Correction of the background in the exoplanet search field
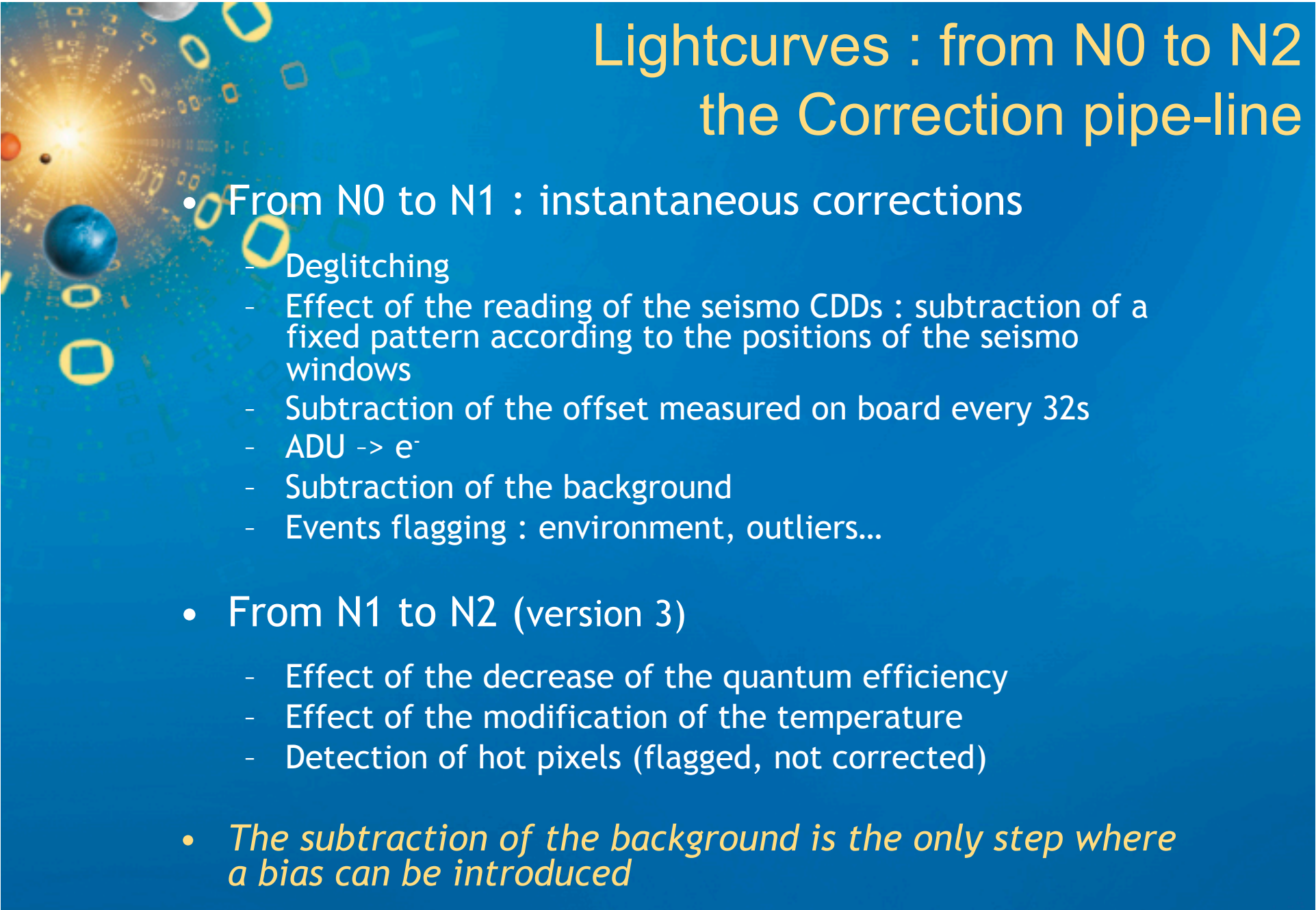
S.Chaintreuil – A.Ferrigno - A.Baglin – M.Auvergne

- ## From N0 to N1 : instantaneous corrections

  - Deglitching
  - Effect of the reading of the seismo CDDs : subtraction of a fixed pattern according to the positions of the seismo windows
  - Subtraction of the offset measured on board every 32s
  - ADU –> e⁻
  - Subtraction of the background
  - Events flagging : environment, outliers…

- ## From N1 to N2 (version 3)

  - Effect of the decrease of the quantum efficiency
  - Effect of the modification of the temperature
  - Detection of hot pixels (flagged, not corrected)

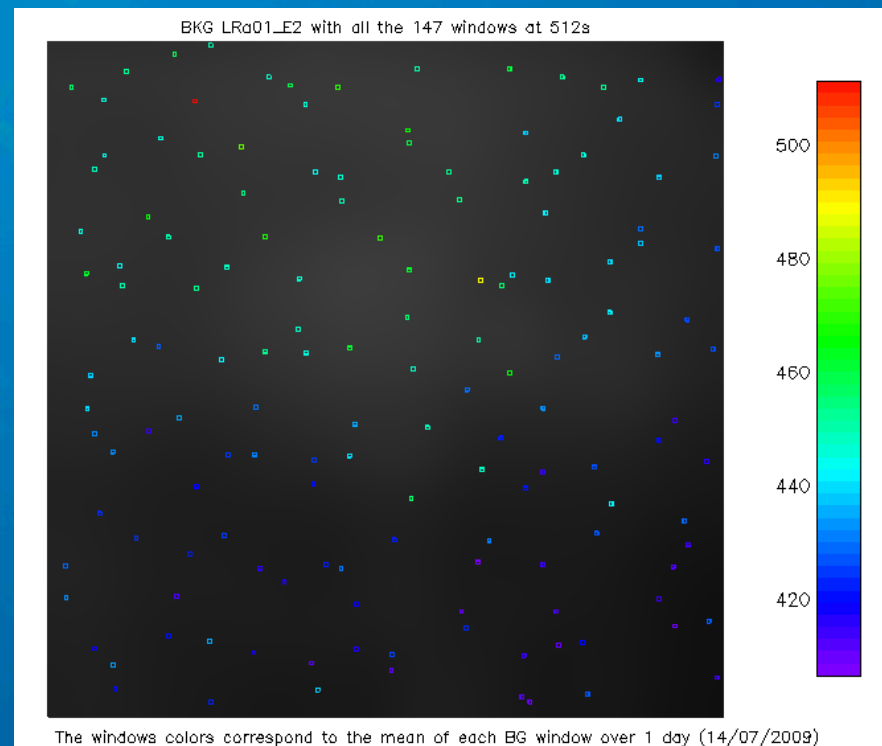- *The subtraction of the background is the only step where a bias can be introduced*

The correction of the background

- $\text{Flux}_{\text{after correction}} = \text{Flux}_{\text{before correction}} - \text{BG}_{\text{med}}$
- $\text{BG}_{\text{med 32s/512s}}$
  - median of the 49 backgrounds at 32s
  - median of the 147 backgrounds at 512s
- OK if the background is homogeneous over the CCD
  - True at the beginning of the mission
  - Now the gradient of the dark current increases

About the Background (BG)

LRa01 $\alpha = 101.66, \ \delta = - \ 0.2 \ \text{Rot} = 7.28$
Oct .2007->March 2008

BKG LRa01_E2 with all the 147 windows at 512s

The windows colors correspond to the mean of each BG window over 1 day (14/07/2009)

- Map of the BG, estimated (grey) and measured (BG windows),
- in electrons per pixel per 32 s
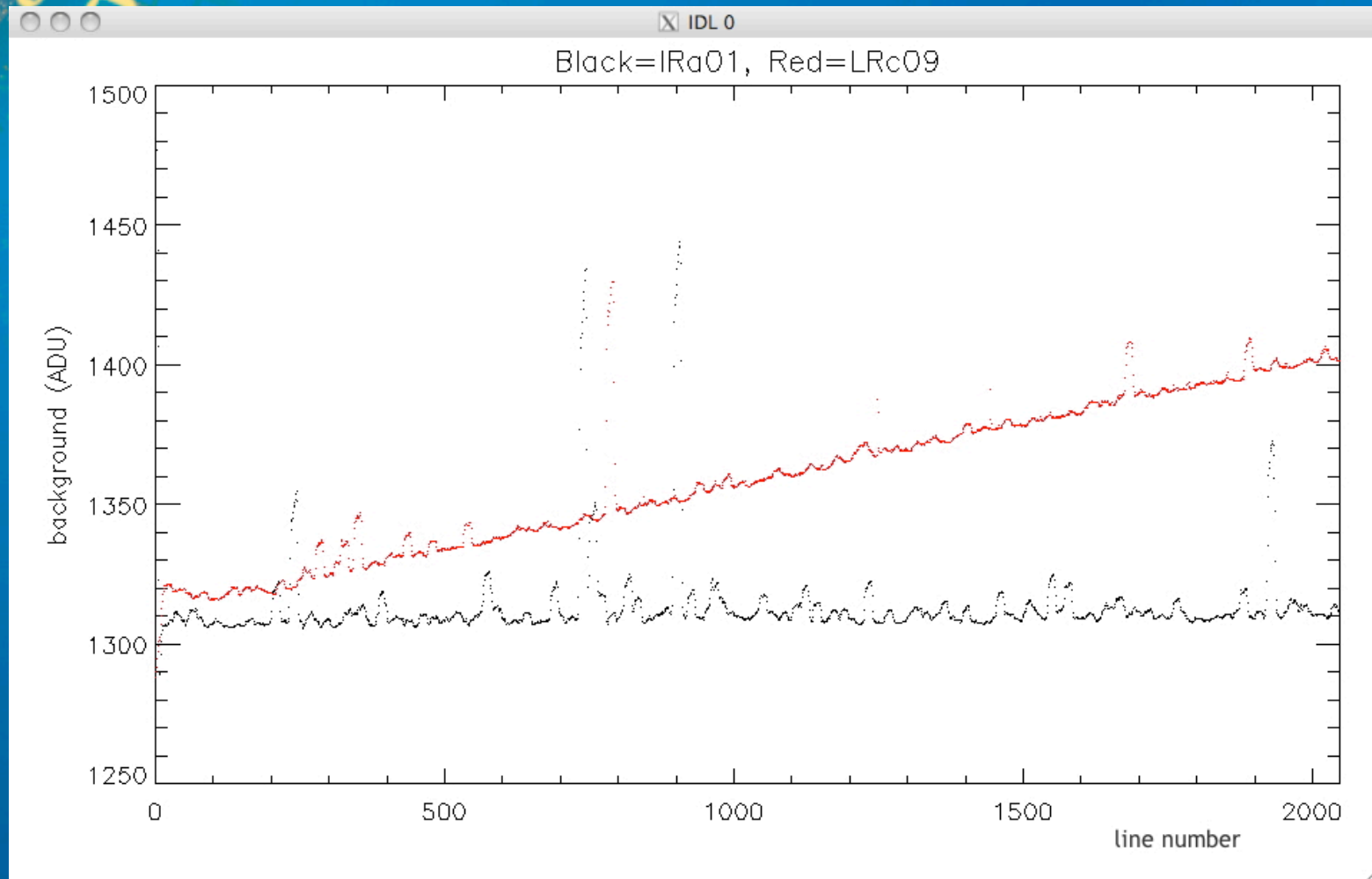
LRa06 $\alpha = 101.54$ $\delta = 0.22$ Rot = 20.00
Jan.-March 2012

Increase of the dark current (expected) and of its gradient

BKG LRa06 with all the 49 windows at 32s

The windows colors correspond to the mean of each BG window over 1 day
r 105891283, coordinates x=891, Y=899
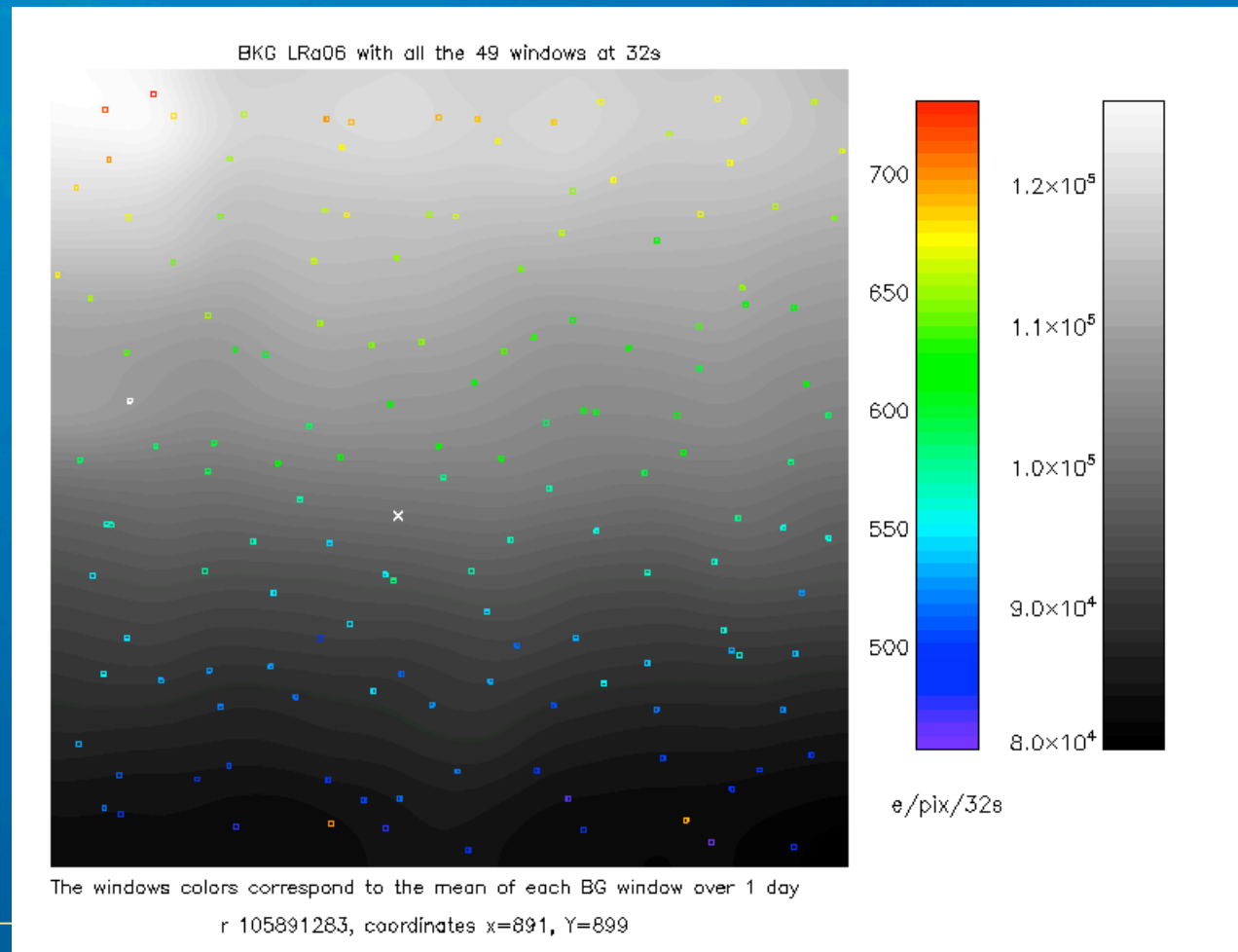
Increase of the dark current over the CCD

Black=IRa01, Red=LRc09

BG and the cluster (1)

SRa01

The contribution of the cluster is clearly underestimated by the median

BKG SRa01 with all the 147 windows at 512s
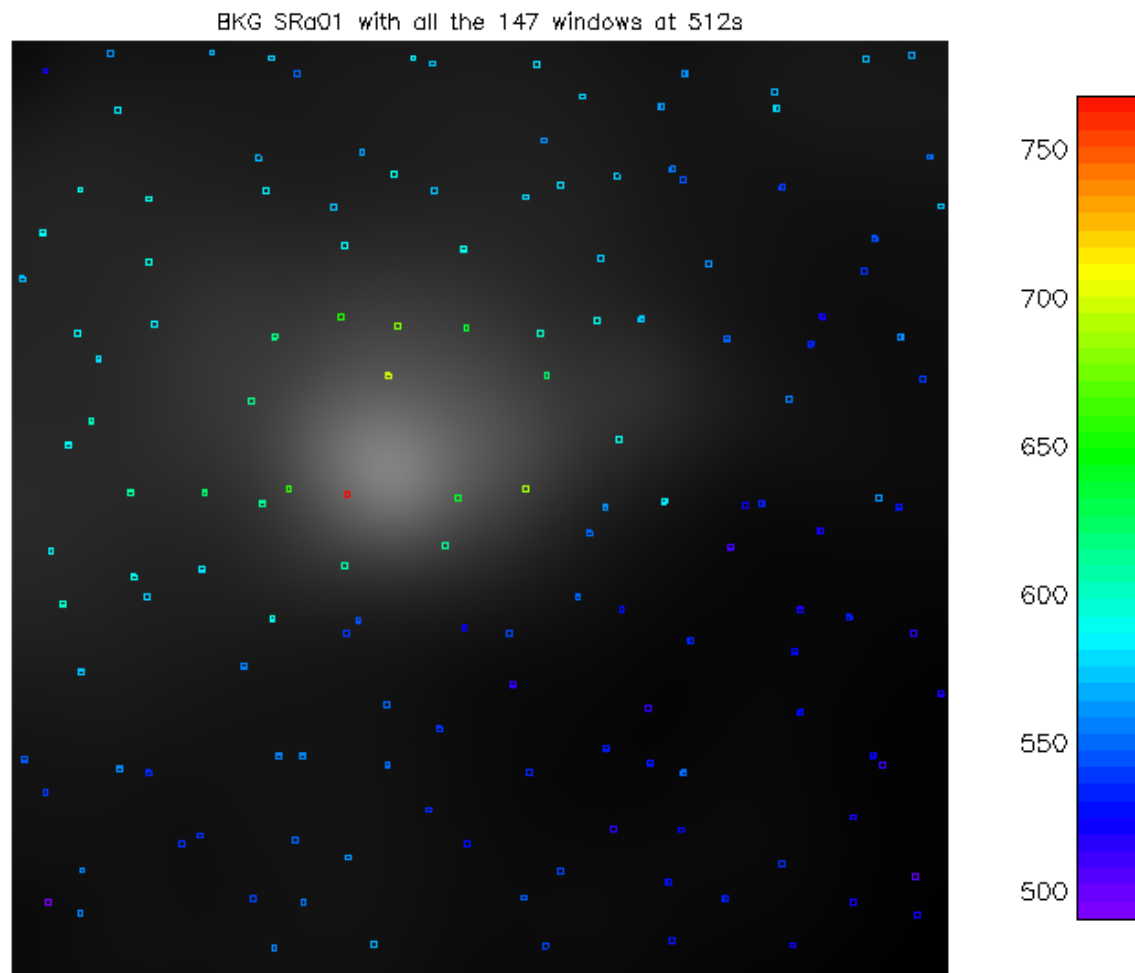
The windows colors correspond to the mean of each BG window over 1 day (21/03/2008)

- SRa05

- Aging of the CCD

- The contribution of the cluster to the background is more important than for SRa01

BKG SRa05 with all the 147 windows at 512s

The windows colors correspond to the mean of each BG window over 1 day (12/12/2011)
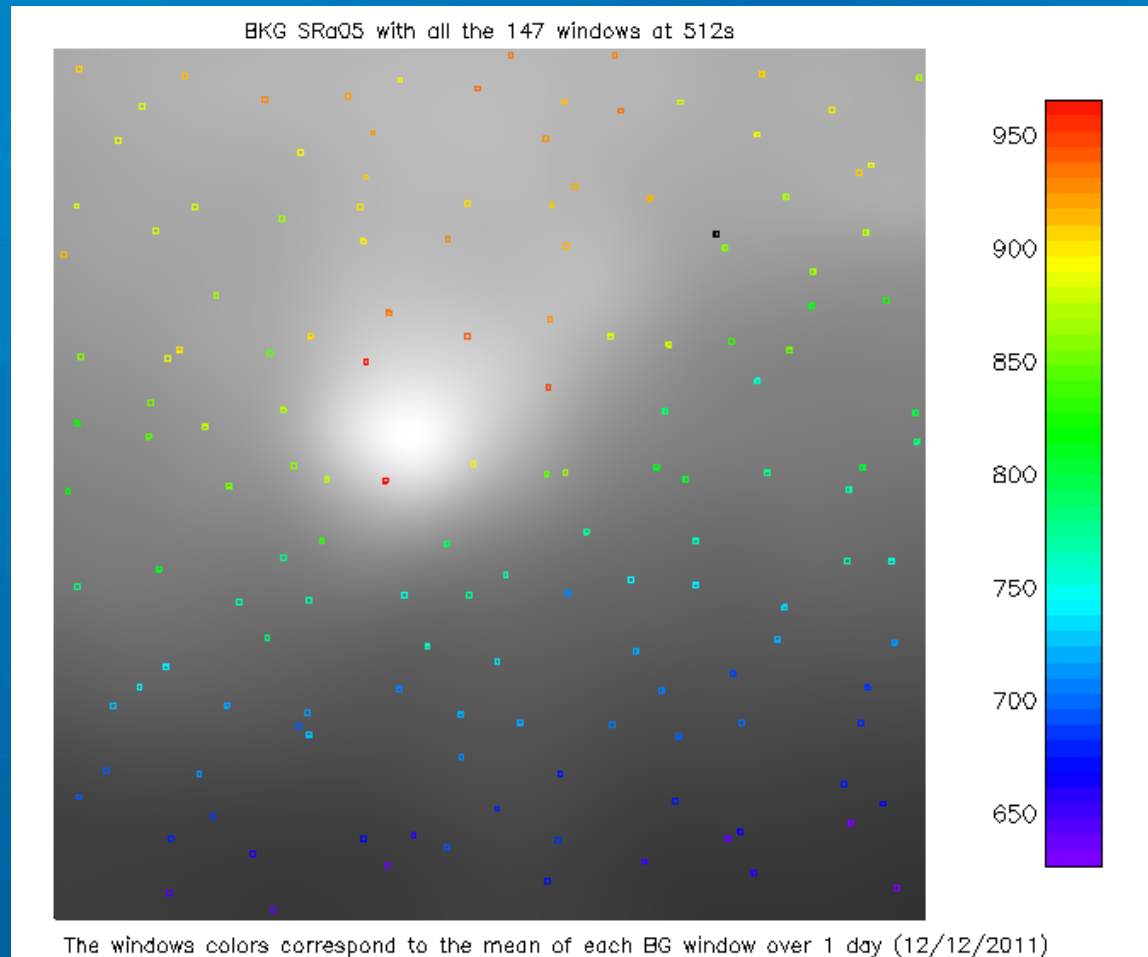
Bias and uncertainties

- $F = N$ (e$^-$ in the template) - T * <bg>
  - F : flux of the target in e$^-$ per 32s
  - T : size of the template in px
- $\Delta F \sim T \Delta bg$
- $\Delta A/A \sim \Delta F/F$

- Average size of templates = 50 pixels
- $\Delta bg \sim 300$

- For a star of mR = 14, F ~150 000
- $\Delta F \sim 12\ 500$ $\Delta A/A \sim 10\ \%$
- $\Delta F \sim 40\ 000$ $\Delta A/A \sim 25\ \%$

but : CoRoT proposes to measure only VARIATIONS of F and not F (no absolute calibration)

BG and the cluster : Scattered light
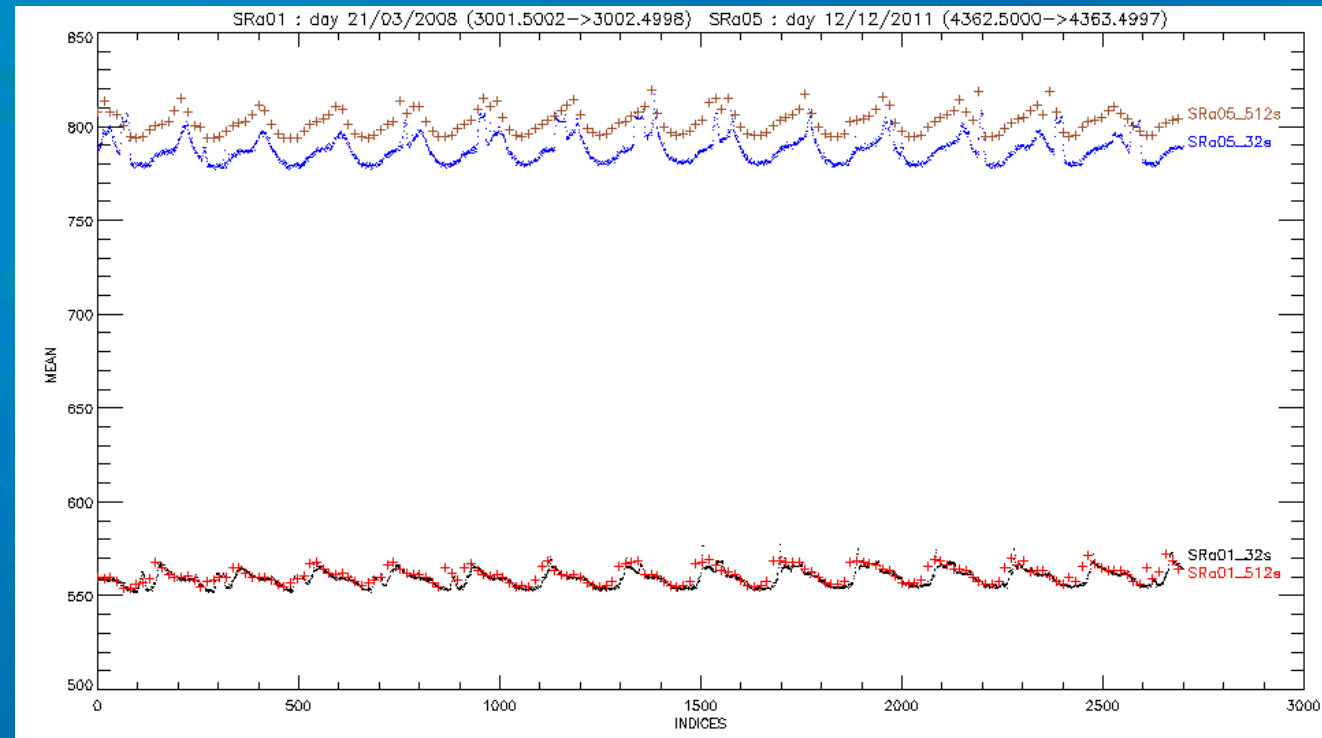
- SRa01 : 0.6 e$^-$/px/s at 10° from the centre of the eye
- SRa05 : 1 e$^-$/px/s at 11°

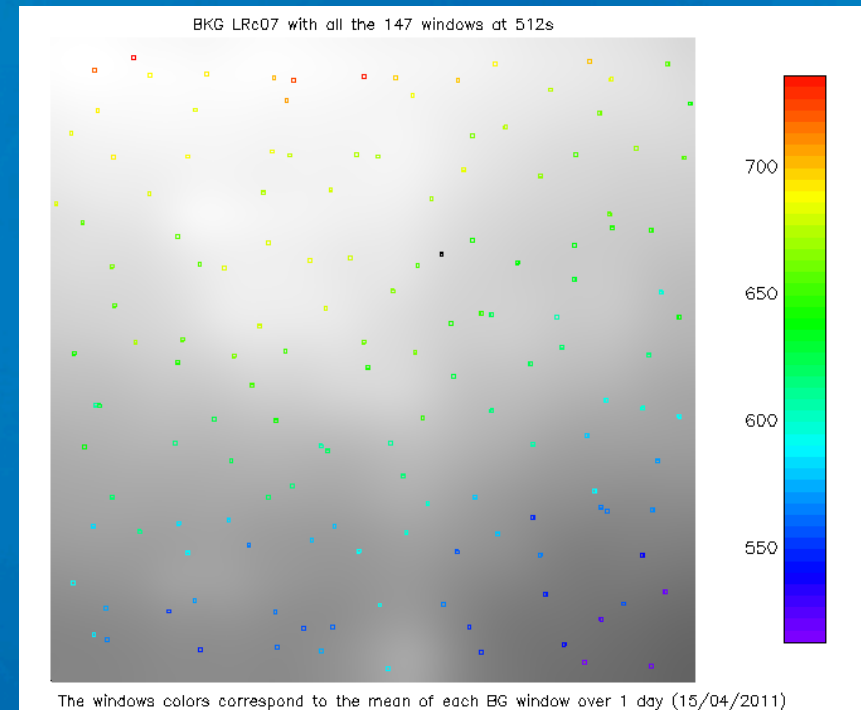Much smaller than simulations;
        corrected and negligeable

Another region observed twice
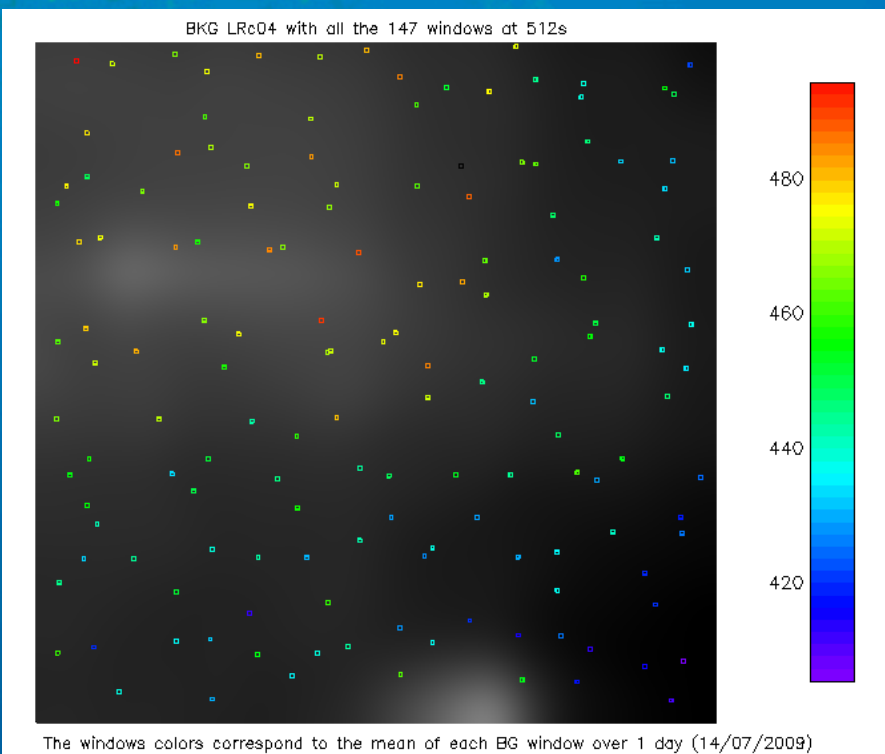
LRc04

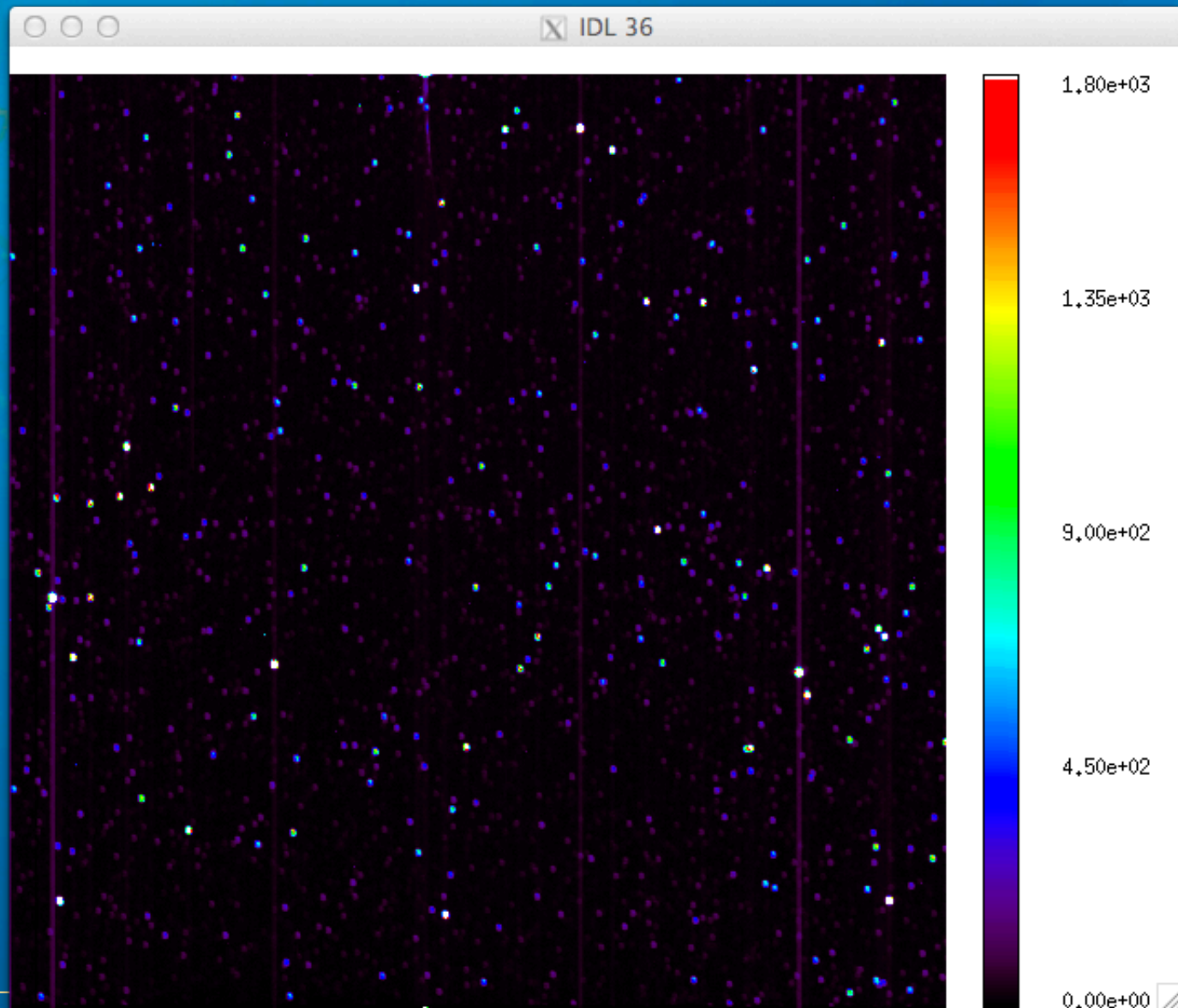$\alpha = 277.72$ $\delta = 8.02$

Rot = 1.20

July , Oct 2009

BKG LRc04 with all the 147 windows at 512s

The windows colors correspond to the mean of each BG window over 1 day (14/07/2009)

BKG LRc07 with all the 147 windows at 512s

The windows colors correspond to the mean of each BG window over 1 day (15/04/2011)

LRc07

$\alpha = 277.60$ $\delta = 6.29$

Rot = 20.00

Apr, June 2011

FullImage IRa01 seismo

FullImage LRc09 seismo