Re-observation of CoRoT-7 with CoRoT

Outline:

- Review of CoRoT-7 system
- New imagette observations of CoRoT-7, LRa06
- Transit model with PASTIS
- Preliminary results

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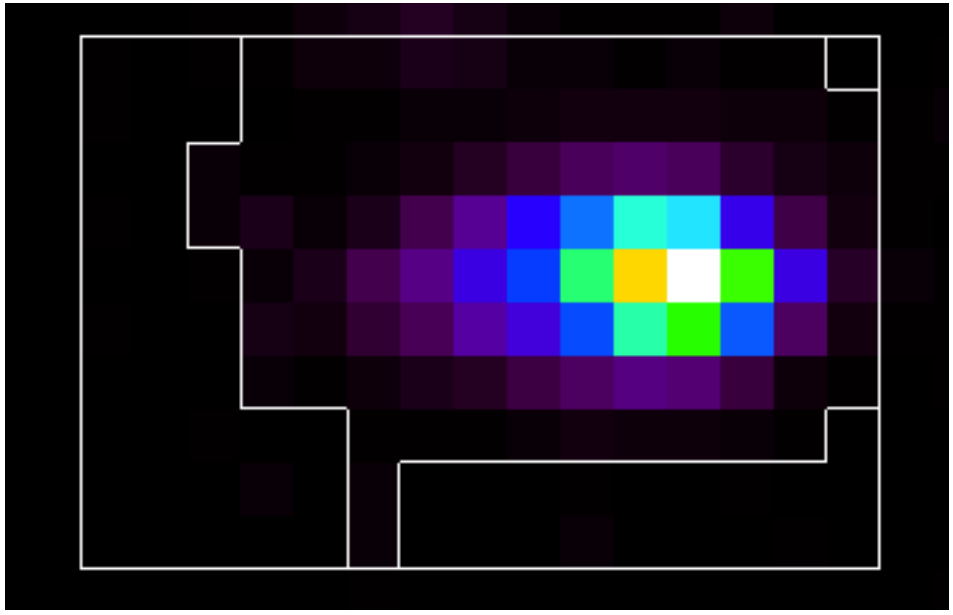
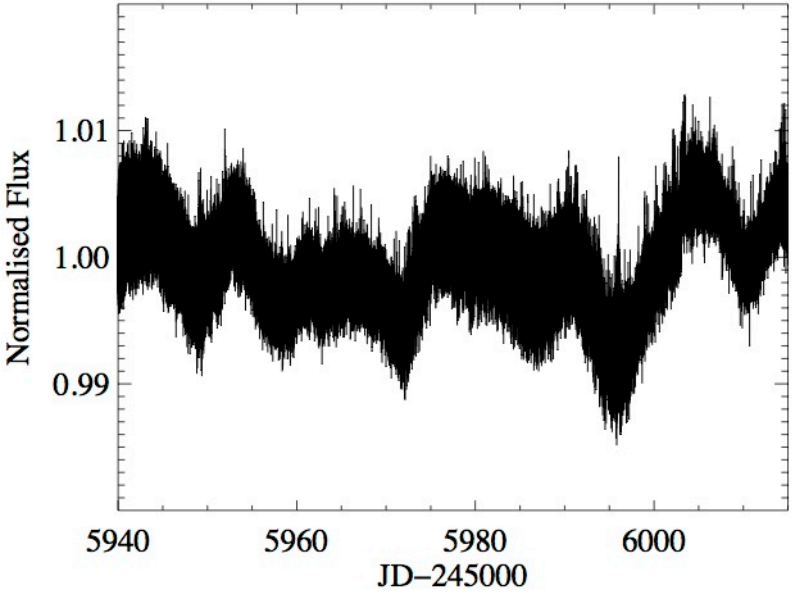
CoRoT-7 System

- Discovered during LRa01 run, October 2007 to March 2008. (Leger et al 2009)
- Period of 0.85 days and depth 0.03%, r ~ 1.6XRearh. First transiting superEarth.
- Transiting planet b was validated independently from RVs, using time series followup, high resolution imaging, CoRoT colours (Leger 2009 and infrared depth measurements (Fressin, 2011).
- Mass estimation are challenging due to activity of the host star young G9 V. (Queloz 2009, Pont 2011, Hatzes 2010, 2011, …)
- Possible 2nd or 3rd planet in the system from RV analysis.

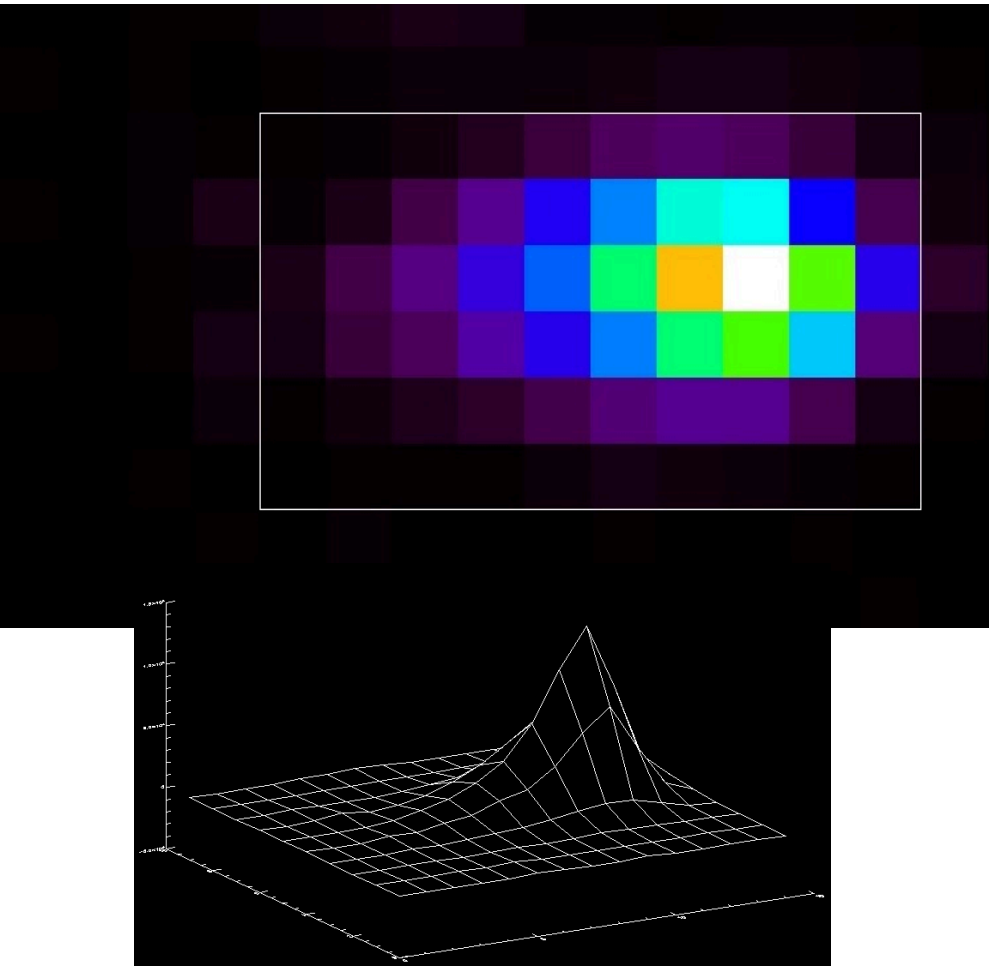
New Observations of CoRoT-7 LRa06

- Re-observations LRa06 10/01/2012 – 29/03/2012, imagette mode. Simultaneous observation with HARPS during 26 consecutive nights, model stellar activity and better constrain the mass of the planets.—Next talks.
- 90 new transits, previous 153 transits LRa01
- Advantage of imagette mode is ability to do custom reduction: optimise the mask, reduce the contamination, calculate the centroid.

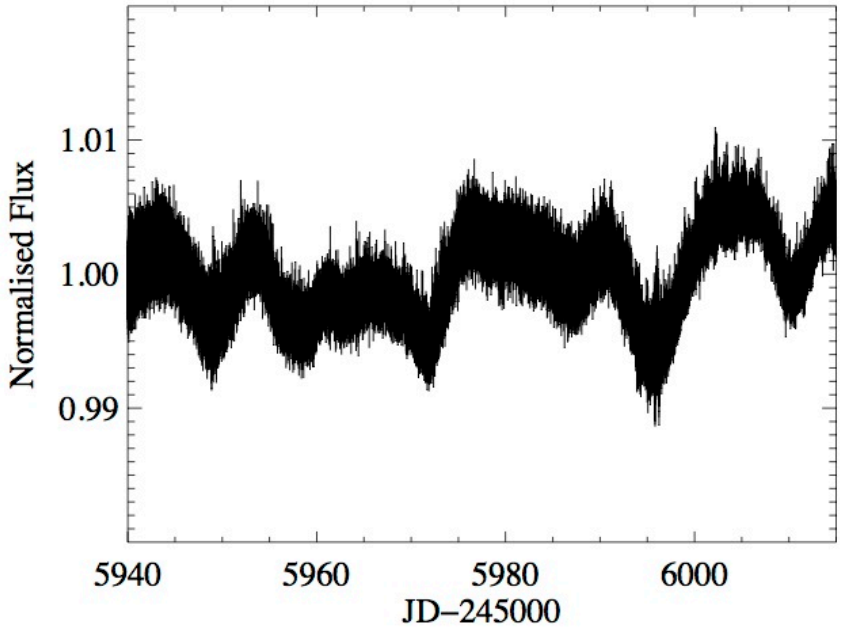




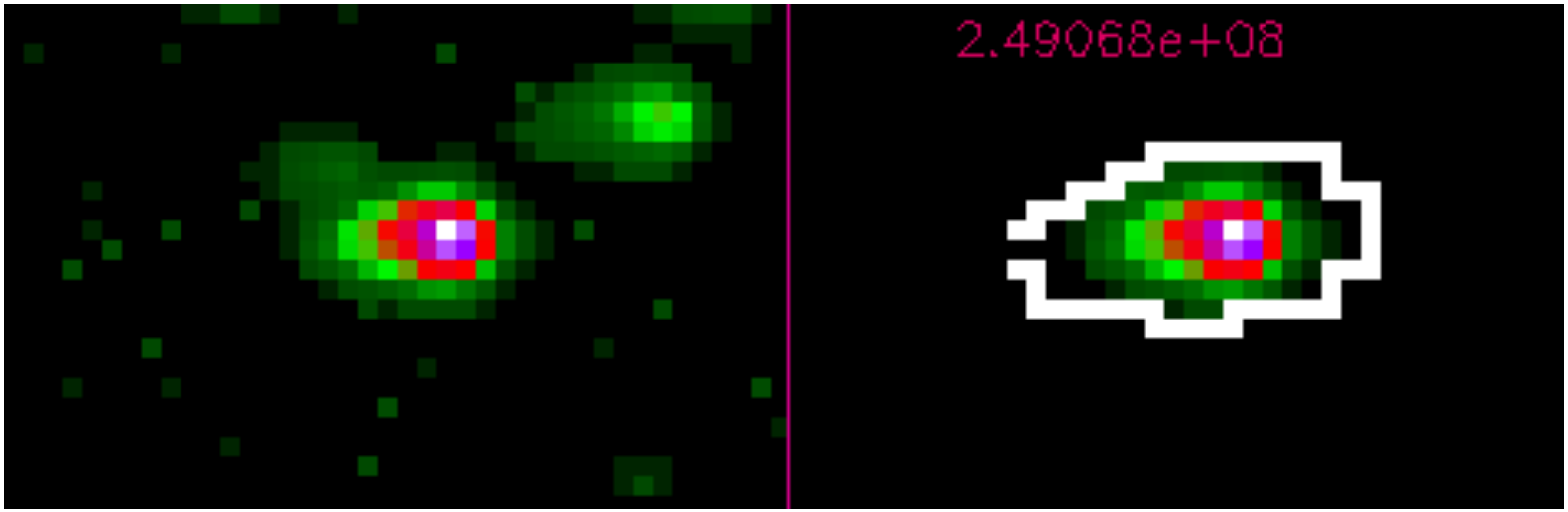
Mask Optimisation



- LRa06 auto mask rms~1.9*wn
- New mask rms~1.2*wn
- LRa01 mask rms~1.8*wn

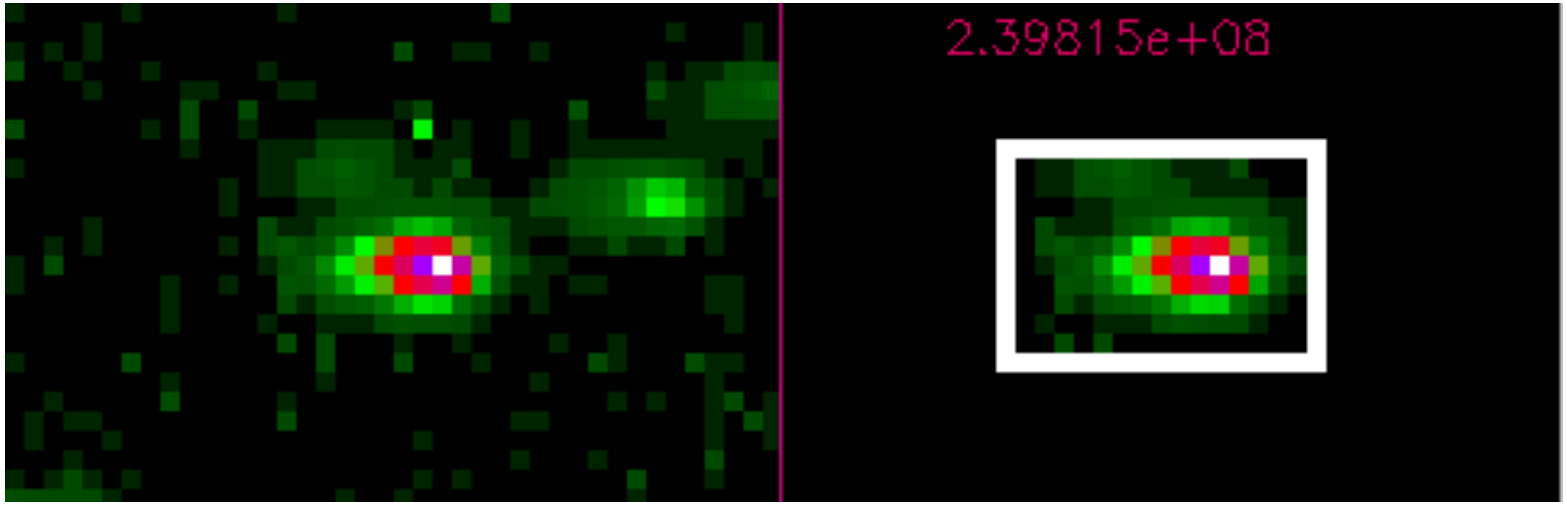


Lower contamination than previous mask



LRa01
>1%

Fitted

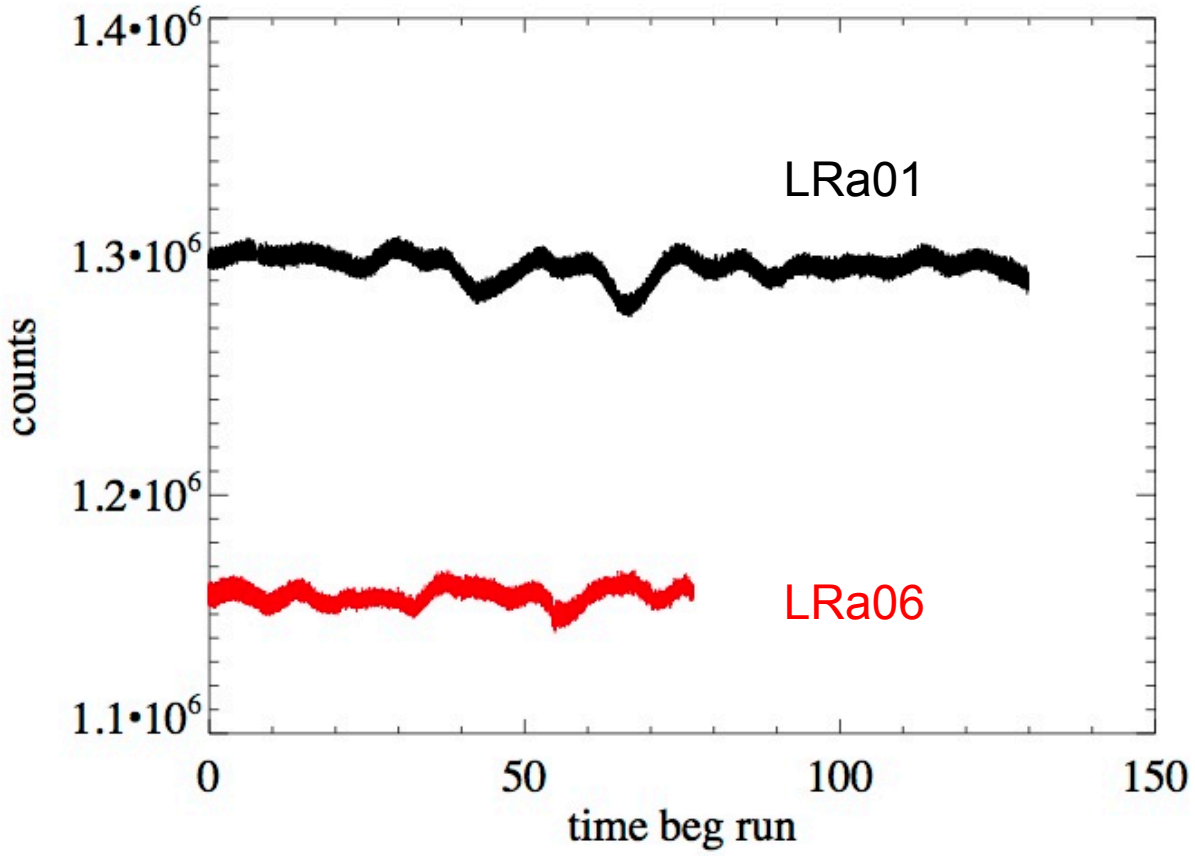


LRa16
0.022 +-
0.002%

Fix to zero

Sylviane Chaintreuil / Thomas Paternacki

Lower activity level



PASTIS transit modelling + Star-evol

Jose Manuel Almenara/ Rodrigo Diaz

Transits

Both runs were fitted together

Allow for diff out-of-transit level

STAREVOL evolution tracks

(Palacios, priv. comm.)

Spectroscopy (Bruntt 2010)

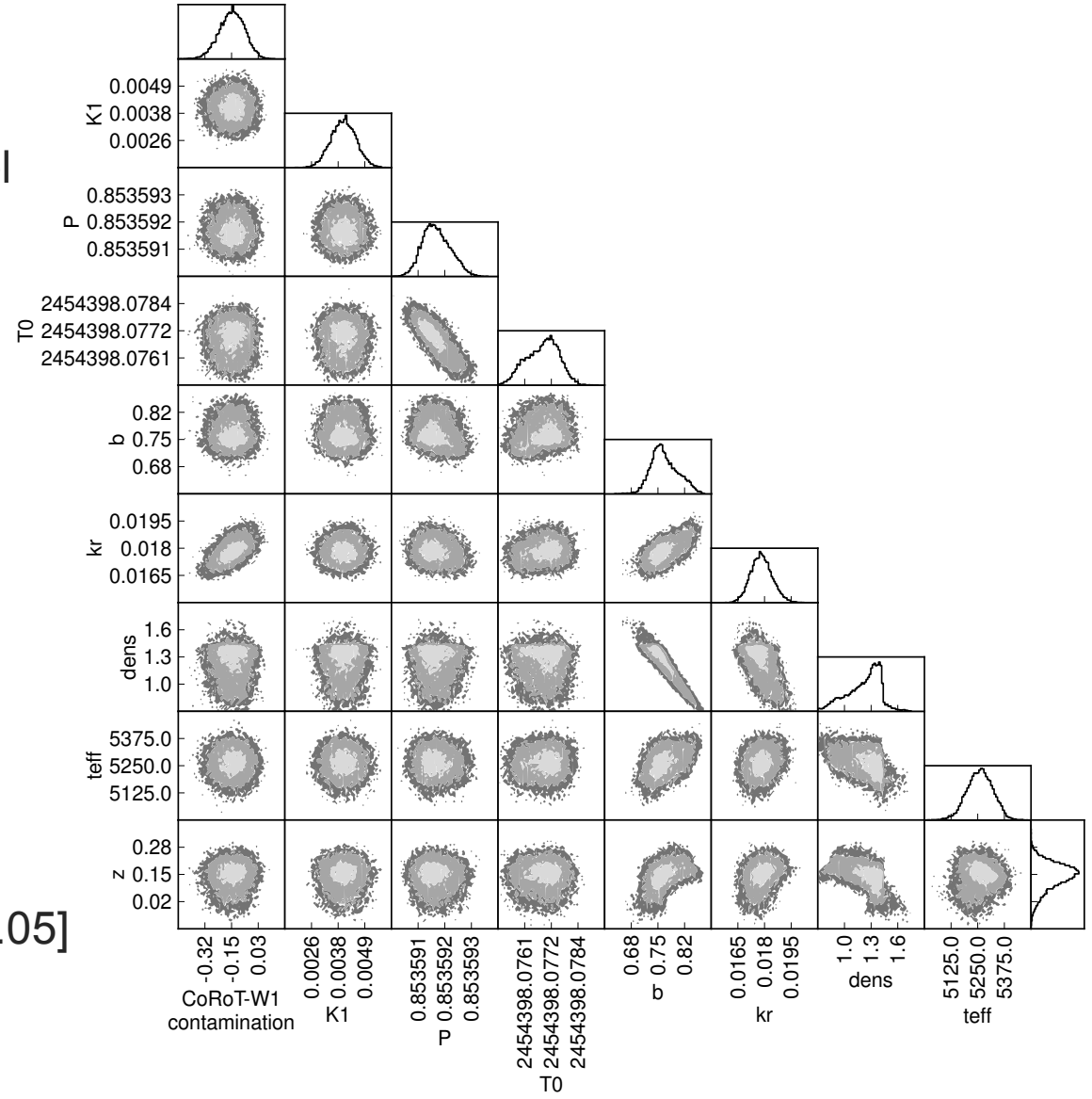
Teff = 5250 +/-60 K

Fe/H = 0.12 +/-0.06

Stellar density from transit

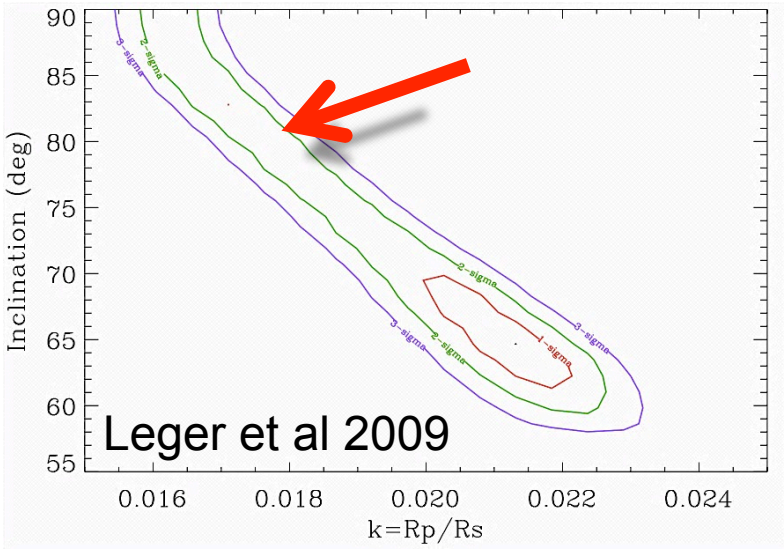
Self-Consistent model

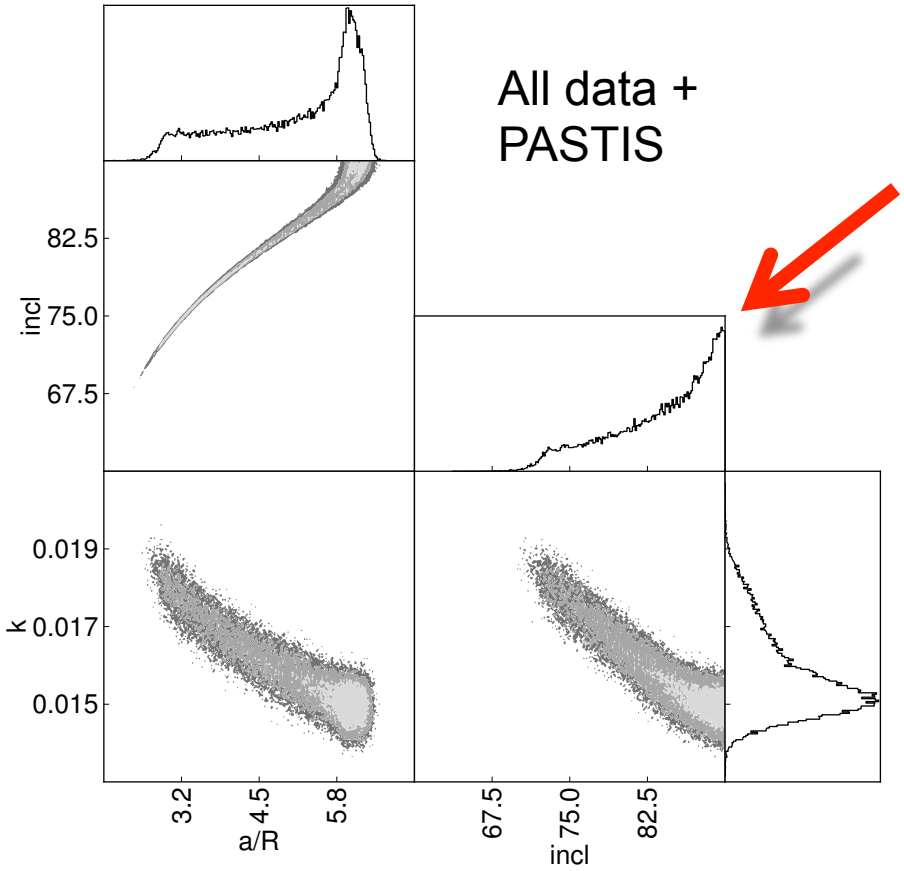
Log g = 4.49 +/-0.06 [4.47+/-0.05]



Stellar density

- LRa01 data
- Poor constrain on the transit shape
- Star radius constrained from spectroscopy



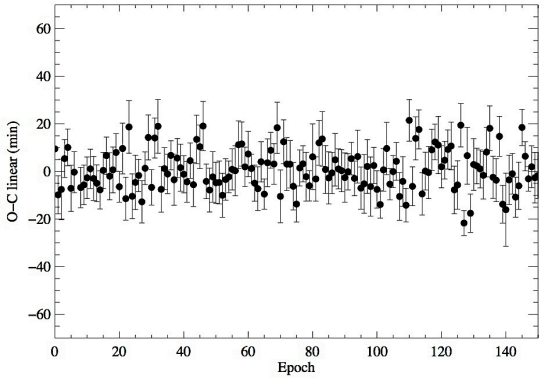


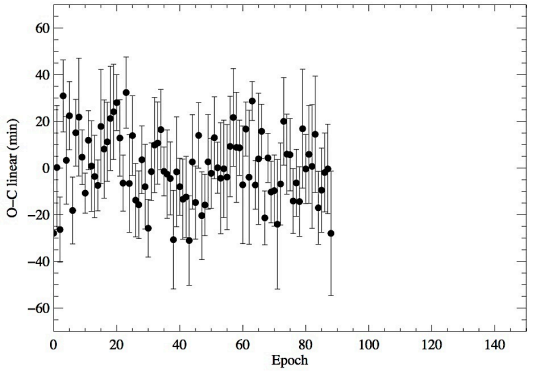
Transit time variations

LRa01

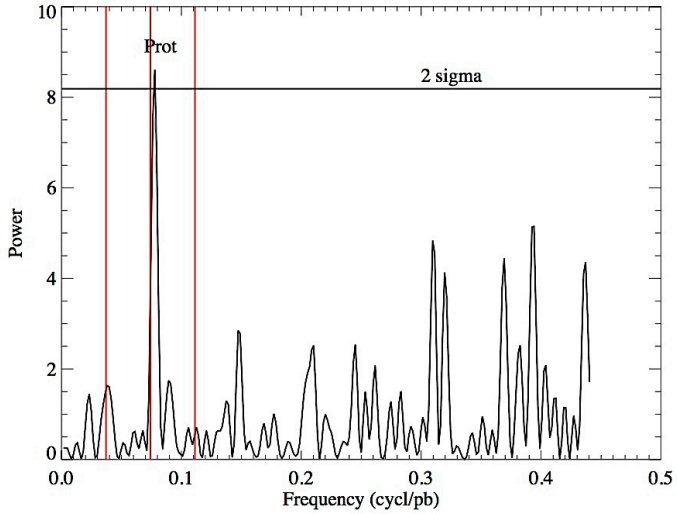
LRa06

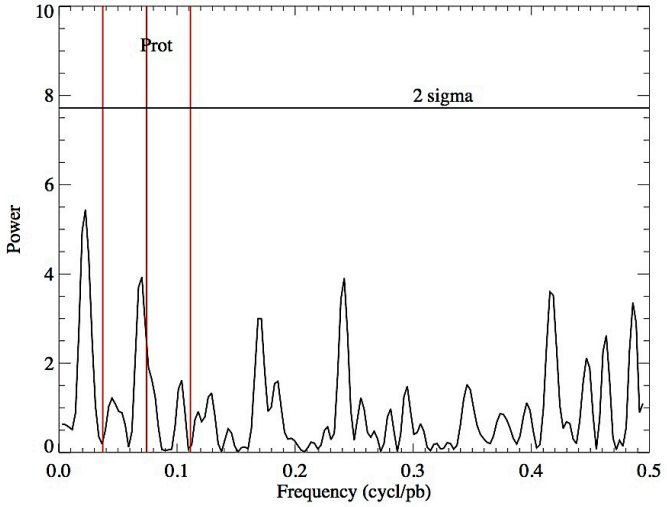
Errors *0.5



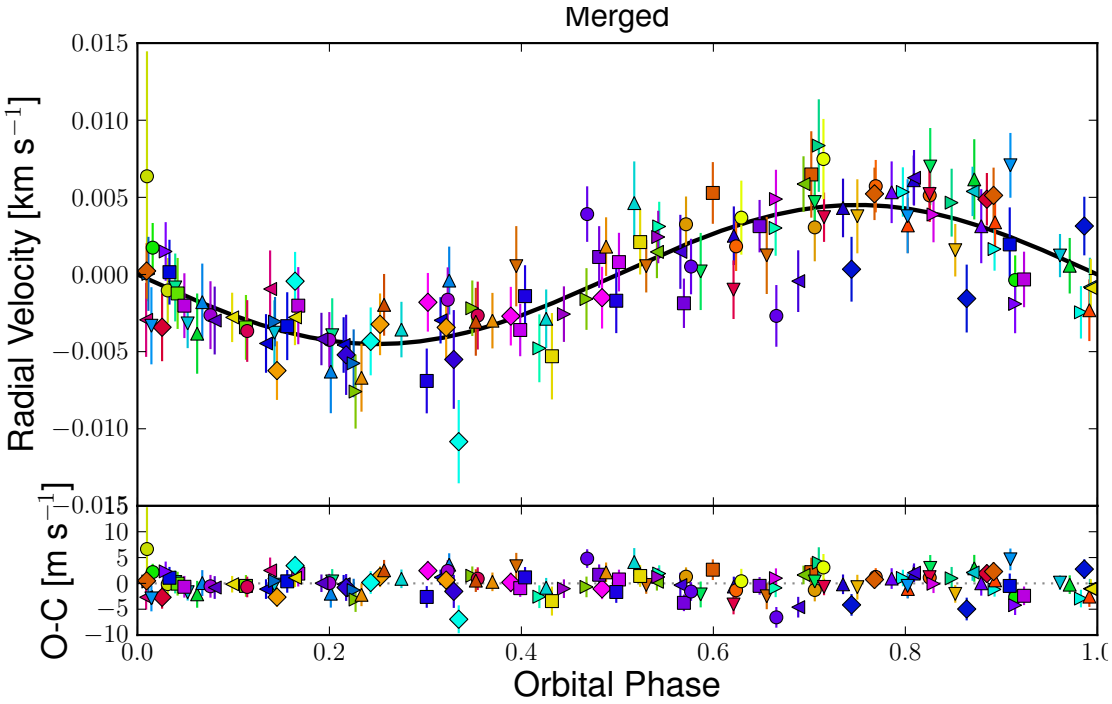


Errors *1.3





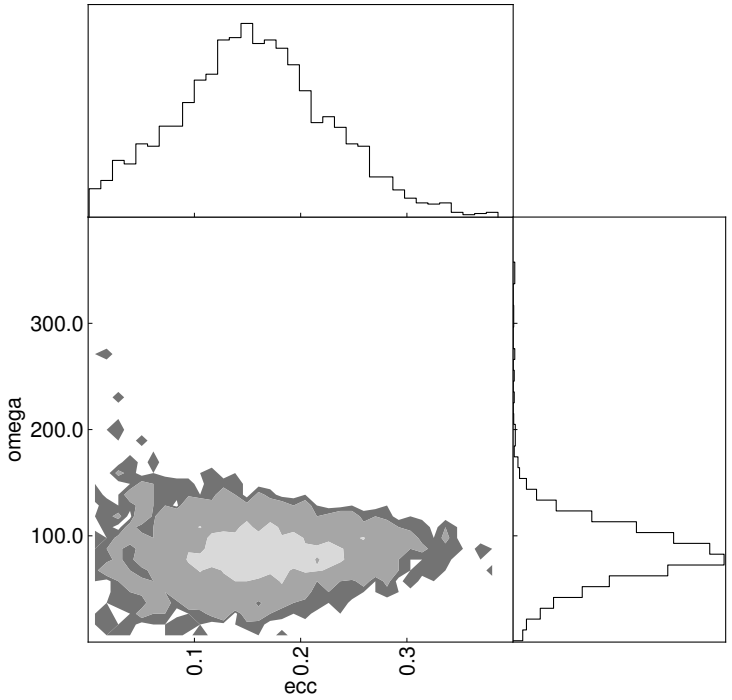
Eccentricity test



Hatzes 2010, Hatzes 2011
Each night separate offset
All HARPS data more than 1 obs./night.

Ecc = 0.130 +/- 0.07
Omega = 83.6 +/-14

Bayesian model comparison
'TPM' : 'Truncated Posterior-Mixture'
Evidence ratio M[ecc]/M[noecc] = 2.955



Results circular model

P = 0.85359165 +/- 5.6e-7 days
T0 = 2454398.07694 +/-8.7e-4 HJD

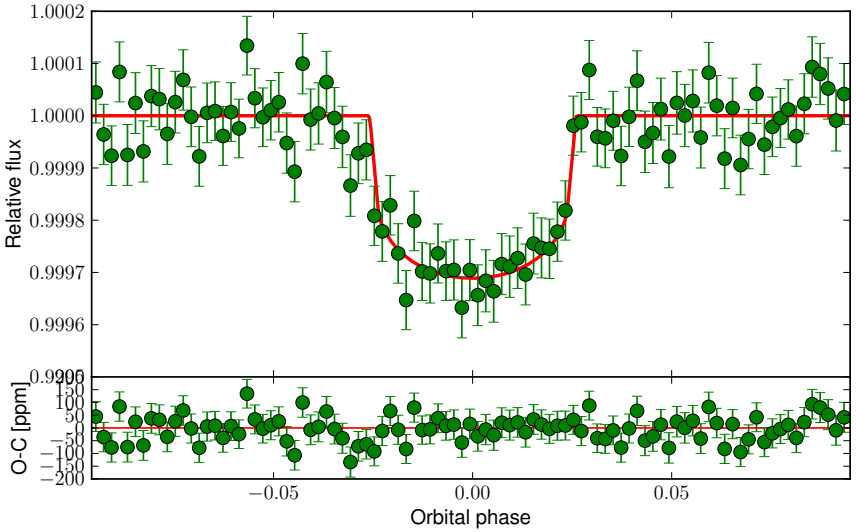
incl: 79.24 +/-1.3 degrees [80.1]
Rp/Rs = 0.01781 +/- 6.2e-04 [0.0187]
Density * = 1.25 +/-0.22

R* = 0.909 +/- 0.08 Rsun [0.82]
M* = 0.924 +/- 0.04 Msun [0.91]

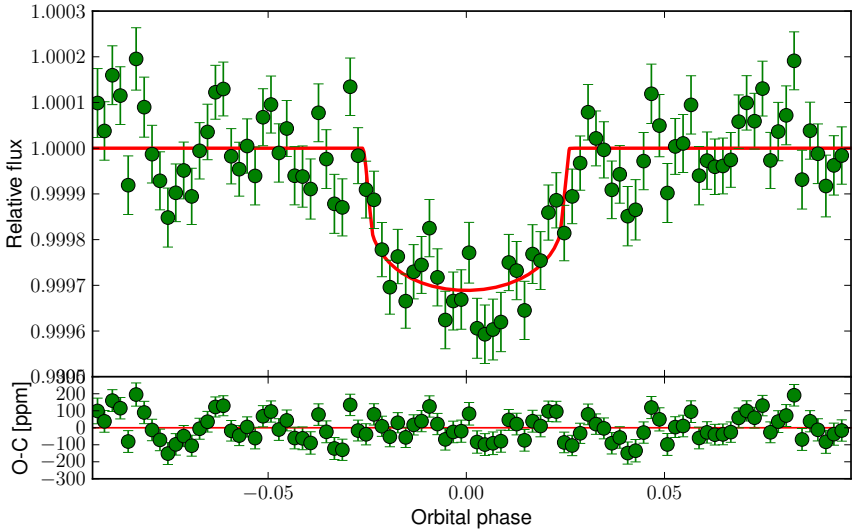
Rp = 1.76 +/- 0.2 Rearth [1.68]
Mp = 5.72 +/- 0.83 Mearth [1.6-7.42] → more detailed analysis next talks
Density = 4.5 +/- 1.4 ρJup (= 1.08 ρEarth = 5.99 g/cm^3)

Contamination LRa06 = 0.0 fixed
Contamination LRa01 = -0.145 +/- 0.092

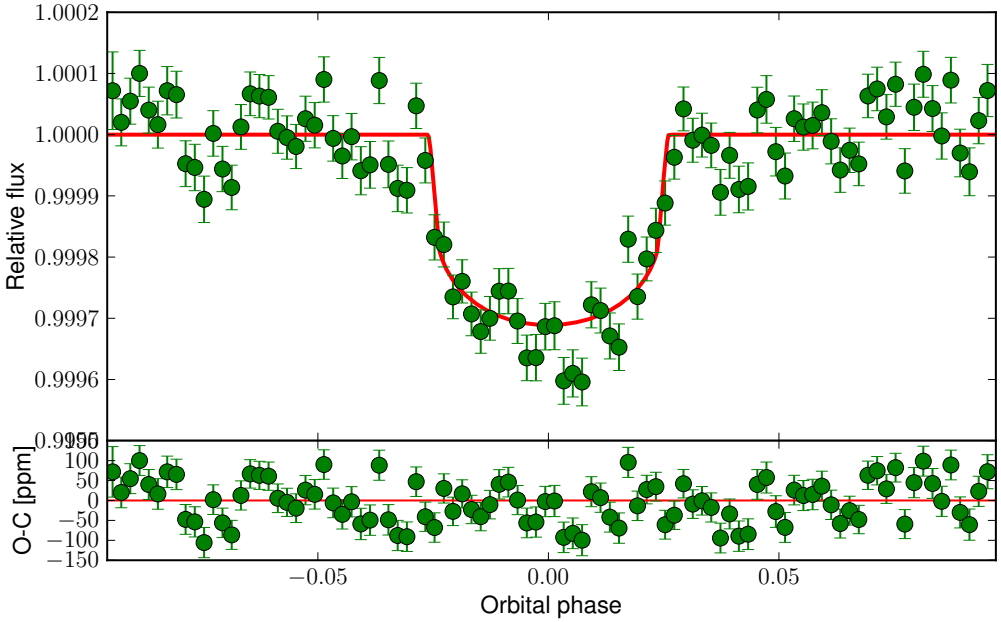
Phase-folded transit + model



LRa01

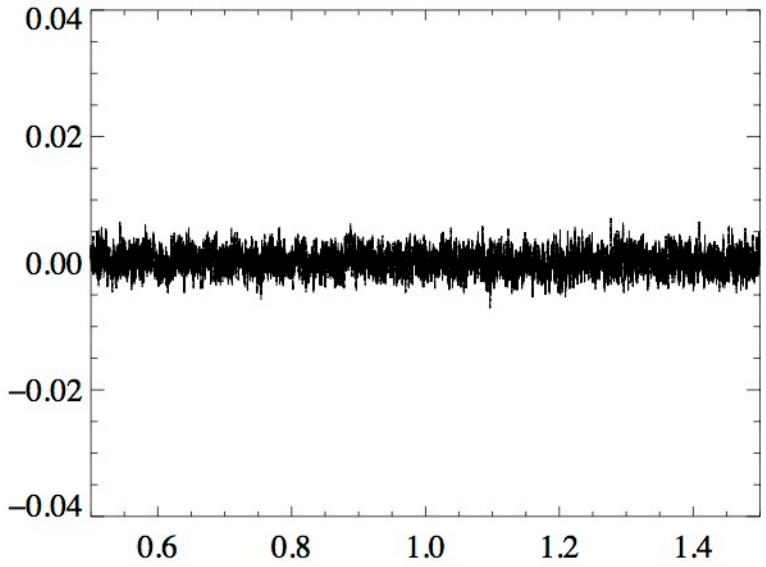


LRa06

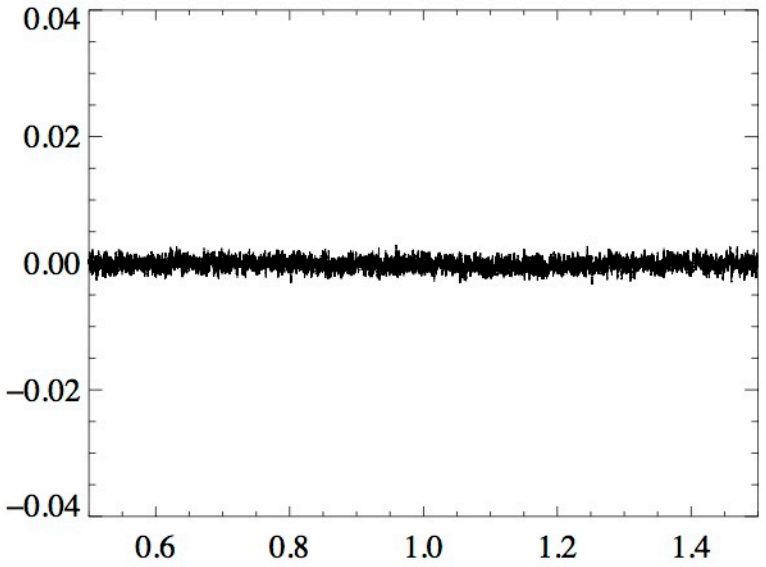


End

CoRoT - 7b centroid



Rms x ~0.017 px



rms y ~0.008 py