



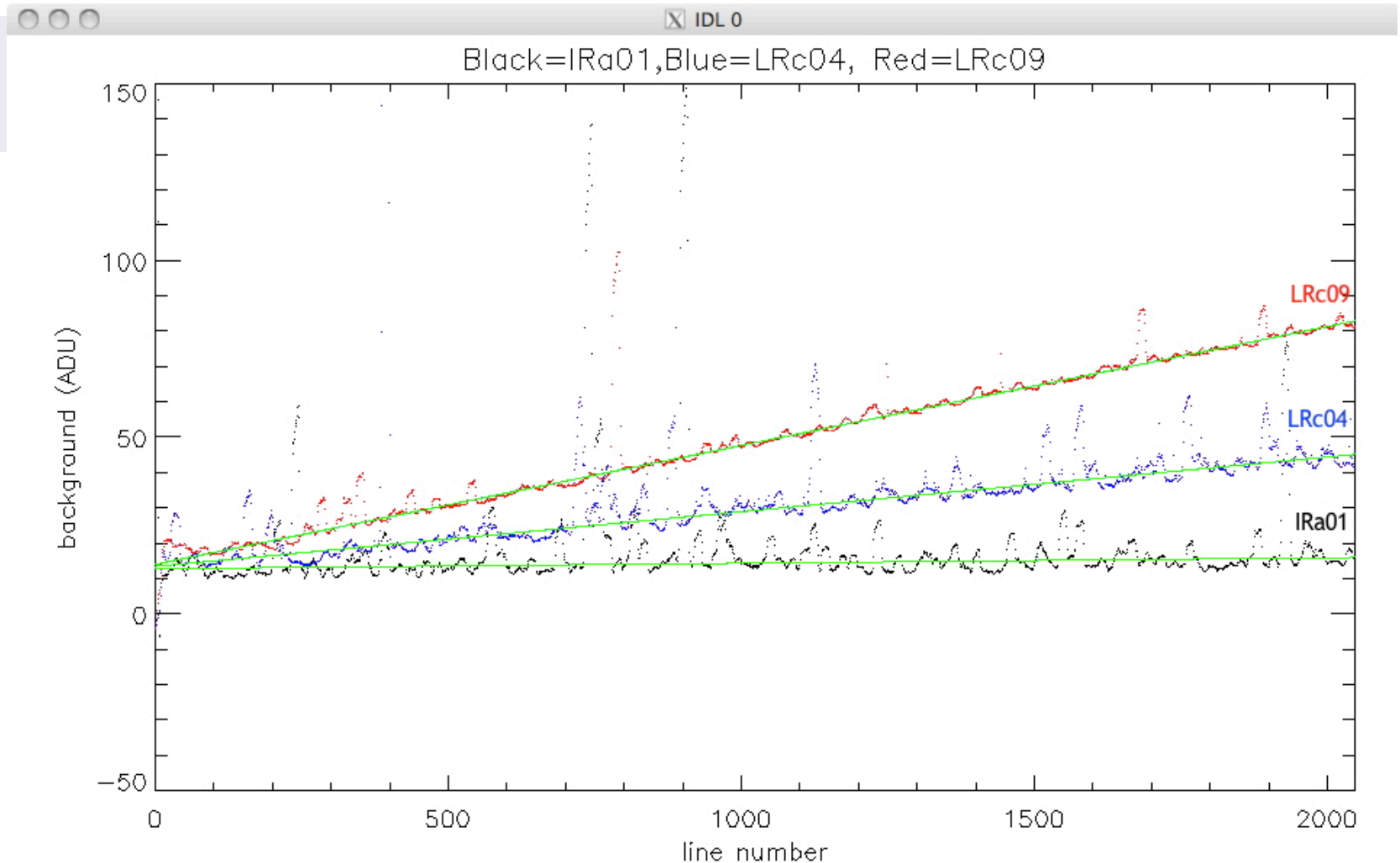
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Correction of the background on the exo channel

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Reminder : background increases over the CCD



- Estimation of the background on exo data : plot of the sum of the flux along each row for IRa01 (janv.2007, LRc04 (july 2009), LRc09 (april 2012) (from N0 fullimage)

=> The rate of increase rises with time

How are backgrounds measured on board ?



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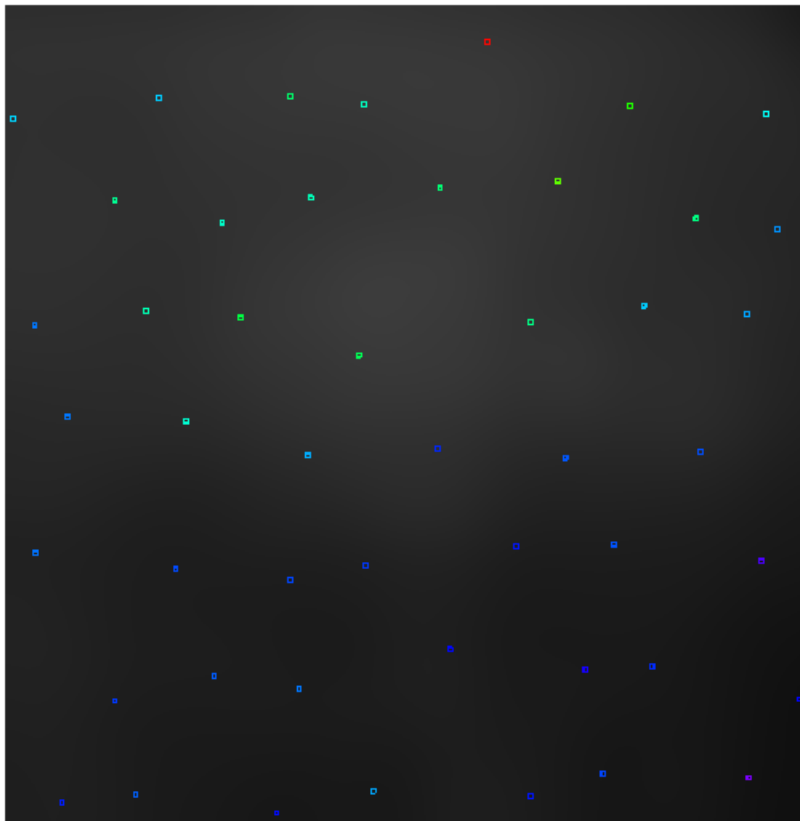


- Reminder : seismo channel
 - 5 stars windows, 5 backgrounds windows positioned as near to the star as possible
 - The background is subtracted on board : ground corrections are marginal
- Exo channel
 - 6000 stars windows
 - 196 sky background windows on the CCD : 147 windows @ 512s, 49 windows @ 32s
 - The CCD is split in 14*14 square zones (except IRa01) :
 - 1 window per zone
 - $\frac{3}{4}$ @ 512 s ; $\frac{1}{4}$ @ 32 s
 - Background is NOT subtracted on board => the ground correction is important

The background windows over the CCD : LRa01

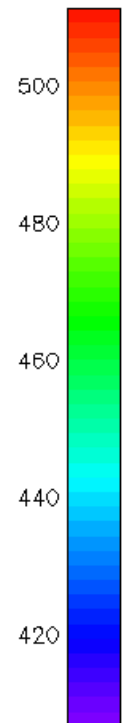
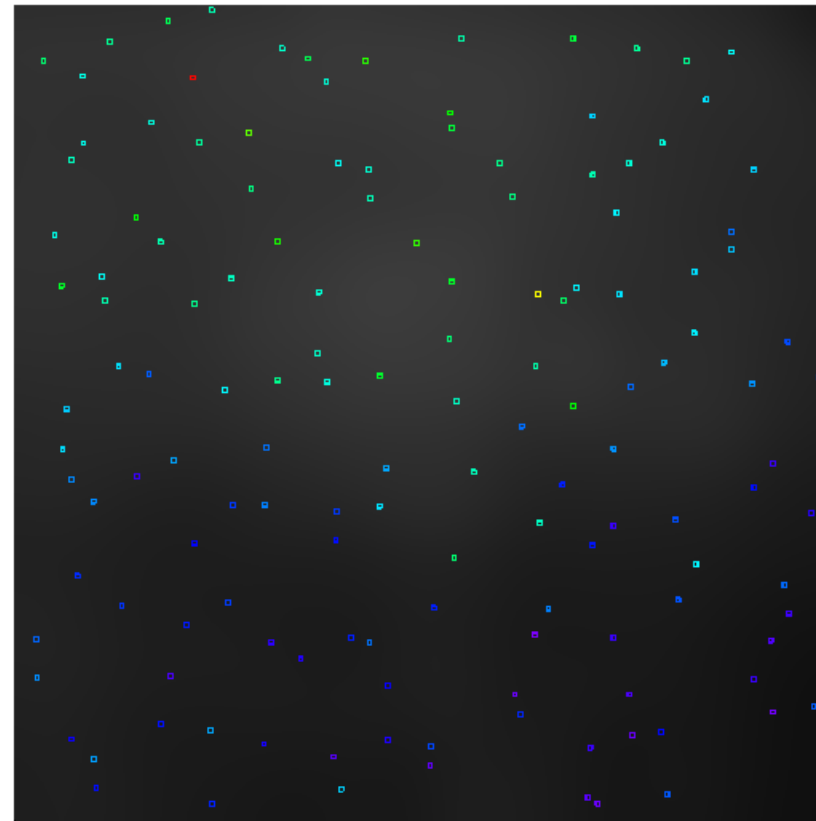


BKG LRa01_E2 with all the 49 windows at 32s



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

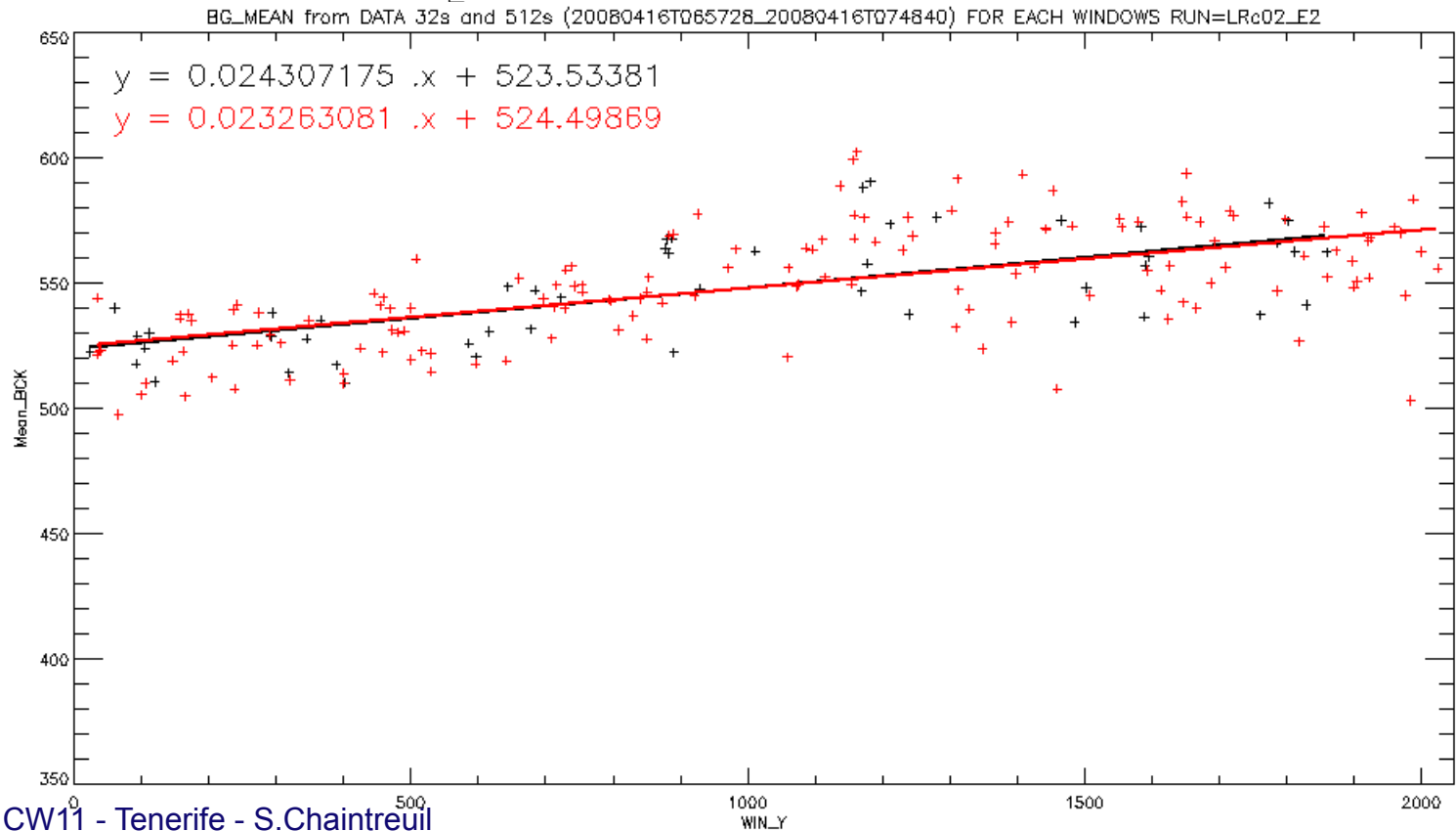
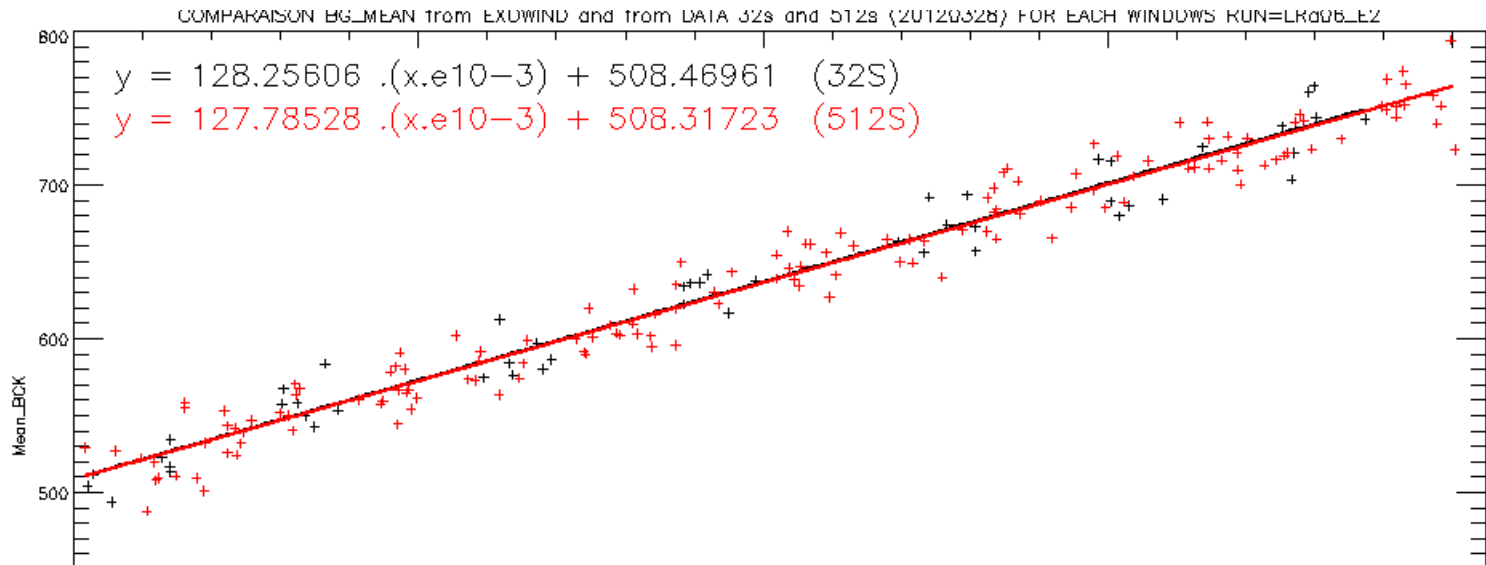
BKG LRa01_E2 with all the 147 windows at 512s



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



LRa06



LRc02

Current exo background corrections



- Several methods proposed for the background correction
 - Subtraction of the nearest background window value
 - Subtraction of the combination of the 3 nearest background windows value
 - Subtraction of a sky background model
- The first two methods are very sensitive to hot pixels
=> subtraction of the **median** value of all background windows
 - Small sensitivity to hot pixels
 - Same correction for the whole CCD
 - OK at the beginning of the mission (tiny dark current, uniform background)
 - Not OK with ageing (increase of dark current)

The components of the background (1)



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- The effective sky background : depends only on the pointing
- The satellite environment (scattered light) : varies with the date of the observation, uniform over the CCD, well corrected by the median value
- The dark current:
 - A uniform part corresponding to integration phase
 - A part depending on the position of the window (Y-axis) during the readout phase
 - Small effect at the beginning of the mission
 - Depends on the CCD temperature
 - The gradient increases with time
 - Dark_Current : $C(tpe) * [32 + \tau(y)]$

The components of the background (2)



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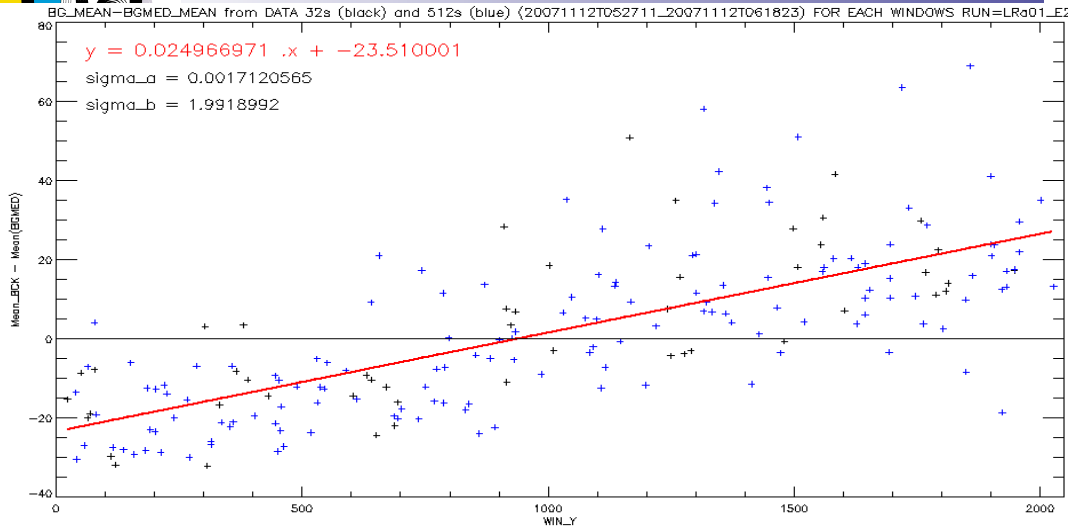


- At a given temperature
 - $BG(t) = C * [32+t(y)] + Sky_BG + scatt_light(t)$
- At a given date and a given temperature :
$$\langle BG \rangle - \langle BG_{med} \rangle = a (y - y_{med}) = a y + B$$
- We compute a & B at the beginning of the run during a quiet period (in the shadow of the Earth, no SAA crossing)
- We use these parameters to correct the fluxes
$$Corr_flux = N0_flux - BG_{med} - (a * Y_{CCD} + B) ; B < 0$$

Fit for BG - BG_{med}



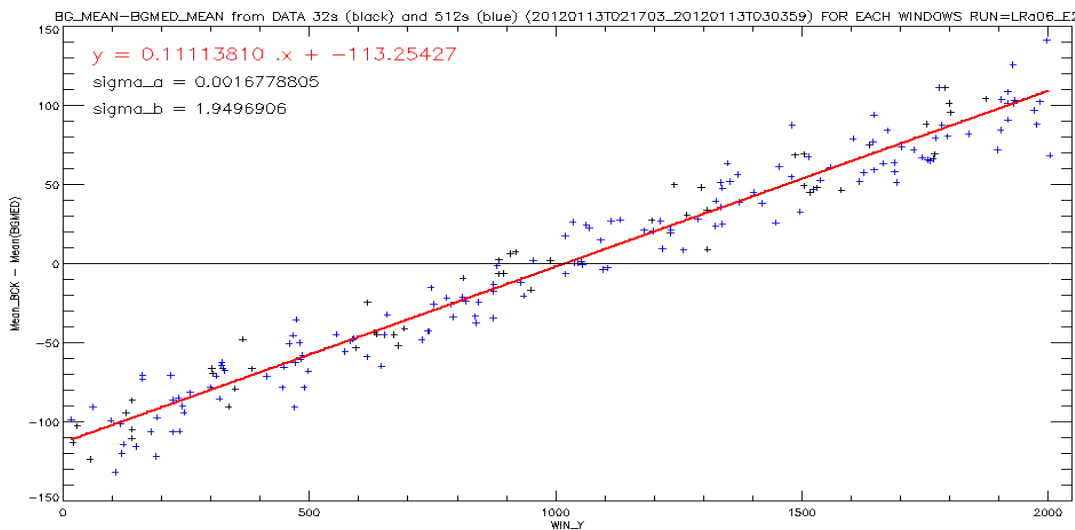
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LRa01/E2

Slope : 0.025 +/- 0.002

BG0 : -23 +/- 2



LRa06

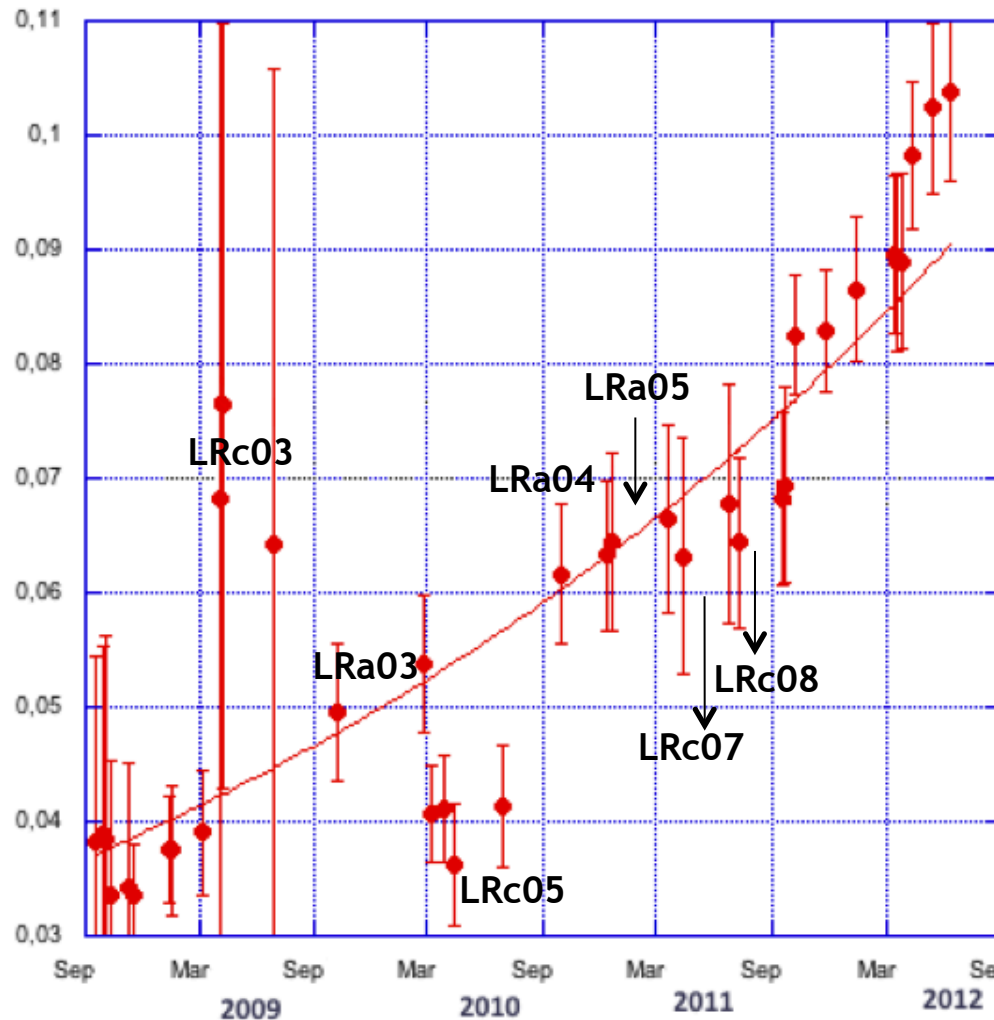
Slope : 0.111 +/- 0.002

BG0 : -113 +/- 2

Evolution of the slope over the time



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- On the plot, slopes are
 - corrected from the temperature of the CCD
 - calculated at the beginning and at the end of each run and before and after the changes of the temperature of the CCDs

⇒ slopes are continuously variable over time within a run and from run to run

- the proposed correction uses the slope at the beginning of the run to correct the whole run
- it is a first order correction

Conclusion



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- The pipe-line is ready to be used
- Some tuning is still necessary
- The evaluation is in progress
- Schedule
 - Evaluation : April to May 2013
 - Production : June 2013 to June 2014
 - Distribution begins in September 2013 til Sept.2014