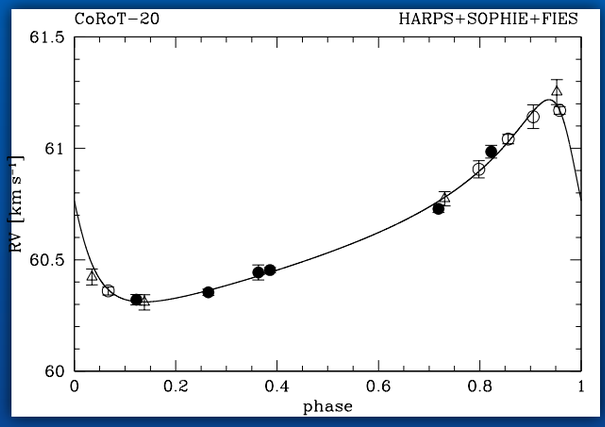
CoRoT - 9b



G3V
Period = 95.27 days
$M_p = 0.84 \pm 0.07\ M_{jup}$
$R_p = 1.05 \pm 0.04\ R_{Jup}$
$\rho = 0.525 \pm 0.15\ g/cm^3$

Deeg et al., Nature 2010

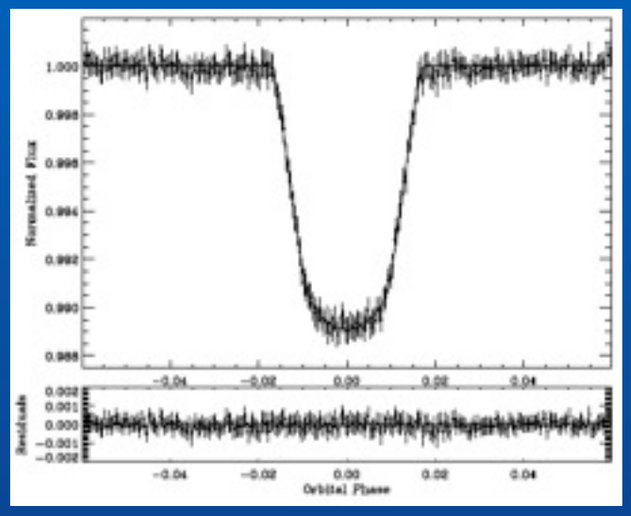
CoRoT - 20b



G2V
Period = 9.242 days
e=0.56
$M_p = 4.24 \pm 0.23\ M_{jup}$
$R_p = 0.84 \pm 0.04\ R_{Jup}$
$\rho = 8.87 \pm 1.1\ g/cm^3$

Deleuil et al., A&A 2011

CoRoT - 11b



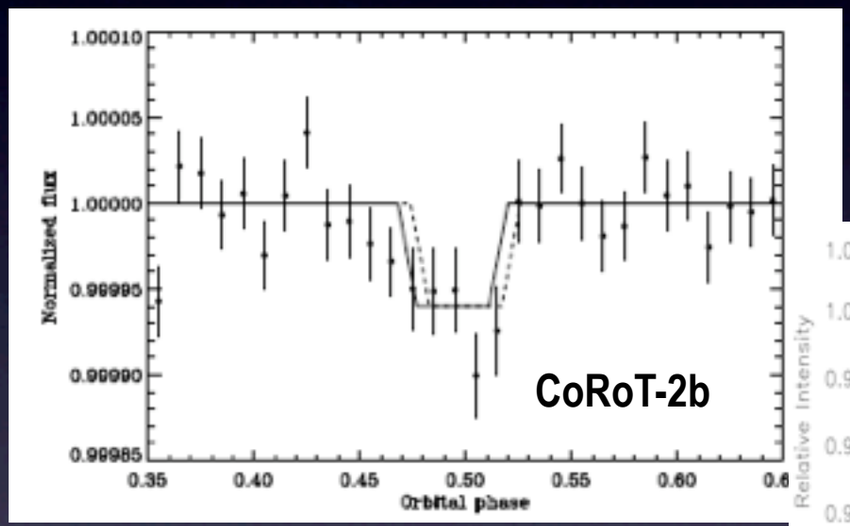
F7V - vsini = 40km/s
Period = 2.99 days
$M_p = 2.33 \pm 0.34\ M_{jup}$
$R_p = 1.43 \pm 0.03\ R_{Jup}$
$\rho = 0.99 \pm 0.15\ g/cm^3$

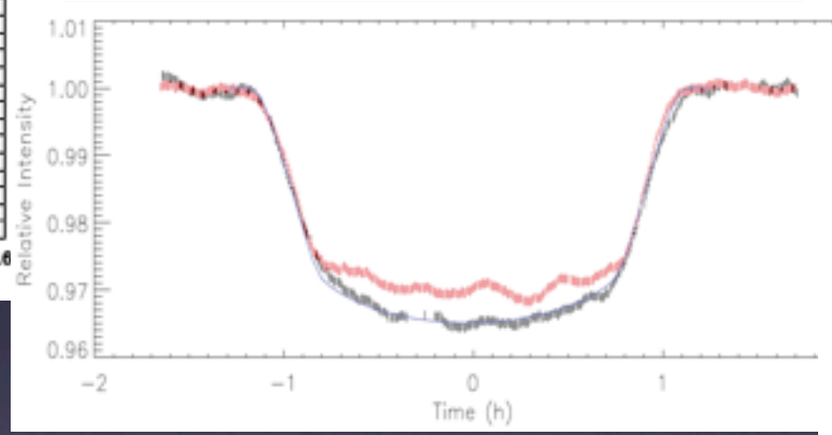
Gandolfi et al., A&A, 2010

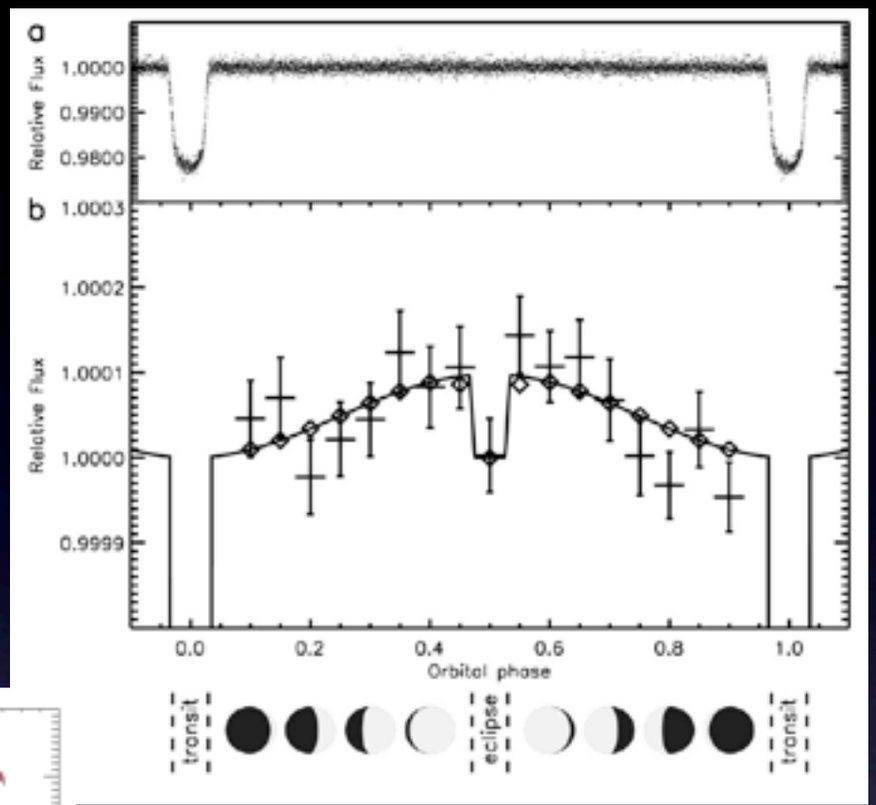
CoRoT planets - Long duration light curves

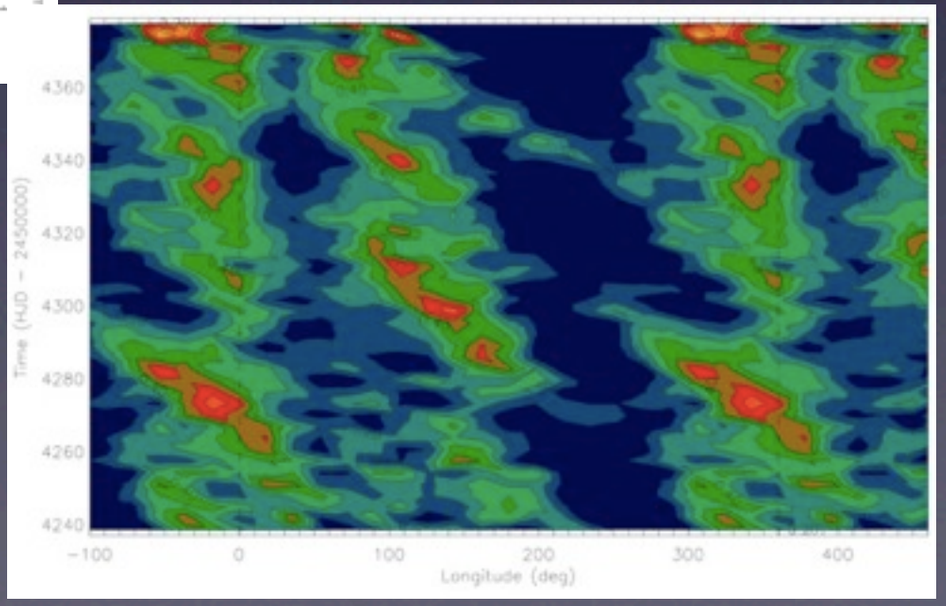
• Optical orbital phase variation ➙ Albedo
CoRoT-1b : Snellen et al., 2009, Nature

• Secondary detection ➙ Atmosphere properties
CoRoT-2b : white LC : Depth = 0.006 ± 0.002%
(Alonso et al., 2009, A&A)





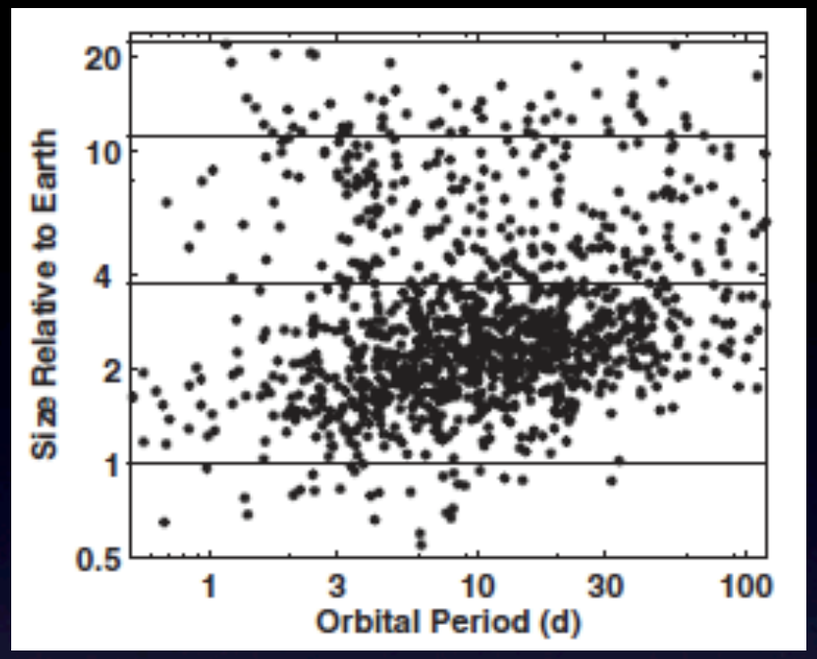




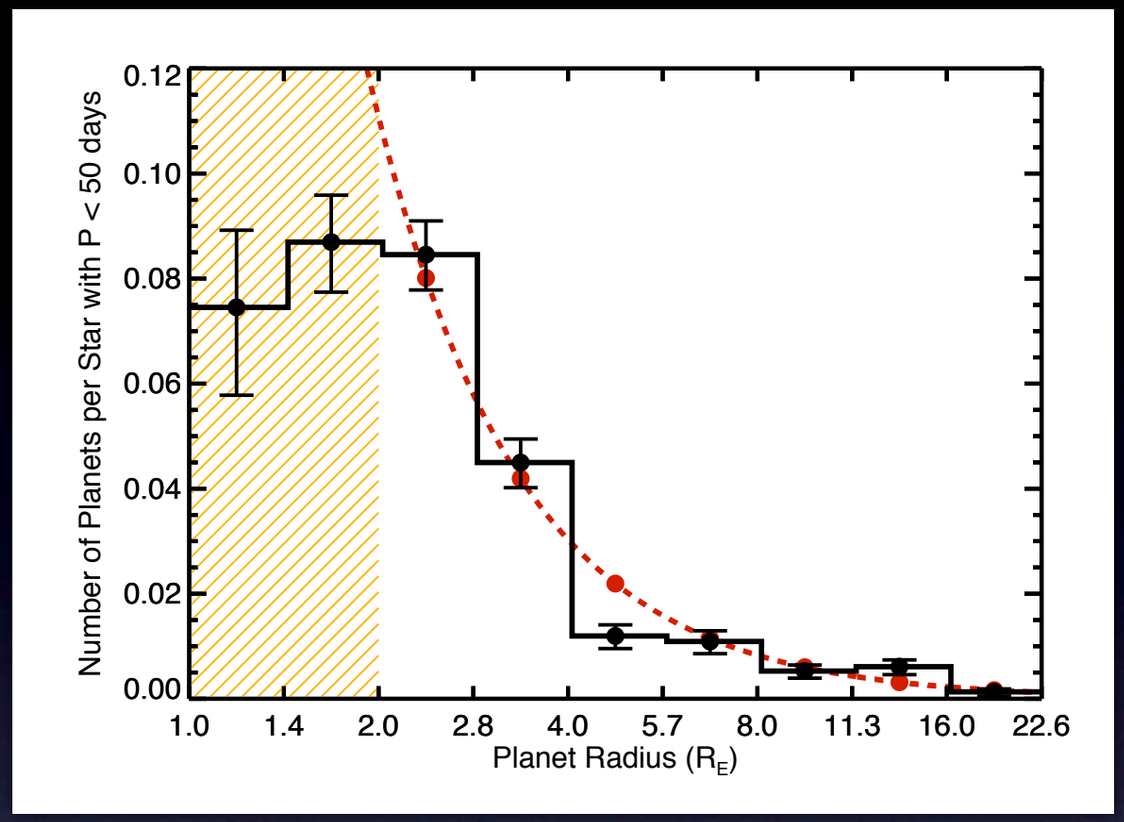
• Star planet interactions

• Stellar surface mapping : active regions, spot coverage and evolution ...

Lessons from Kepler



Borucki et al., 2011, ApJ



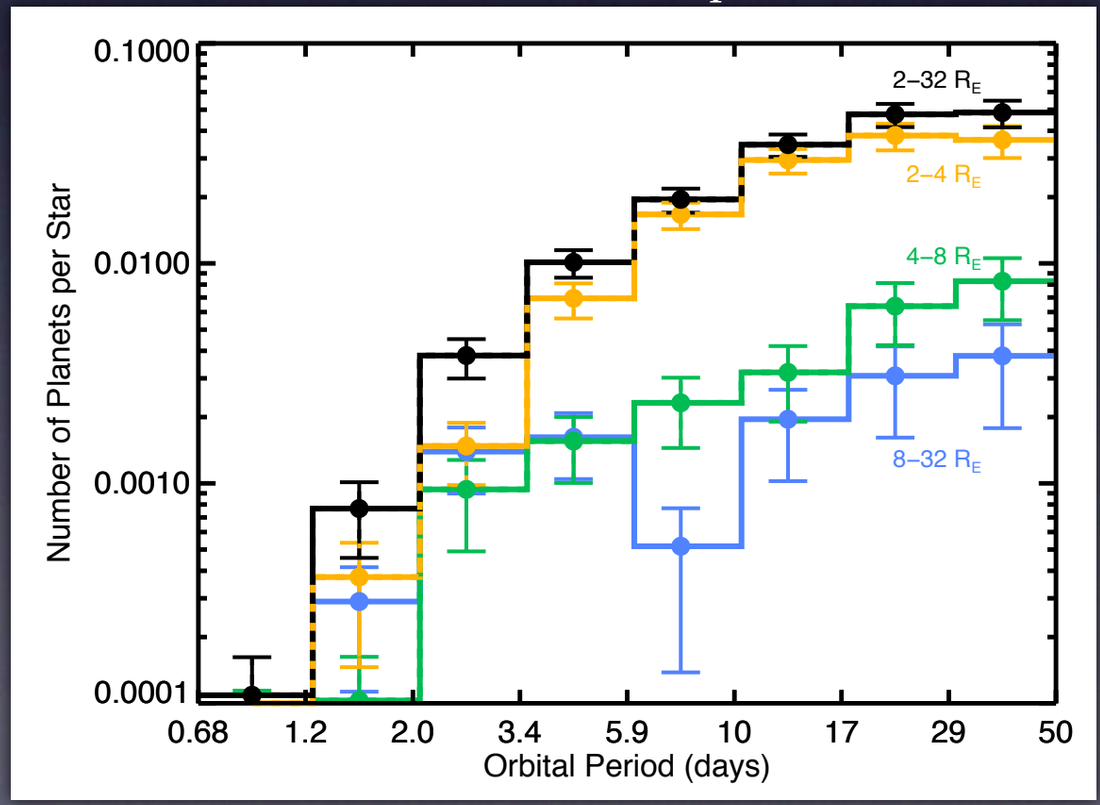
Howard et al., 2011, ApJ

Planet population at orbital period less than 50 days :

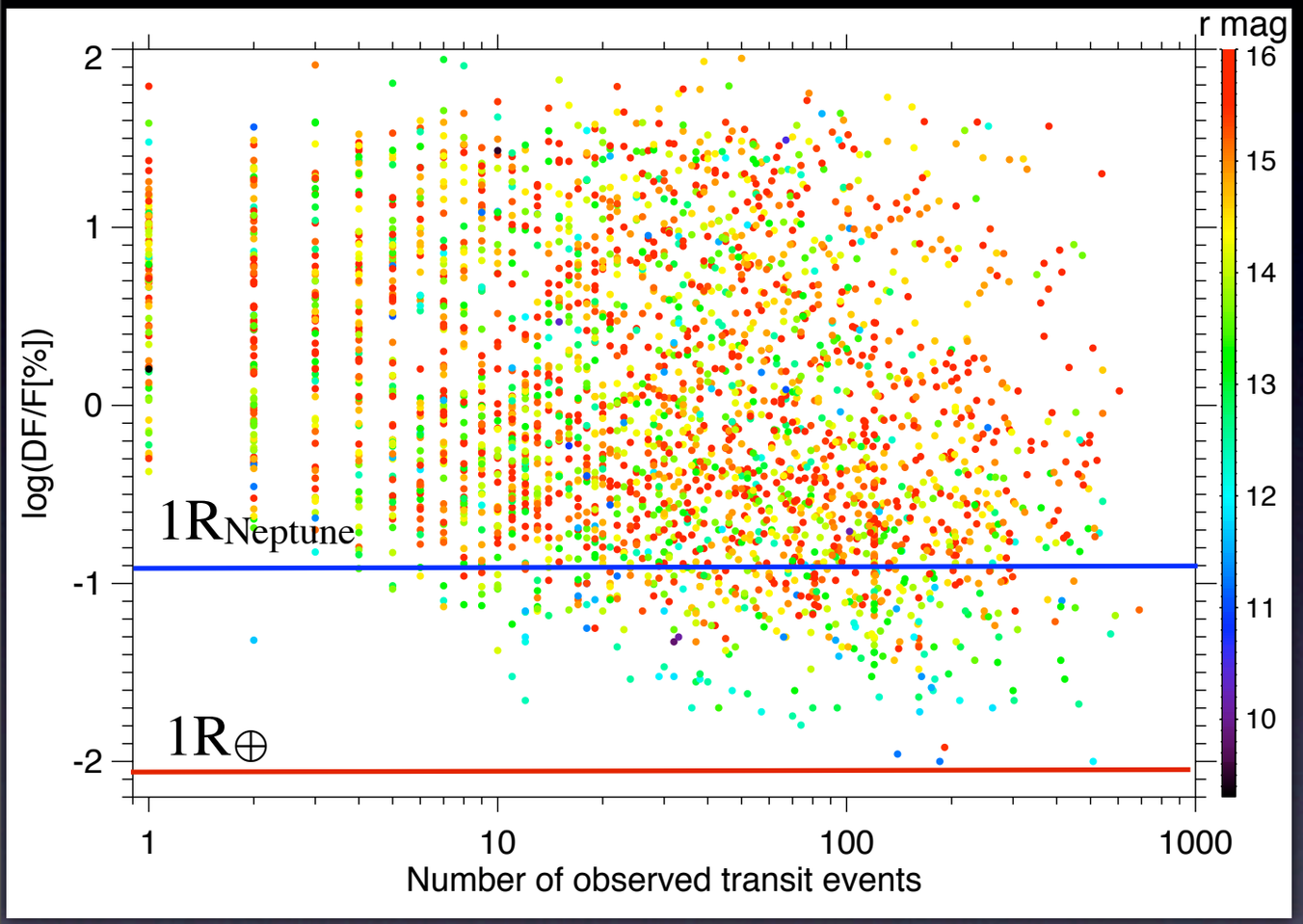
➙ small size planets (range 2 - 4 $R_\oplus$) are the most numerous

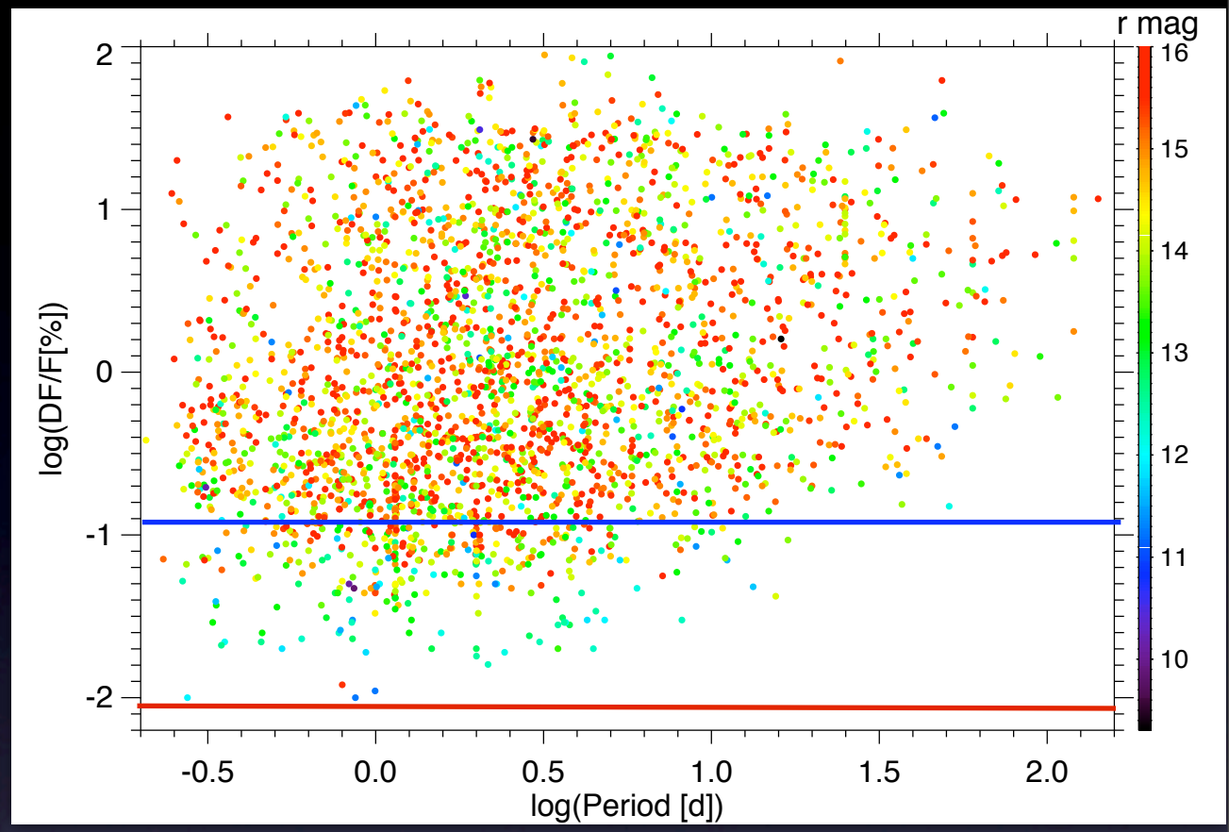
➙ their frequency increases with increasing orbital period

➙ multiple transiting systems are frequent ~18%



CoRoT detection capability





all candidates up to March 2011 (SRa03)

- CoRoT is well adapted for the detection of Neptune-size planets with orbital period less than a dozen of days and temperate Jupiter-size ones

- Super-Earth size planets could be detected on the very bright stars only.

Proposed strategy for CoRoT-3 /Exoplanet program - 1

- Concentrate on ***bright stars***. Cut the targets in the exoplanet channel at R=15.

Objectives :

- lighten the load on the detection and the FUp observations so that effort will concentrate on small-size candidates.

- Use the available telemetry to increase the number of imagettes ➙ the centroids curves will be provided and false positives better filtered out.

- Investigate the possibility to use at least 2 sizes of imagettes: one for very bright stars and another for slightly fainter one.

- Improve the selection of targets to be observed with imagettes so that they will be dedicated to the observation of well-secured dwarfs.

Duration of the runs :

- no short runs : detection of Neptune/Super Earth planets impossible.
- 2 intermediate duration runs per season or a single LR

Proposed strategy for CoRoT-3 /Exoplanet program - 2

- Detection of transiting planets around ***stars with known planets*** on the asteroseismo CCD.

  - A dozen of host-stars identified in the 2 eyes.

  - A radial velocity program that aims at detecting planets around bright stars in the CoRoT eyes with an orbital period less than 50 days is proposed:
74 targets (M1 - F5, no binary) brighter than V = 9 are identified, and additional 30 stars with magnitudes between 9 and 11.
A dozen of planets expected among which 1 +/- 1 could be transiting

- No strong case for re-observation of CoRoT planets but CoRoT-9b

Pointing :

- with a single CCD, dwarfs FGK brighter than mag R = 14 account for ~ 500 per field. Selection of the field is critical. A study on the planet yields as a function of the stellar population is on going.

- stars with known planets (RV). Possibility to observe outside the “eyes” under investigation. GJ1214 could be reachable.

- observation of a cluster well populated in dwarfs

Beyond CoRoT 2..
CoRoT 3 ?

Scientific goal :

- search for Neptune size planets around bright stars

- characterization of hot Jupiters : bright stars still needed!