

Cleaning CoRoT Lightcurves from systematic effects

Tsevi Mazeh, Tel Aviv

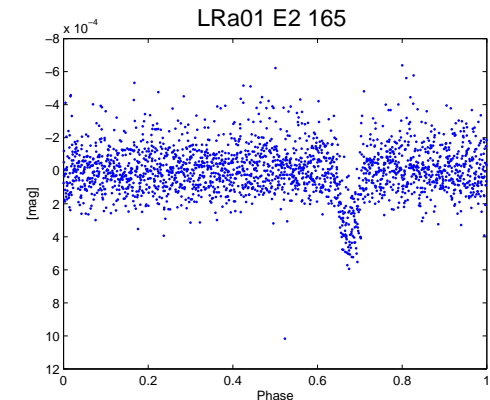
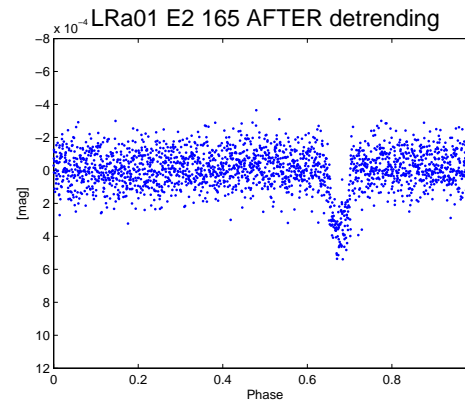
**Pascal Guterman,
Marseille**

Suzanne Aigrain, Exeter

Shay Zucker, Tel Aviv

Nir Greenberg, Tel Aviv

Ron Sabo, Tel Aviv



Paris 2009

Searching for systematic effects

Collective behaviour:

SysRem (Tamuz, Mazeh, Zucker 2005)

Collective behaviour (per exposure)

Exposure no. 2

Star no. 1

m_{11}	m_{12}	K	K	K
m_{21}	m_{22}	K	K	K
m_{31}				
m_{41}				
K				
K				
K				
K				

Removing stellar average

$$\begin{pmatrix} m_{11} & m_{12} & K & K & K \\ m_{21} & m_{22} & K & K & K \\ m_{31} & & & & \\ m_{41} & & & & \\ K & & & & \\ K & & & & \\ K & & & & \\ K & & & & \end{pmatrix} \rightarrow \begin{pmatrix} r_{11} & r_{12} & K & K & K \\ r_{21} & r_{22} & K & K & K \\ r_{31} & & & & \\ r_{41} & & & & \\ K & & & & \\ K & & & & \\ K & & & & \\ K & & & & \end{pmatrix}$$

Preparing N2 Lightcurves I

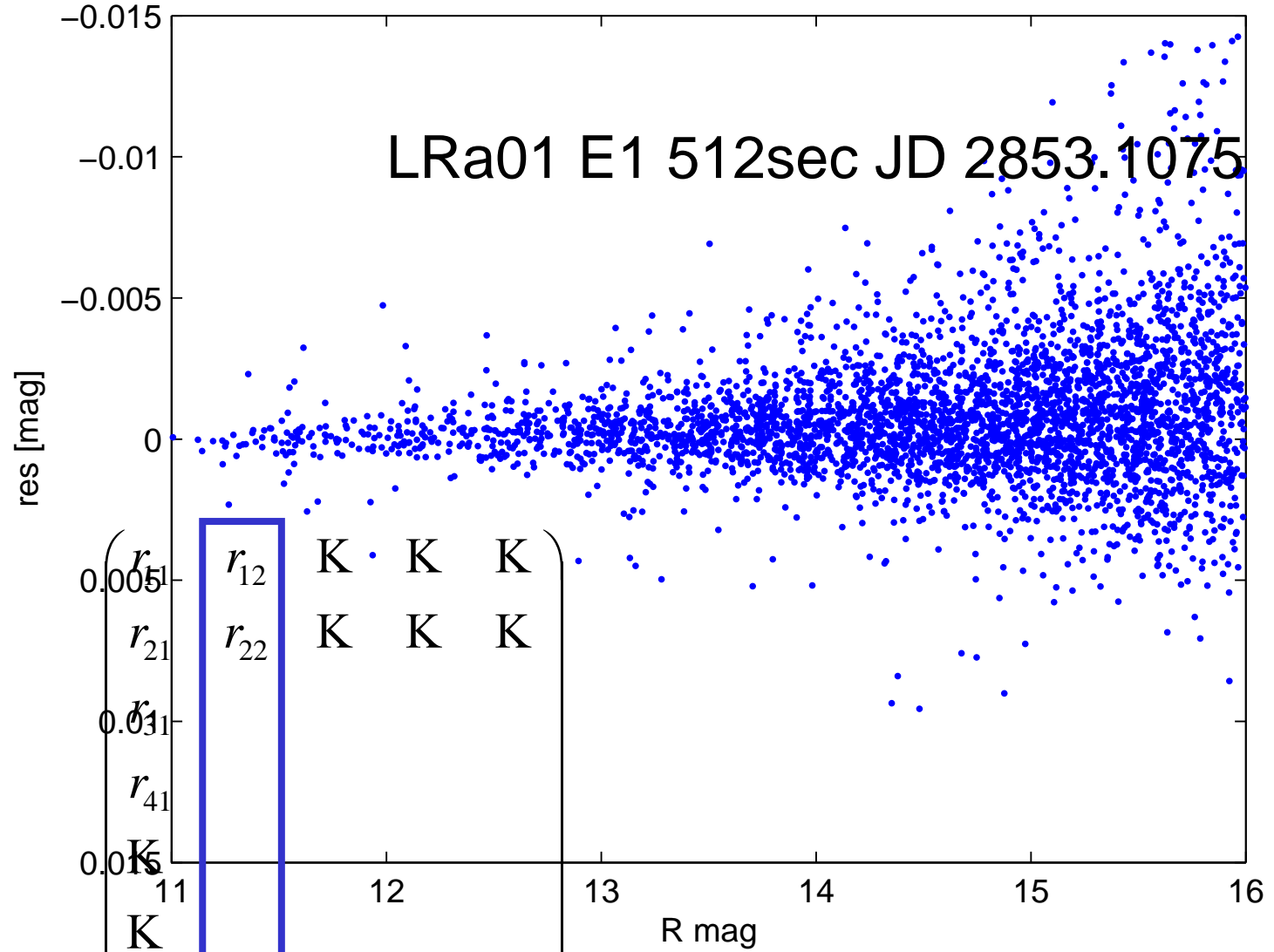
- Distribute N2 data into a synchronised grid
- Remove **temporal** outliers
- Rebin to 512 as would have done CoRoT,
- Add three bands into monochromatic
- Remove slow variation by median filtering

Preparing N2 Lightcurves II

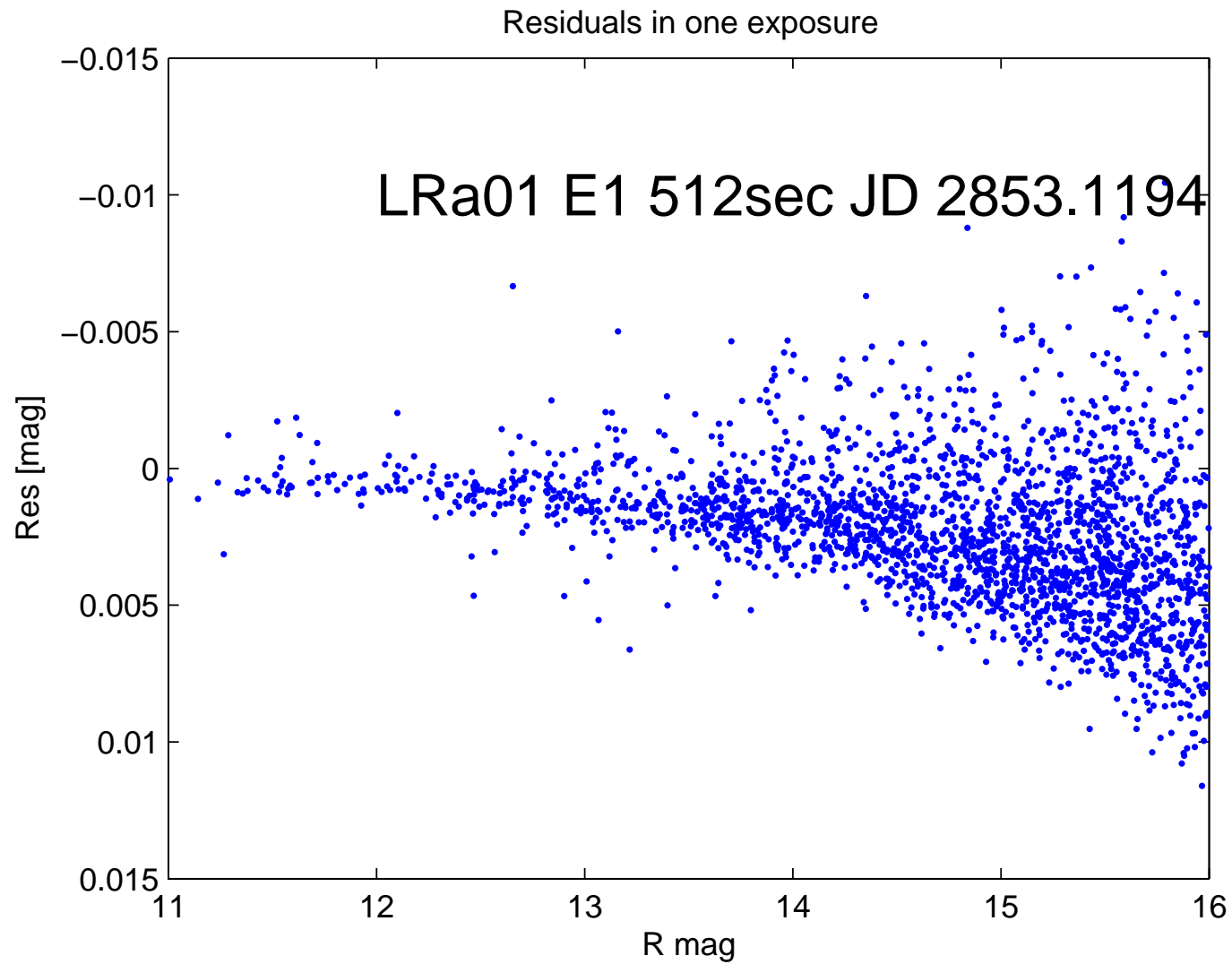
- cut run into 10 days subruns
- select best ~4,000 “learning” lightcurves

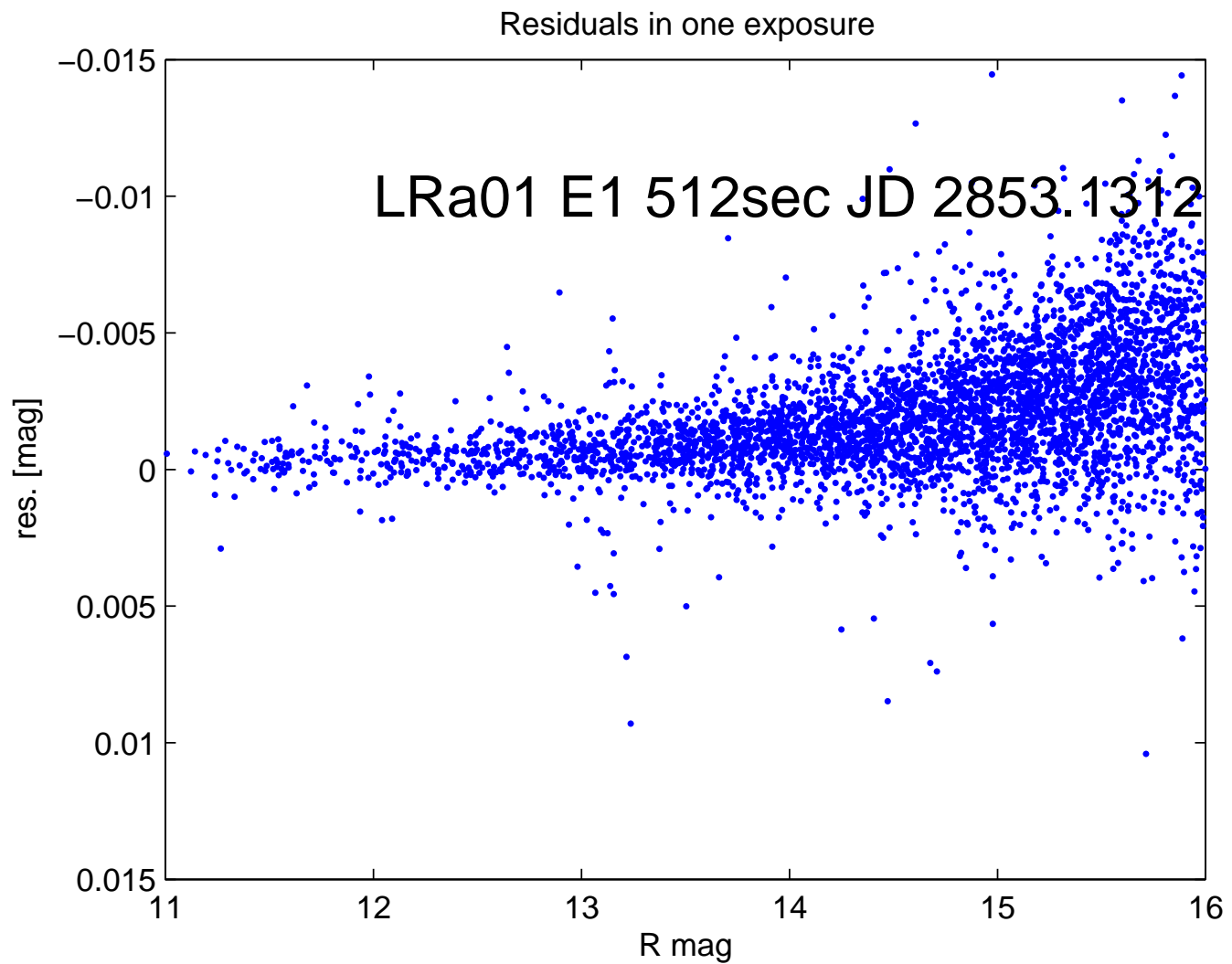
- 1. high S/N**
- 2. no strong stellar variations**
- 3. no hot pixels**

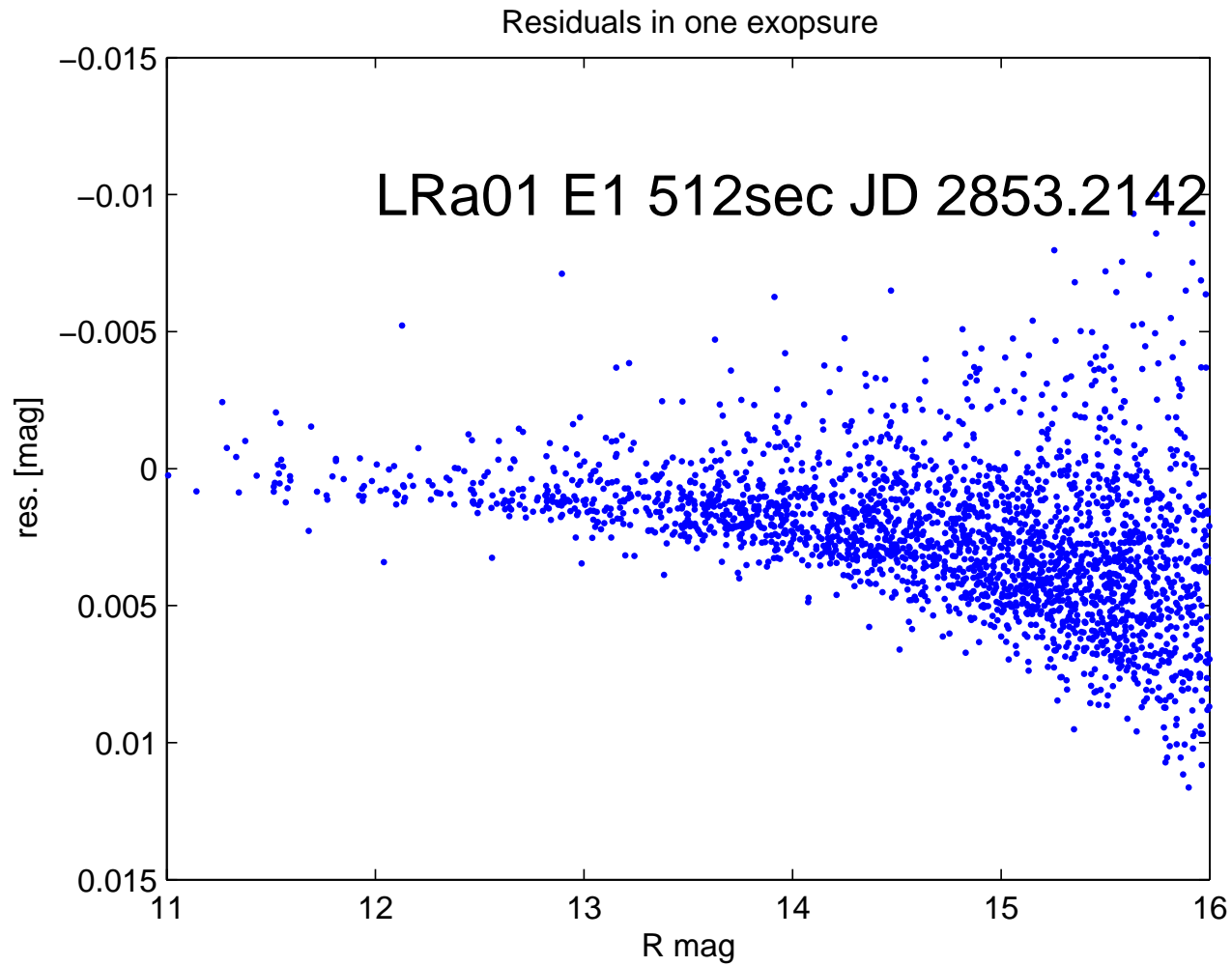
Residuals in one exposure



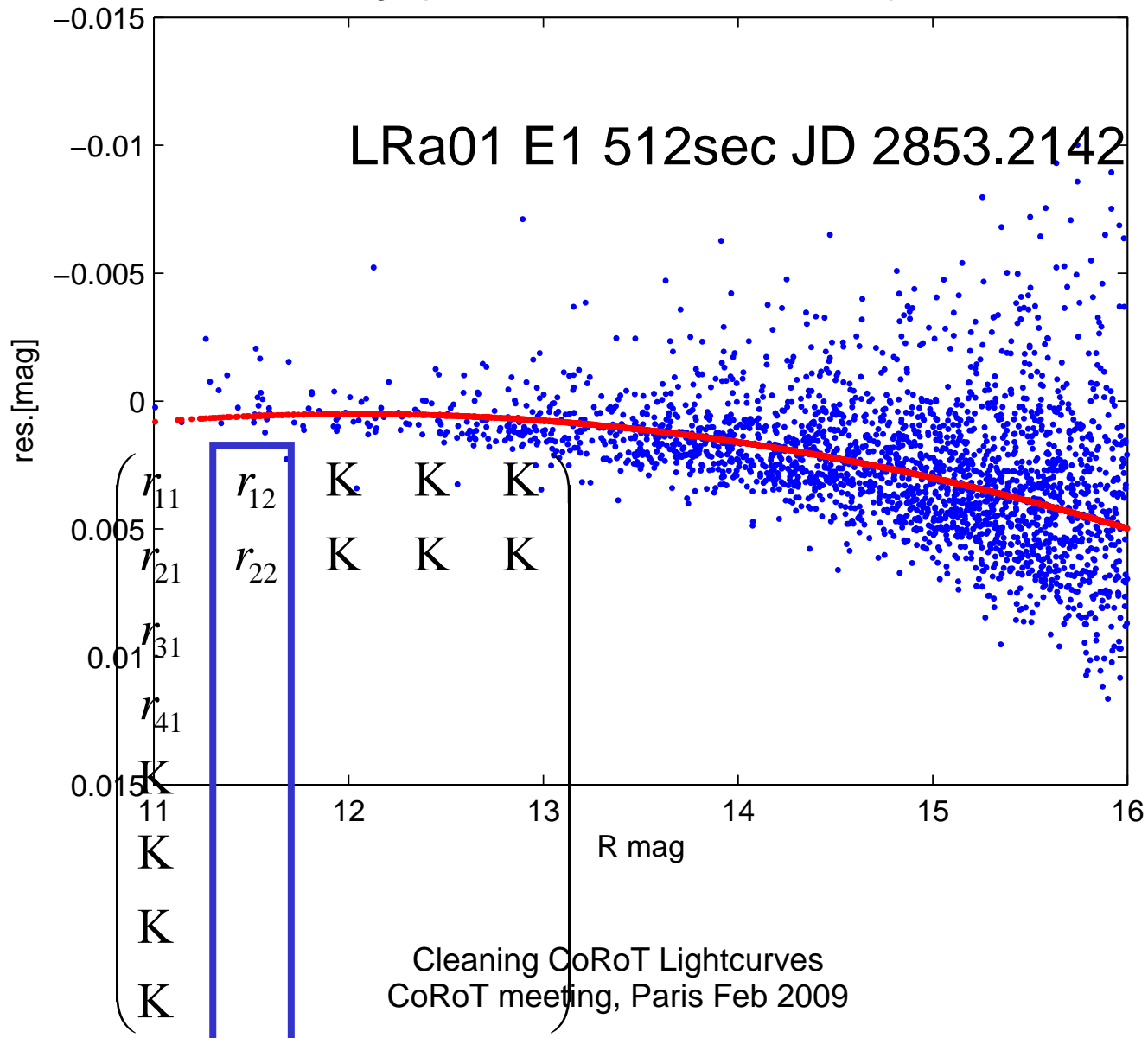
Cleaning CoRoT Lightcurves
CoRoT meeting, Paris Feb 2009

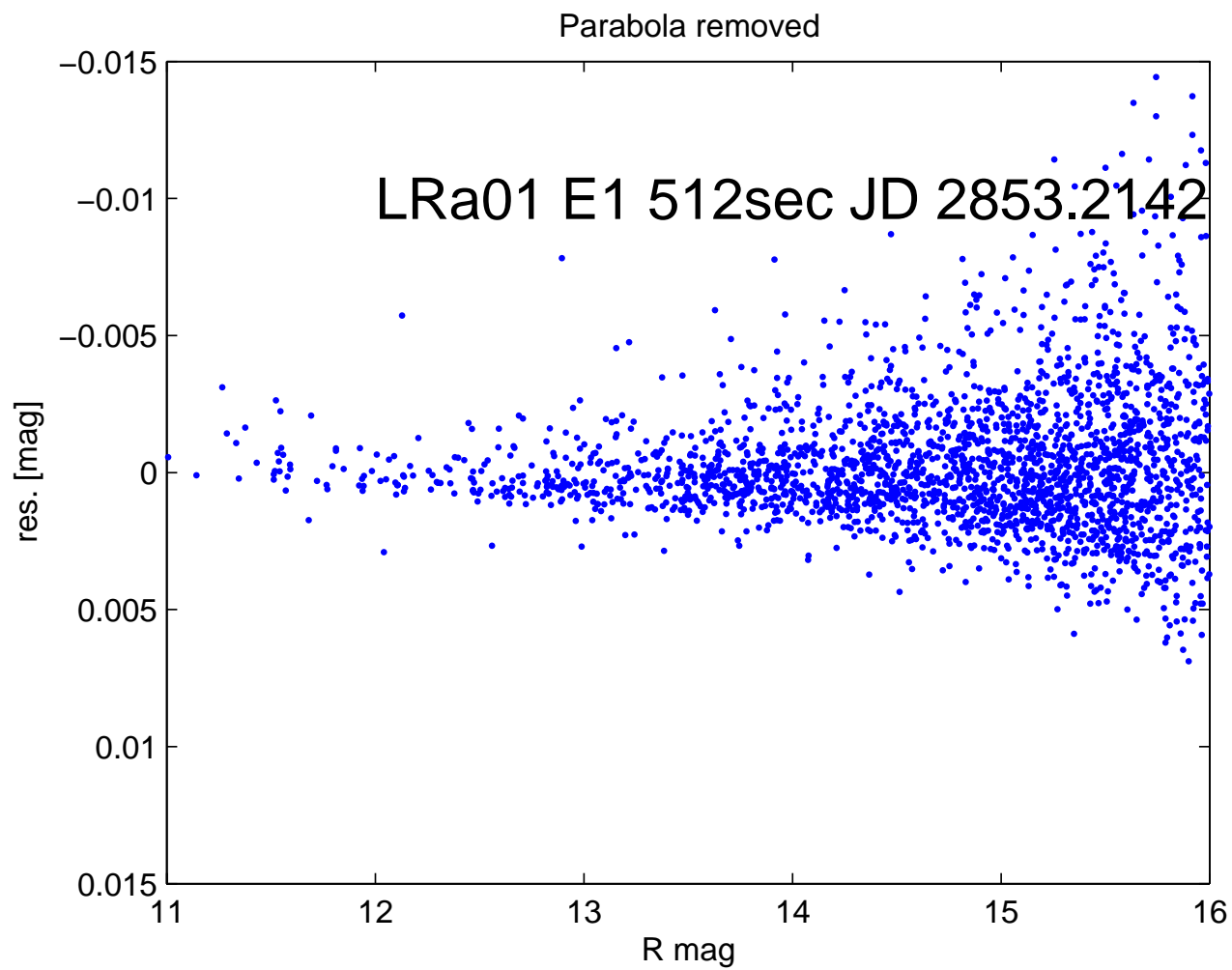




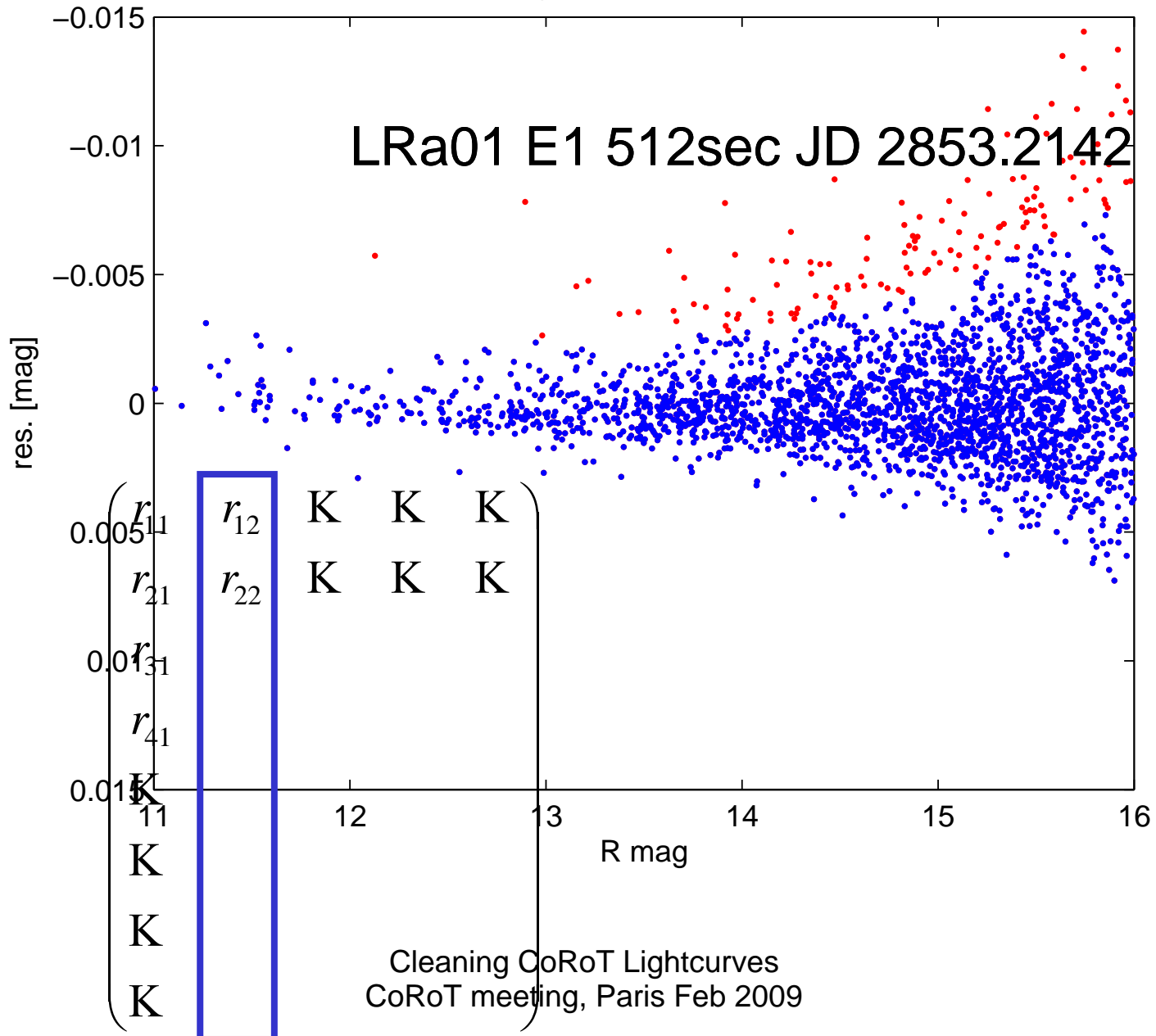


Fitting a parabola to the residuals of one exposure





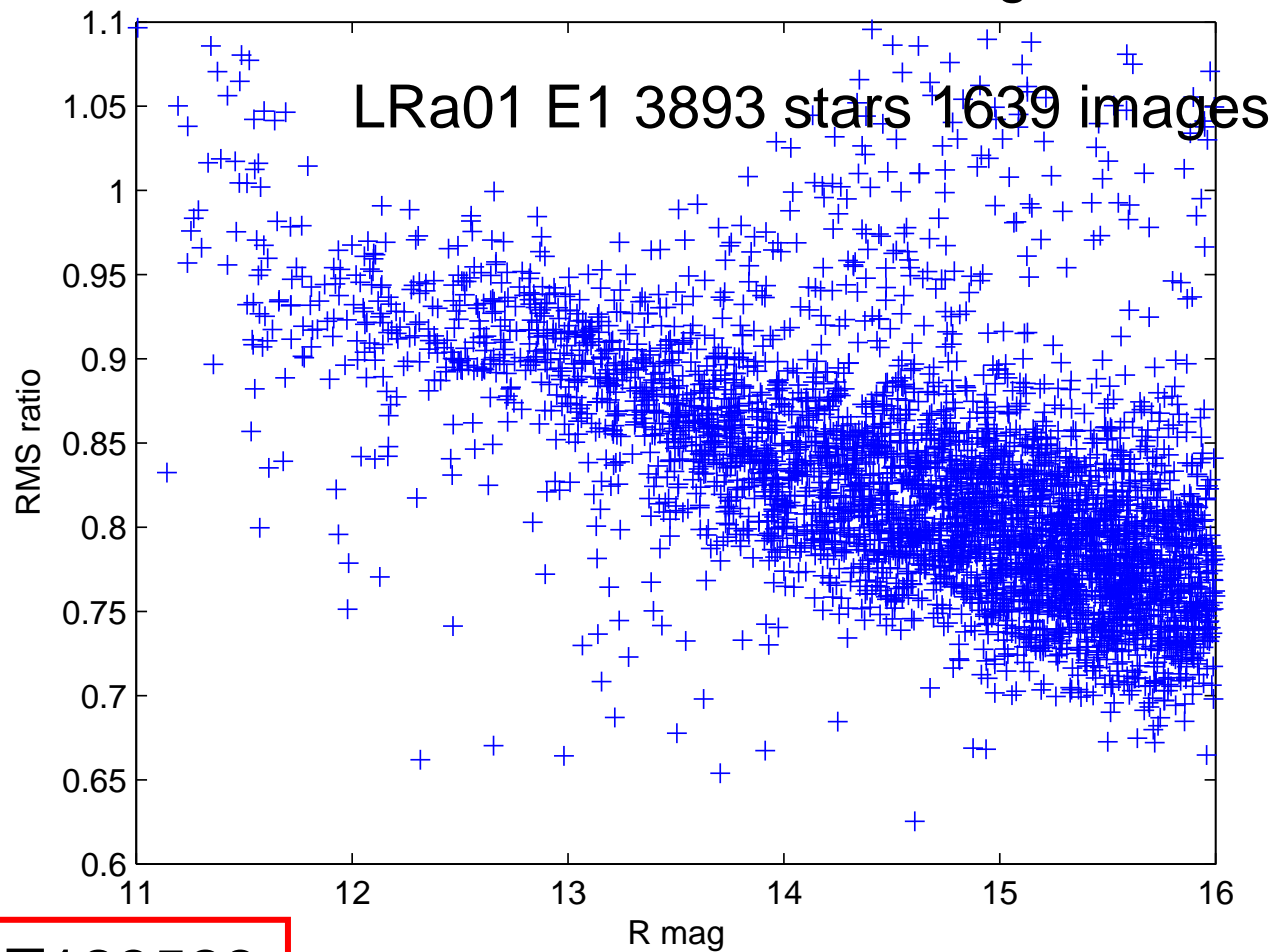
Identifying outliers in one exposure



Our new algorithm

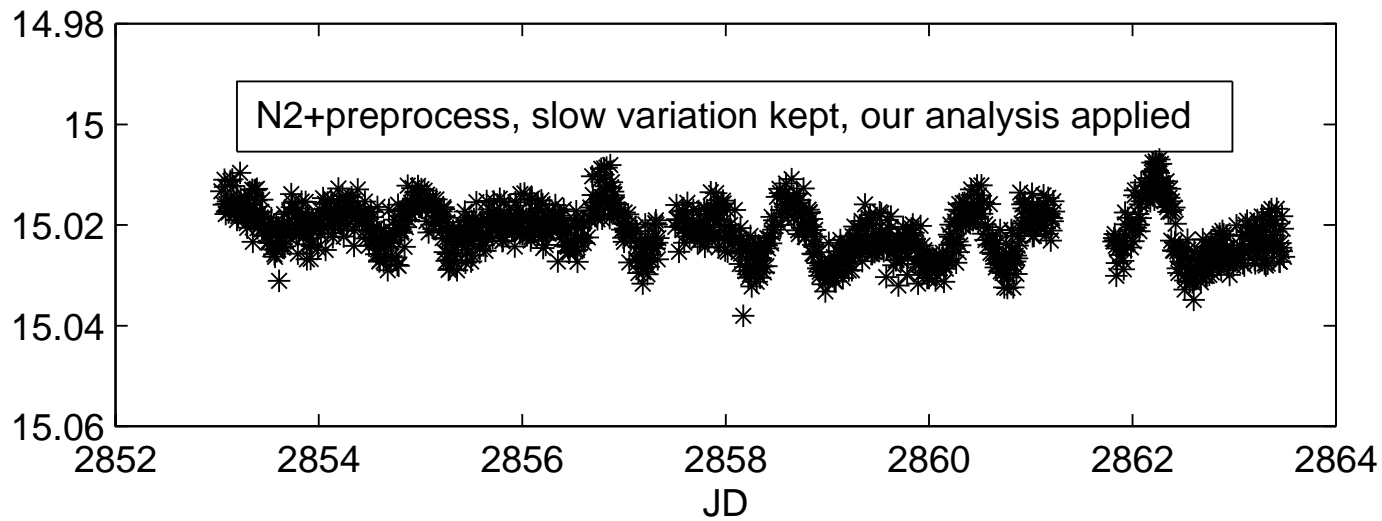
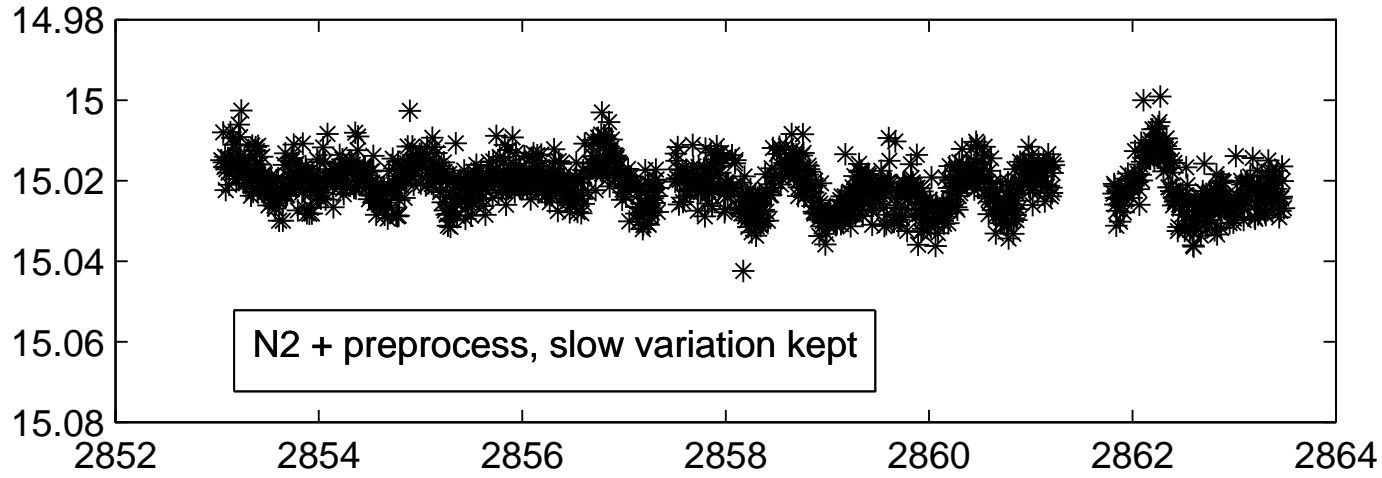
- Fitting and subtracting a parabola to the residuals of each exposure
- Re-estimate errors (as a function of exposure no. and star no.)
- Removing **exposure** outliers
- Applying SysRem

RMS RATIO after cleaning

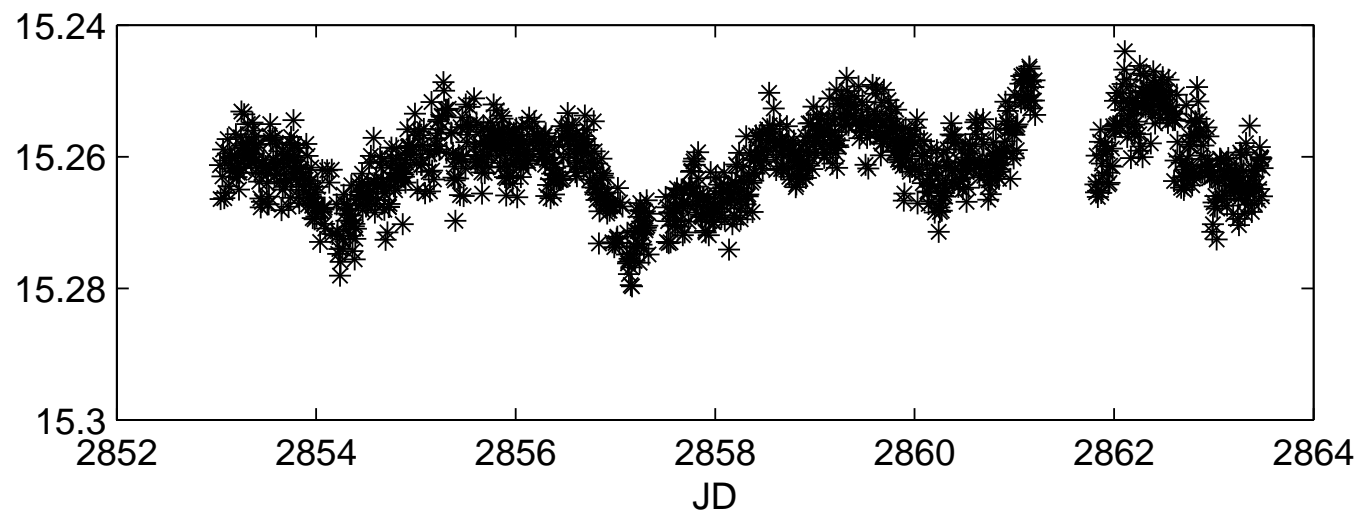
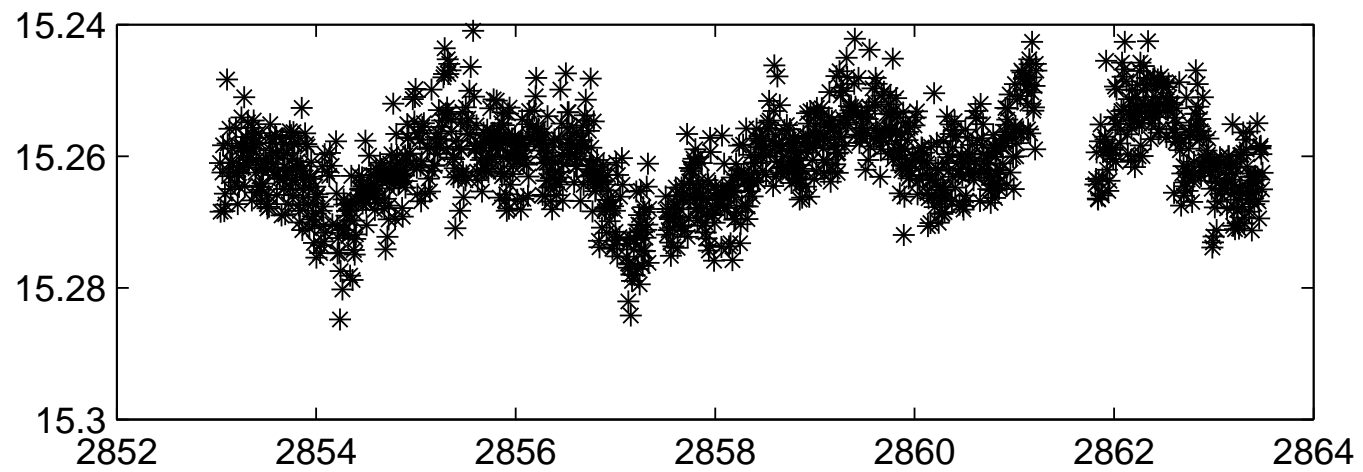


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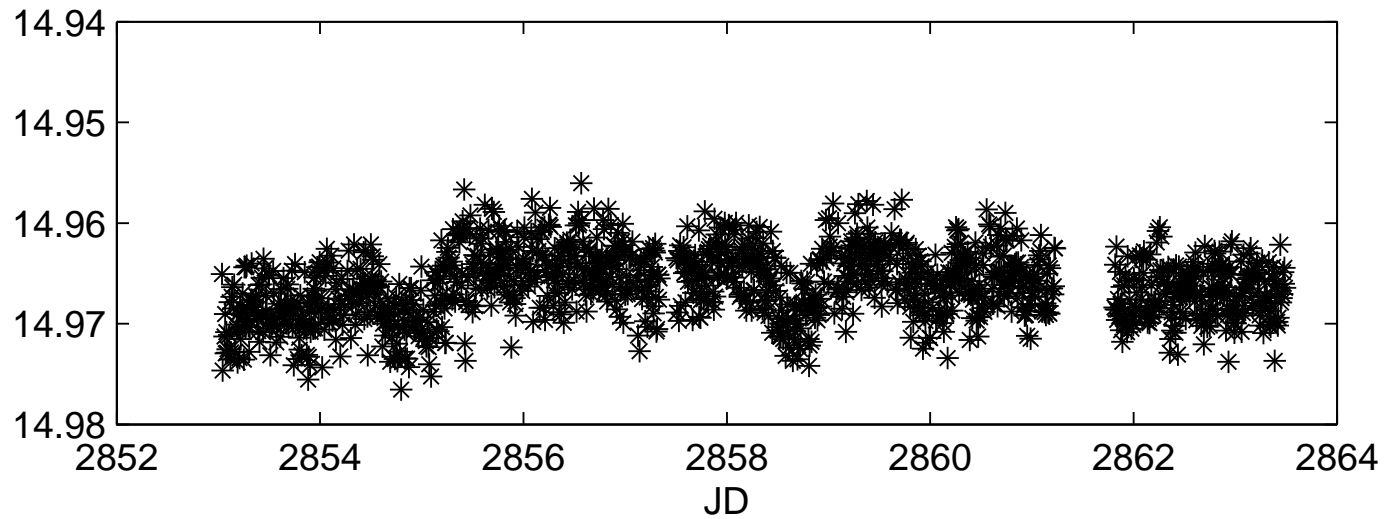
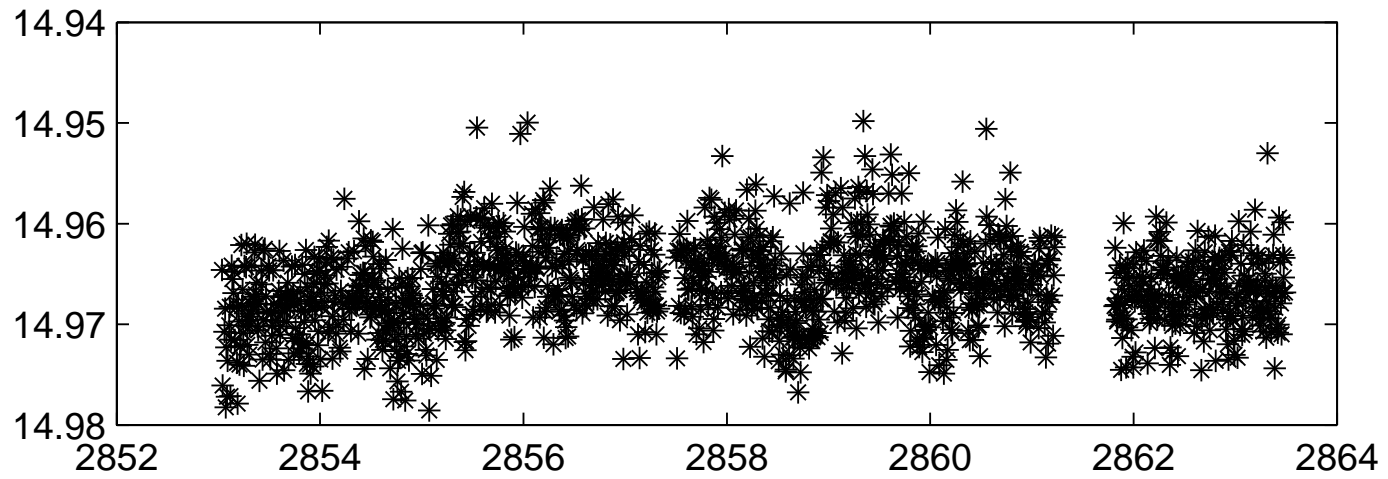
LRa01 E1 CoRoT ID: 102583380



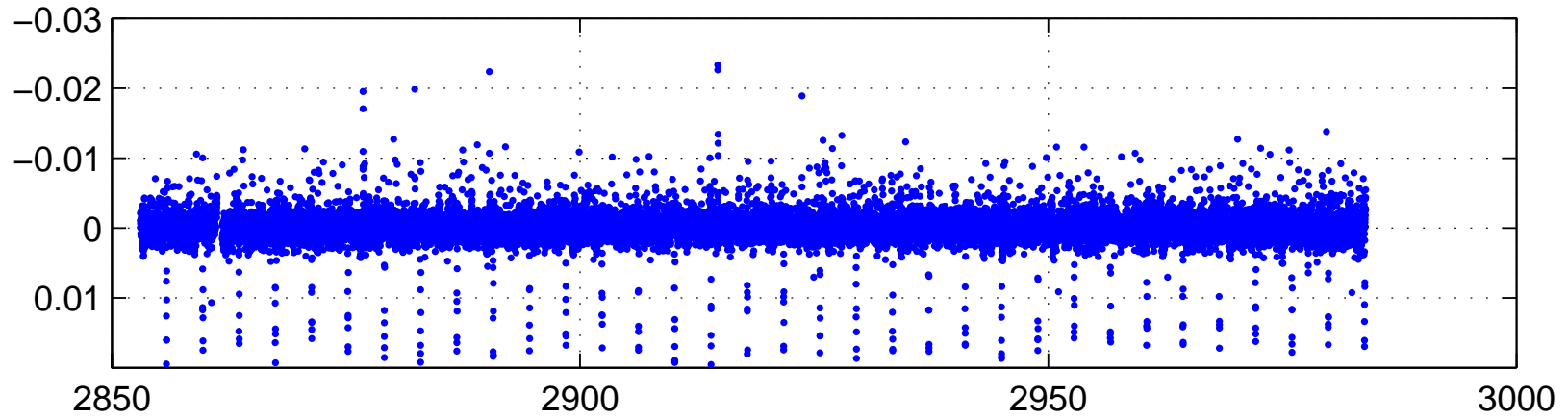
LRa01 E1 CoRoT ID: 102578609



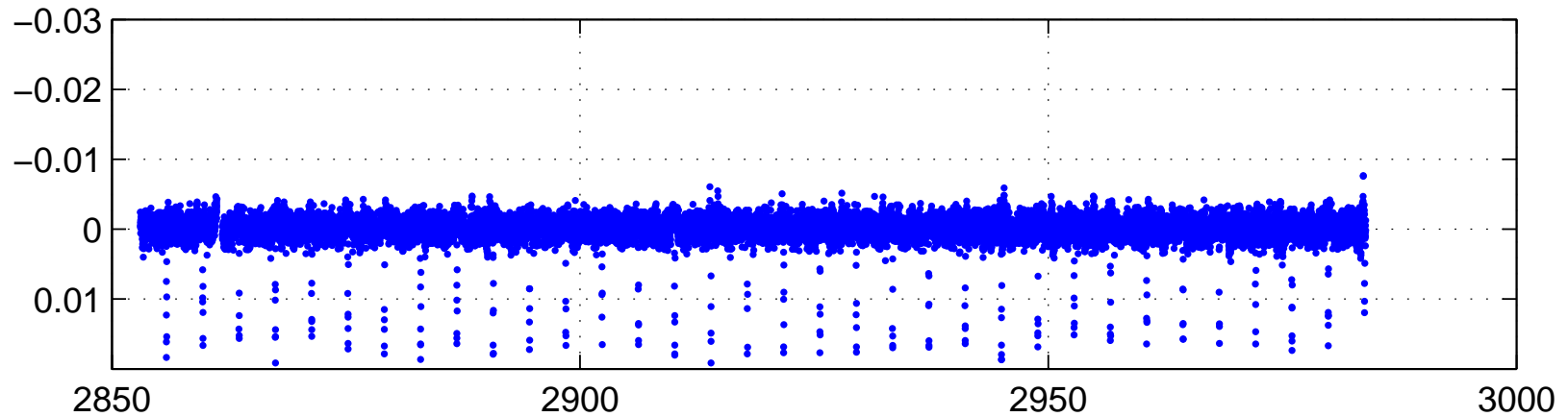
LRa01 E1 CoRoT ID: 102579597



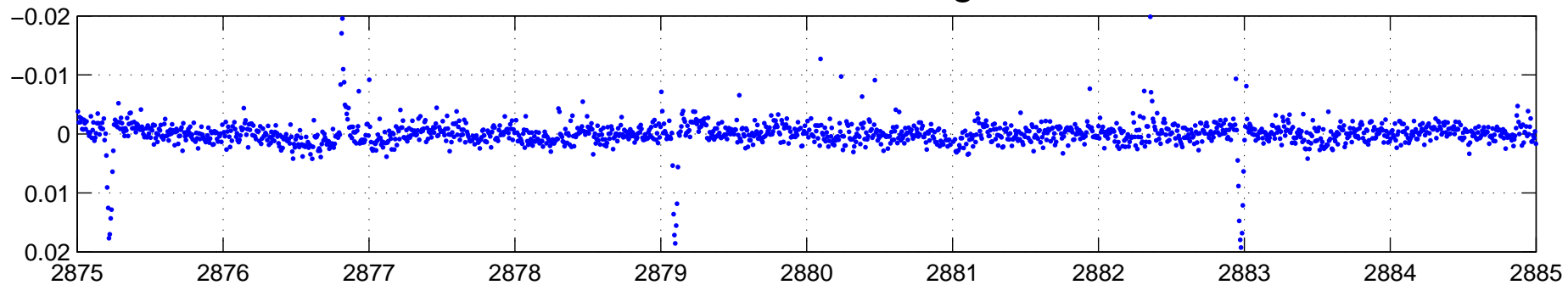
LRa01 E2 1123 [Vmag=14.6]



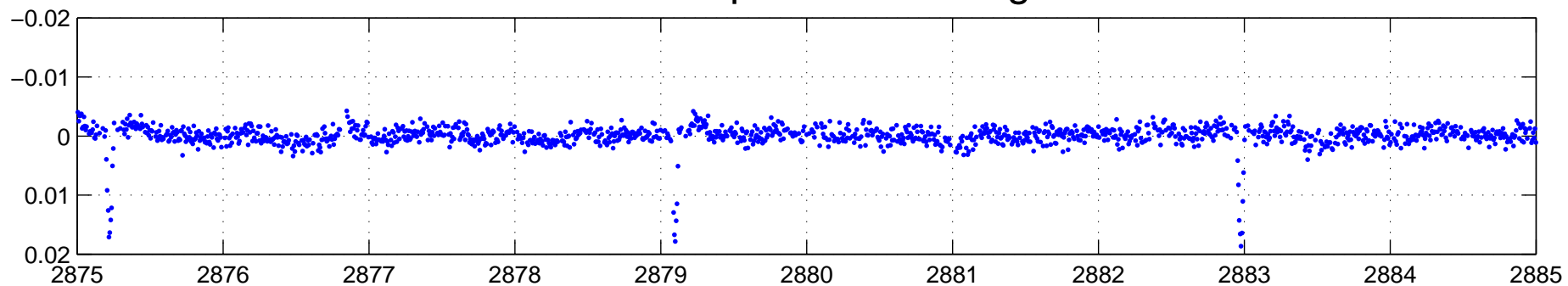
After exposure cleaning

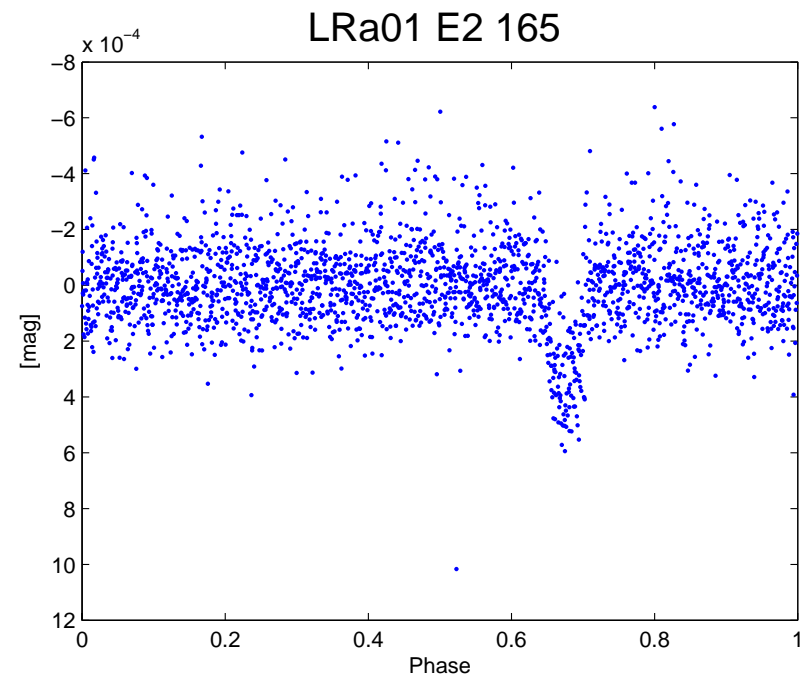
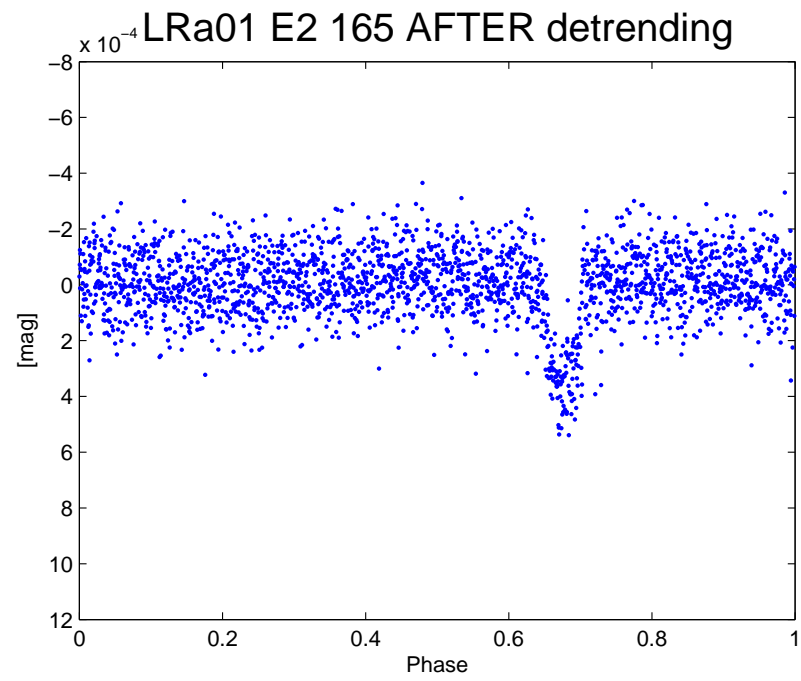


LRa01 E2 1123 Vmag 14.6



After exposure cleaning





Paris 2009

Summary

- Strong collective effect, depending on the stellar magnitude and the exposure
- The effect is stronger for the faint stars
(which consist most of the CoRoT stars)
- Removing these effects and adjust the estimated error can improve our detection threshold by ~25% for the faint stars
- The effect is stronger at the beginning and end of the LRa01 run

What do we do next?

