CORRECTION PIPELINE EVOLUTION

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17october 2013

INSTRUMENTAL CORRECTION PHILOSOPHY

- N0 generated at CNES
- 2 successive correction pipeline
  - N0 -> N1 : On the fly corrections (board and ground) on N0 data : generation of N1 data
  - N1 -> N2 : a posteriori correction (after the run end) requiring parameters computed over a whole run
- Correction of the effect only if it is identified / modelled / quantified
- Neither blind corrections, nor systematic removal (using SYSREM or another algorithm).

PIPELINE N0 -> N1

- Seismo field (corrections applied successively)
  - 1. EMI removal : using a pattern obtained during the calibration phase
  - 2. Removal of offset and background residuals (on board background subtraction)
  - 3. Correction of the observation duration and absolute date
  - 4. Correction of the jitter using high resolution PSFs
- Exo field (corrections applied successively)
  - 1. EMI removal : using a pattern obtained during the calibration phase
  - 2 removal of offset and a median background pattern (obtainedusing background windows) : spatially uniform correction
  - 3 on chromatic LC: generation of the white light LC
  - 4. Correction of the observation duration and absolute date
  - 5. Correction of the jitter using medium resolution PSFs
- Seismo and Exo fields (corrections applied successively after specific corrections)
  - 1. Correction of the relativistic aberration
  - 2. Flag of the outliers (flag for points at a level > 5σ of a sliding mean)
  - 3. Identification of orbital events (SAA, in/out of eclipses…)

PIPELINE N1 -> N2

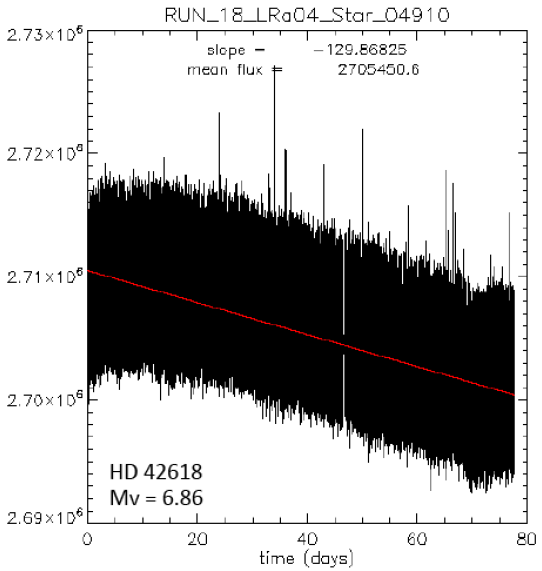
- Exo and Seismo data
  - translation of UT datations into heliocentric time
  - Correction of thermal jumps within the camera
  - Correction of the detection chain efficiency loss

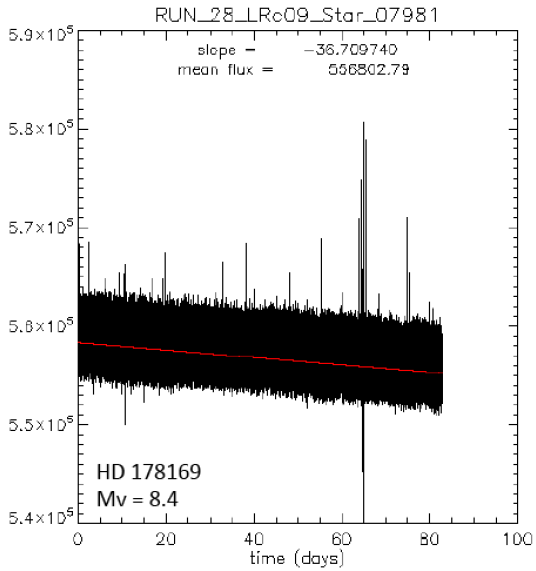
- Seismo field
  - re-sampling 1s -> 32 s : satellite time (« raw » data)
  - Correction of T and mask changing jumps (« hel » et « helreg »)
  - translation satellite time into heliocentrique time (« hel » data)
  - re-samplict at 32 s sharp in heliocentric time (« helreg » data)
  - search for / correction of proton impacts (« hel » and « helreg » data)

- Exo field
  - 1merging of data at a sampling rate of 512 and 32 s into a unique LC
  - 2. Flag of hot pixels
  - 3. Generation of the « windescriptor » containing the observation information for each target.

AGEING OF THE INSTRUMENT

- Decrease of the detection chain efficiency
  - Decrease of the optical transmission
  - Decrease of the quantum efficiency

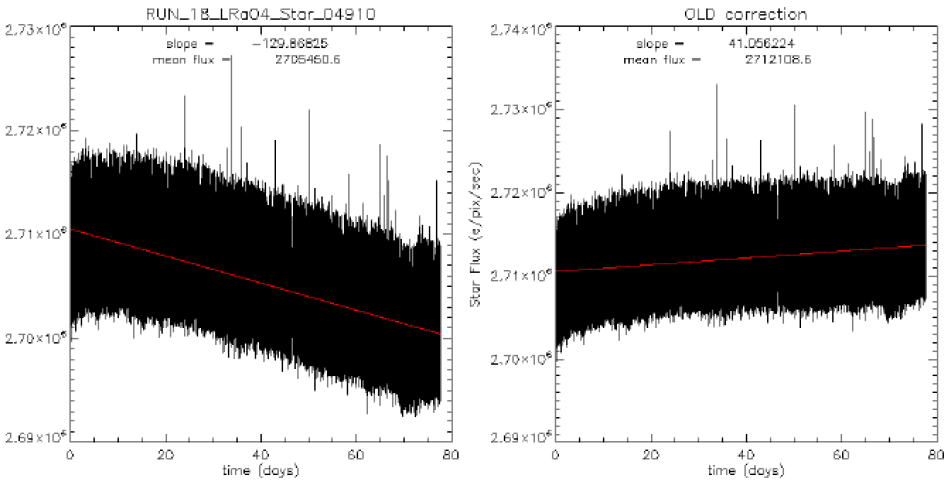


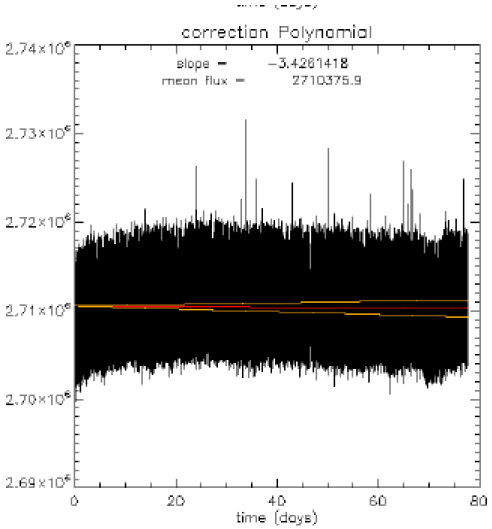


- Effect estimated thanks to the observation of stable stars (variation over 1 run) and re-observation of several targets (long term variation) : efficiency loss of about 10% over 6 years.

AGEING OF THE INSTRUMENT

- Decrease of the detection chain efficiency
  - ✦ over correction of several LC with classical correction
  - ✦New estimation of the correction amplitude as a function of the stellar flux of reference (stable) (A. Deru : LESIA)
  - ✦Correction for both seismo and exo LC
  - ✦Correction accuracy : 10 %





HD 42618
Mv = 6.86

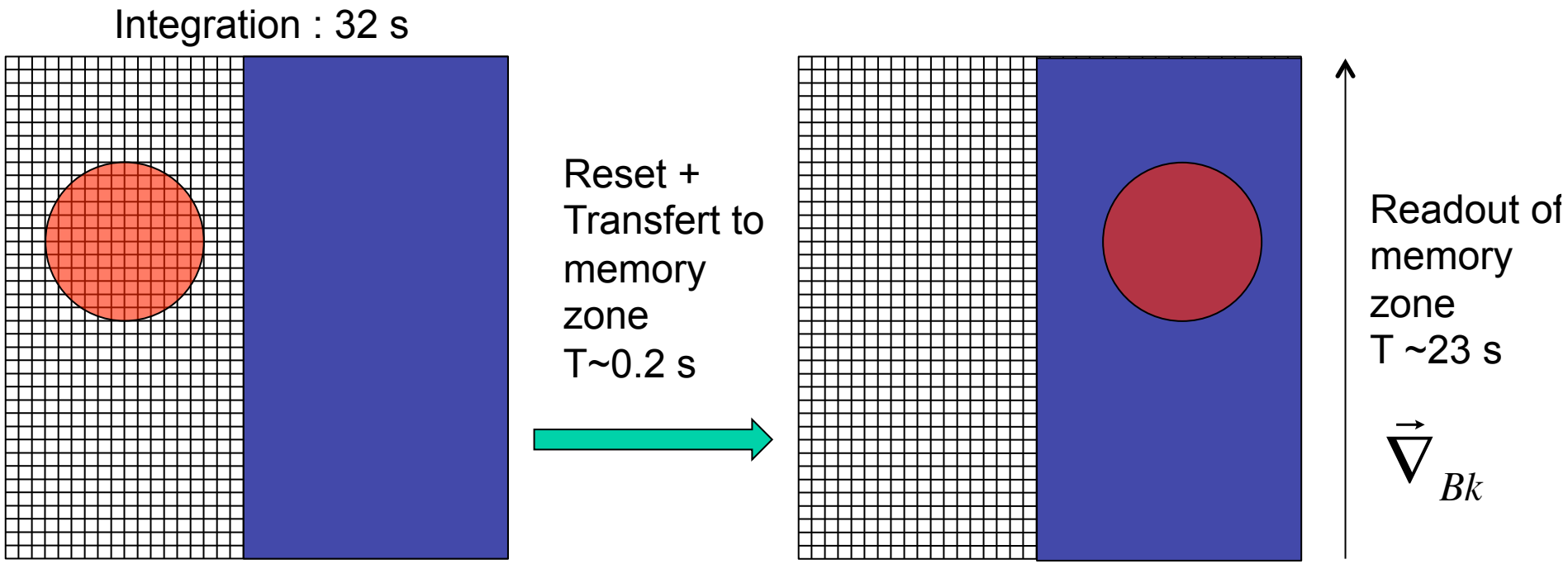
Error of correction : 9.9799663 %
Slope max : 9.1926716
Slope min : −16.044957

AGEING OF THE INSTRUMENT

- Increase of the detector dark current

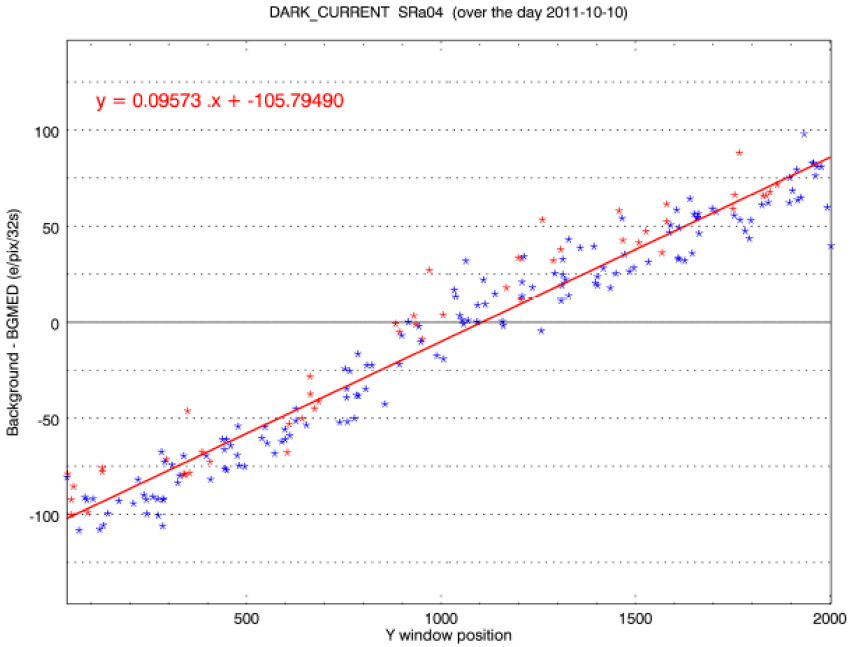
- Negligible/neglected at the beginning of CoRoT
- Increases with time (and irradiation)

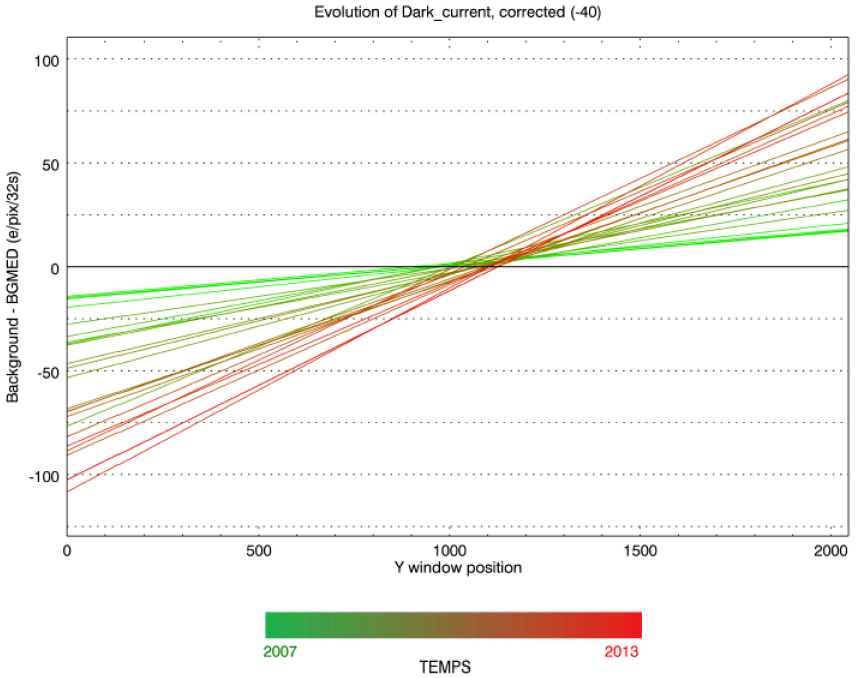
➔ Background residual on ExO LC, depending on the target position on the CCD.



AGEING OF THE INSTRUMENT

- Evolution of the dark current with time





AGEING OF THE INSTRUMENT

Correction of the Exo background

- Model of the background

$$\boxed{BG(t) = C_T \times [32 + \tau(y)] + sky_{BG} + scatlight(t)}$$

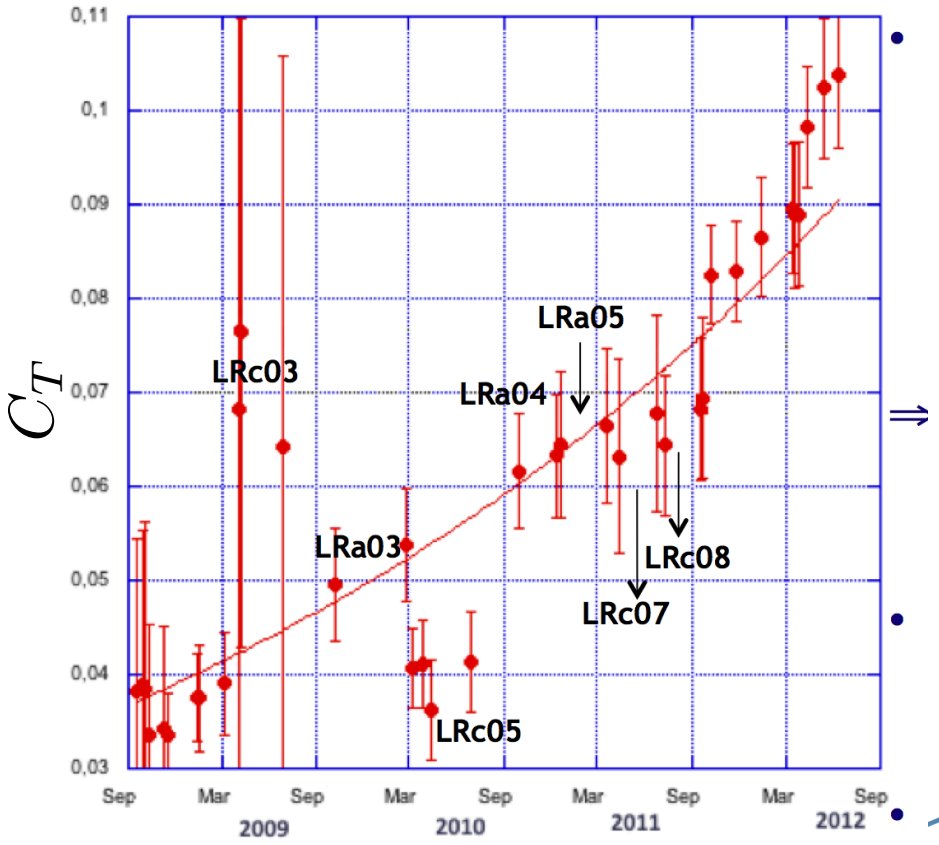
BG = total background on the CCD

C_T = Coefficient (function of run, T)

$\tau(y)$ = CCD readout time

sky_{BG} = sky contribution

Scatlight(t) = scattered light

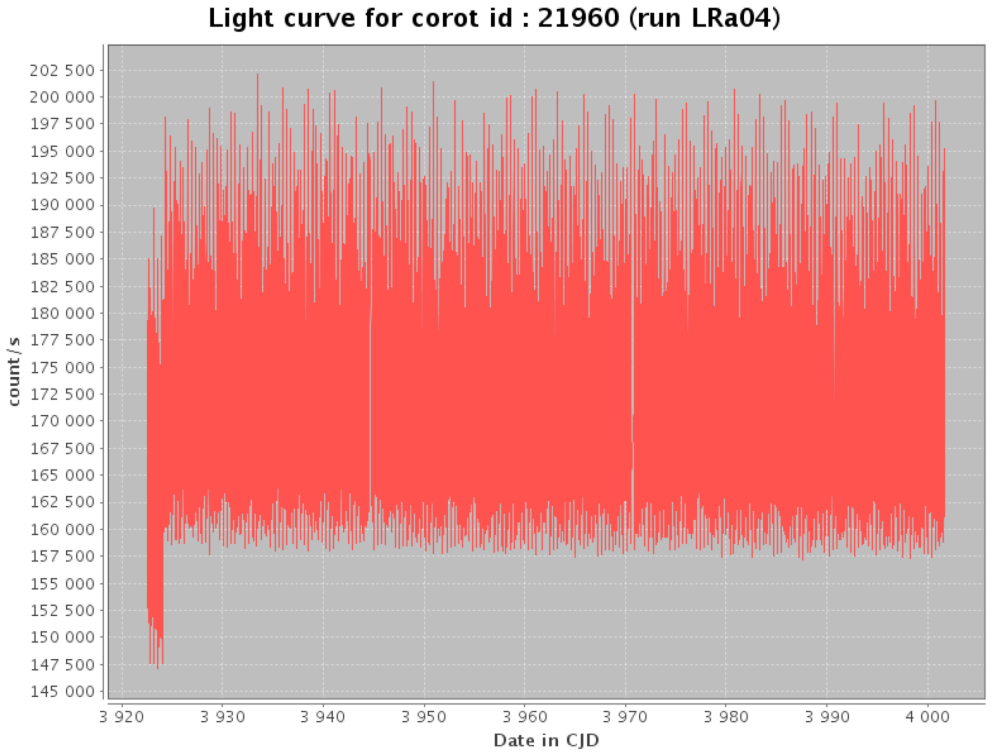


status

- Pipeline ready
- Production should start

OTHER CORRECTIONS

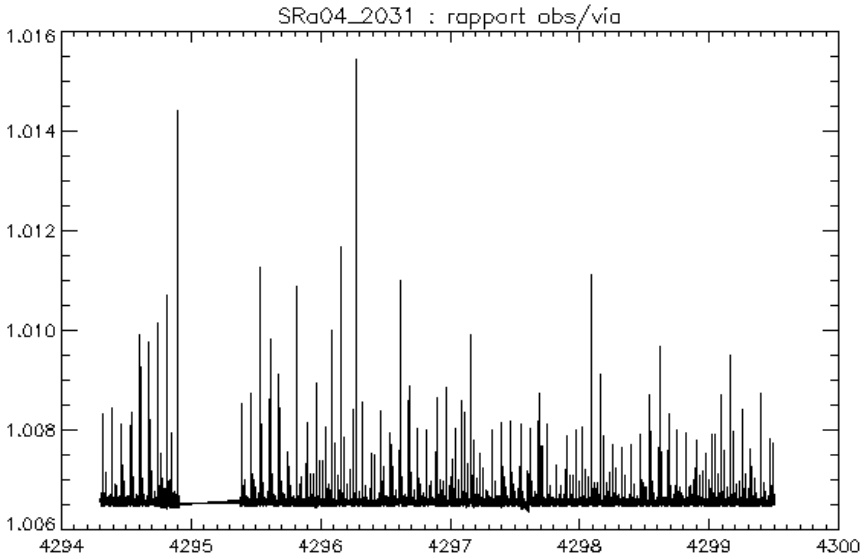
- Photometric jumps on seismo data
  - Due to the change rough -> fine mask
  - Correction using seismo imagettes to compute the photometric loss

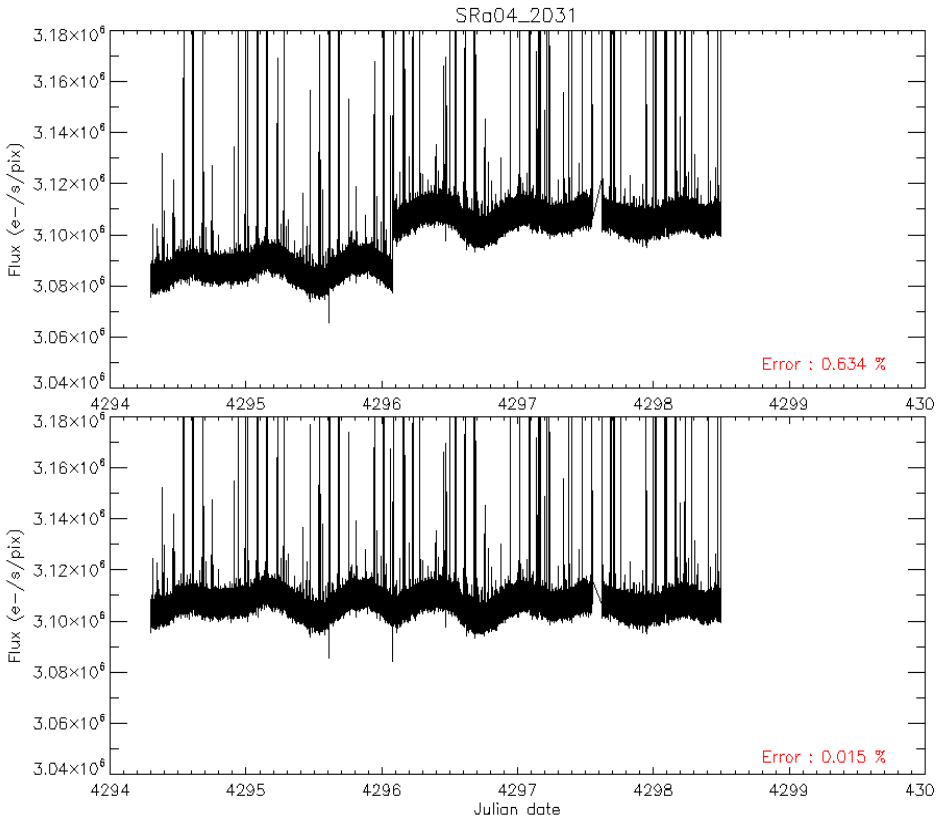


OTHER CORRECTIONS

- Photometric jumps on seismo data

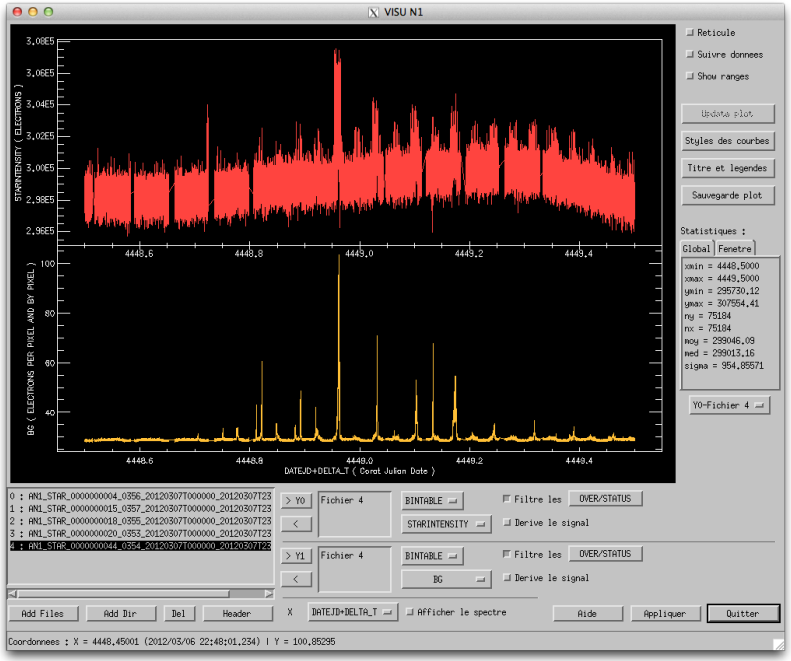
- works well (except for 8 stars)

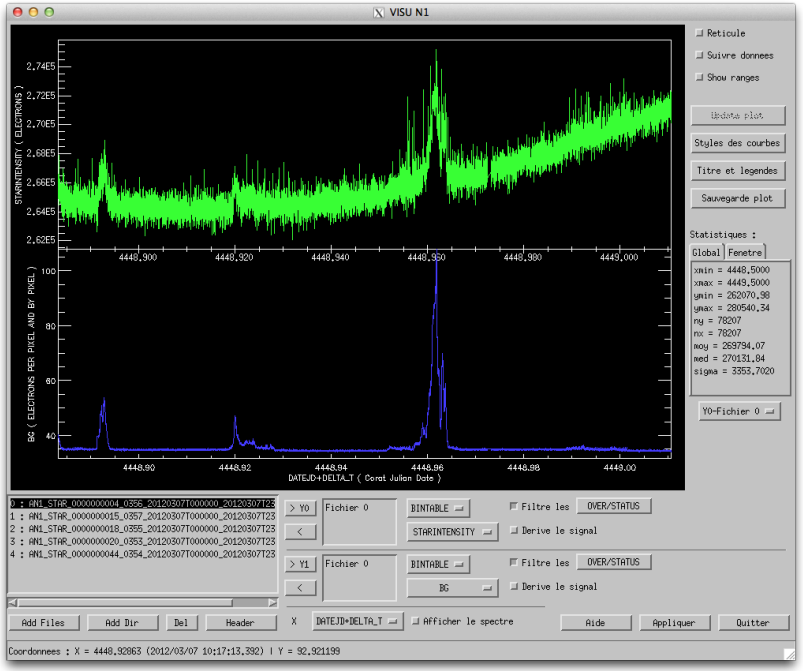




OTHER CORRECTIONS

- Background residuals on seismo and exo LC
  - Out of SAA residuals :
  - Duration : several minutes
  - Happens during several hours at about the orbital frequency every 21 to 24 days
  - Can be seen on every Seismo window
  - Not evident on Exo windows
  - No evident correlation with orbital events

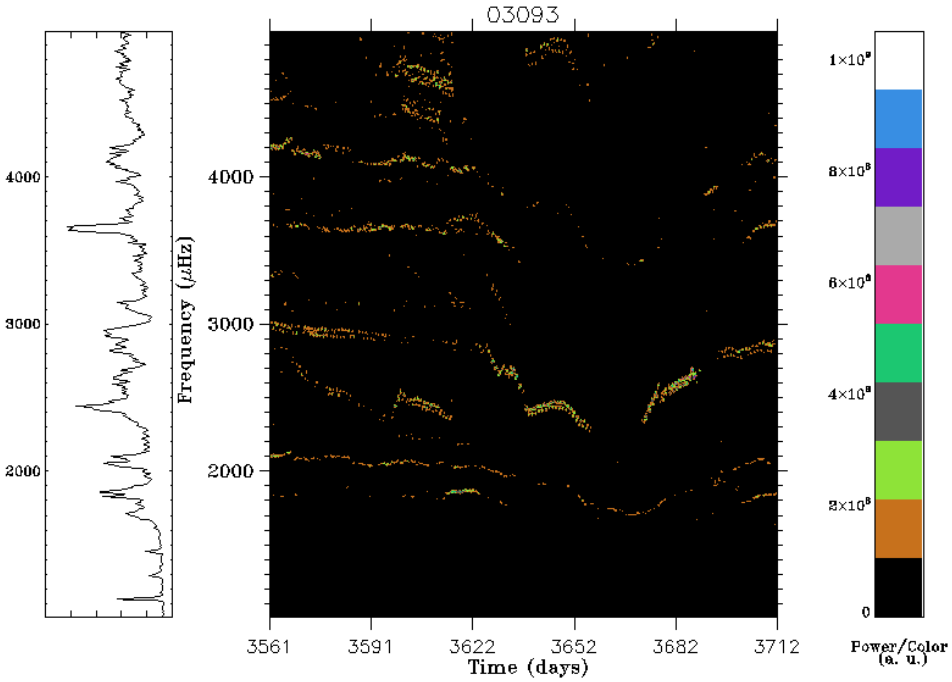




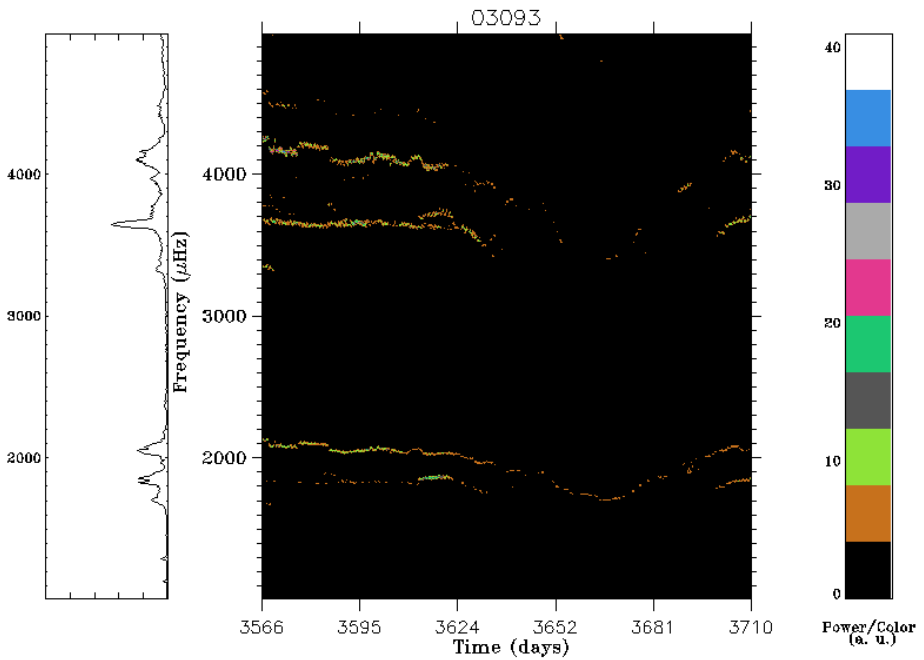
OTHER EFFECTS

- Effects to be considered
  - Photometric jumps in the Exo LC : hot pixels
  - Noise frequencies in the seismo LC: jitter residuals

Photometry



Jitter residuals



DISCUSSION AT THE CEST

- 2 major effects identified on exo LC that may be corrected
  - Jumps in the LC : specific for each LC (each color)
  - Correlated residuals at the orbital period and others : global detrending

- Proposed improvement
  - No new level
  - Within the N2 data, 1 or 2 new levels of correction (as for the N2 seismo)
  - Correction of jumps
  - Detrended LC (using a sysrem algorithm)
  - -> a new level of data for people outside the present CoRoT community : EasyCoRoT

- How to ?
  - Difficult to organise a dedicated workshop before december
  - Make a list of existing things (on personal laptops)
  - Identify the right persons
  - Select the right algorithms and transform them into robust routines included in the production pipeline