P2SC-ROB-WR-046-20110131 Weekly report #046	**P2SC Weekly report**	
Period covered: Date: Written by: Released by:	Mon Jan 31 to Sun Feb 06 2011 Thu Feb 10 2011 Anik De Groof David Berghmans	Royal Observatory of Belgium PROBA2 Science Center
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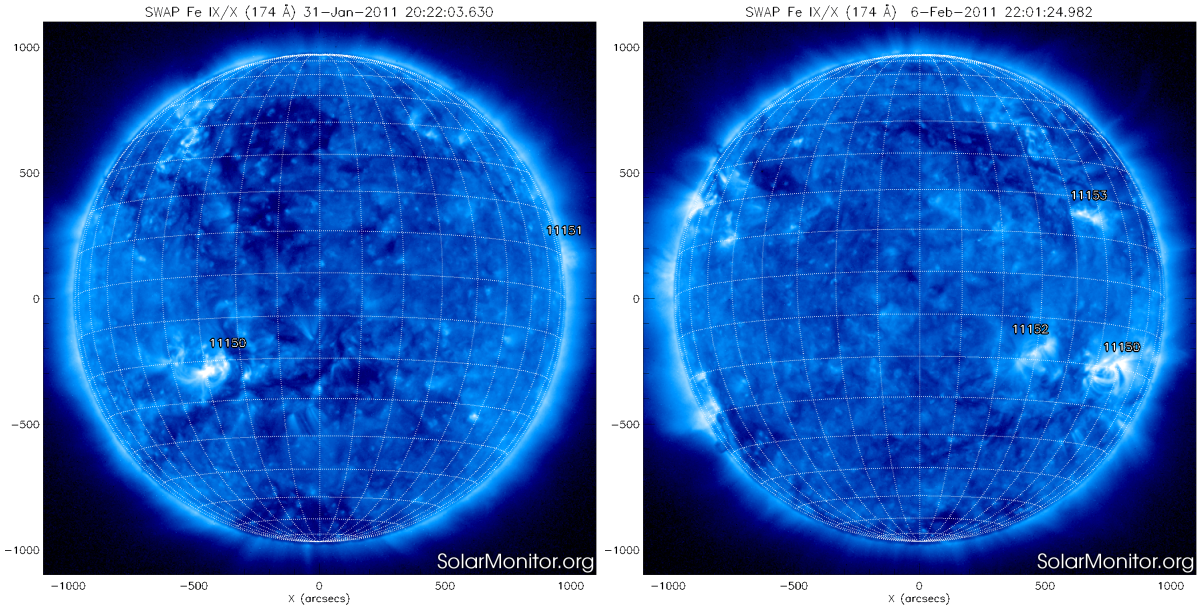
1. Science

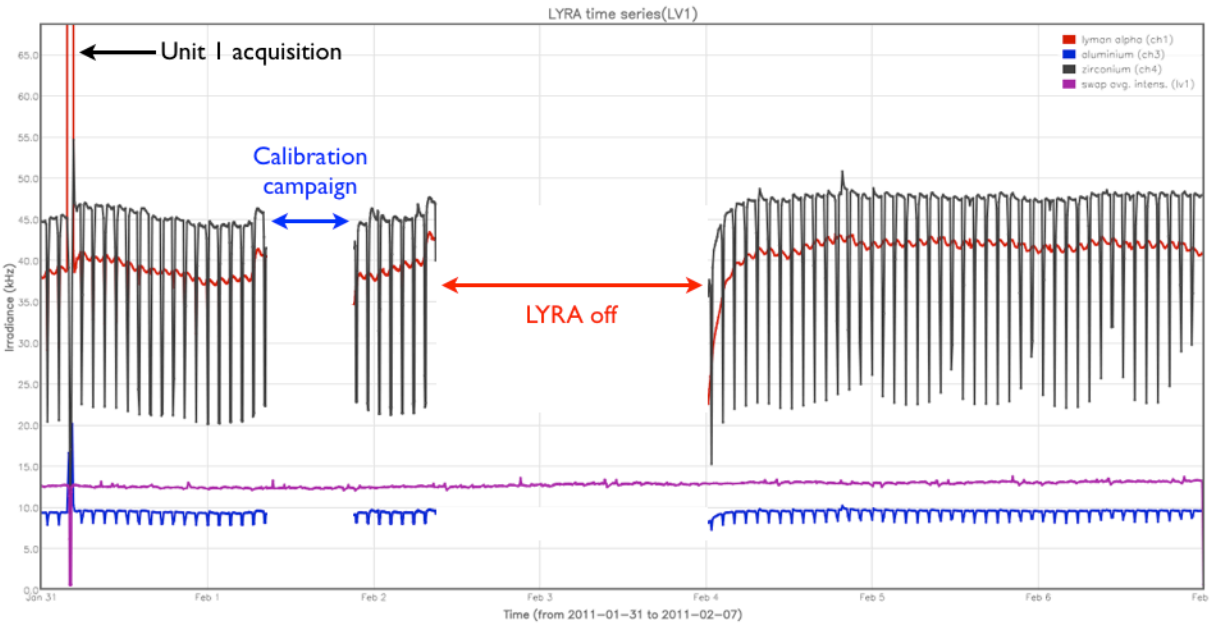
Solar & Space weather events

SWAP Active Regions at the beginning and end of the reported period:



AR 11150 was the main AR visible this week, quietly rotating towards the West limb. On Friday and Saturday also ARs 11152 and 11153 showed up nearby but neither of them showed a lot of activity. No single C-flare was recorded this week.

The overview of LYRA data over the week is given below:



As clear from the figure, no important flares (>B type) were recorded. LYRA was off for 1,5 day due to the hot temperatures onboard (see Sect. 2). The other gap on Feb 1st was due to a calibration campaign (also in Sect. 2).
The peak in the 4 signals on Jan 31 was the effect of unit 1 being used as nominal head for 30minutes, during an occultation campaign. As unit 1 has different filter/detector sets and is not degraded, the signal is much higher.

Scientific campaigns

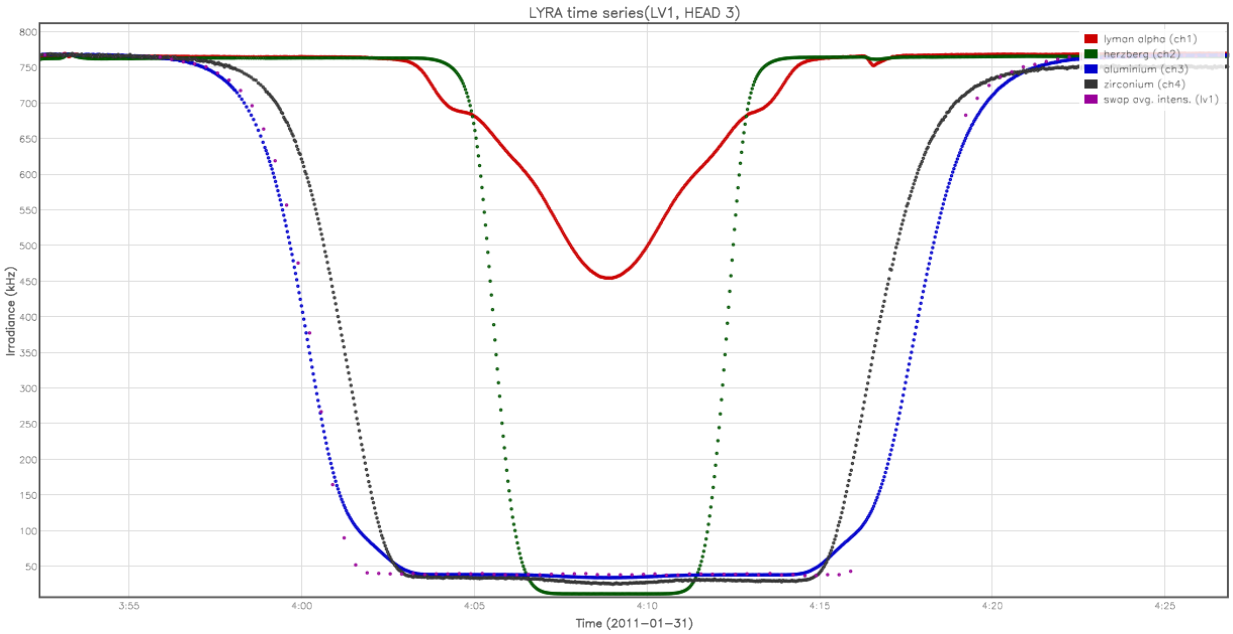
LYRA continued the occultation campaigns during EUV eclipses. The occultations this week were purely due to the absorption of EUV light in the Earth's atmosphere. True visible eclipses are over. The minimal tangential altitude ranged from 26 km on Monday to 133km on Sunday.

The times at which the **LYRA occultation campaigns** were performed are listed below:

- Mon Jan 31 3:52 to 4:15 / Unit 1 (nominal) + Unit 3 (backup)
- Tue Feb 01 6:20 to 6:58 / Unit 2 (nominal) + Unit 3 (backup)
- Wed Feb 02 7:09 to 7:46 / Unit 2 (nominal) + Unit 3 (backup)

The planned campaigns for Feb 3-4 got cancelled due to the high temperatures onboard.

On Jan 31, SWAP supported the LYRA occultation campaign by acquiring at high cadence through the occulted phase. The data of both SWAP and LYRA (unit 3) are shown below, all scaled to the same unocculted level:



Part of the SWAP average intensities (purple dots) during sunrise are missing in this figure because of a LAR. These images have to be processed in a non-standard way to complete the curve. Analysis is ongoing.

Outreach, papers, presentations, etc.

Ines Kienreich joined P2SC on Monday as Guest Investigator for SWAP. She will stay until the end of February to analyse global coronal waves seen with SWAP.
LYRA Guest investigator Marty Snow is currently exploring the evolution of LYRA unit 2 dark current and LED signals over the mission.

To be explored

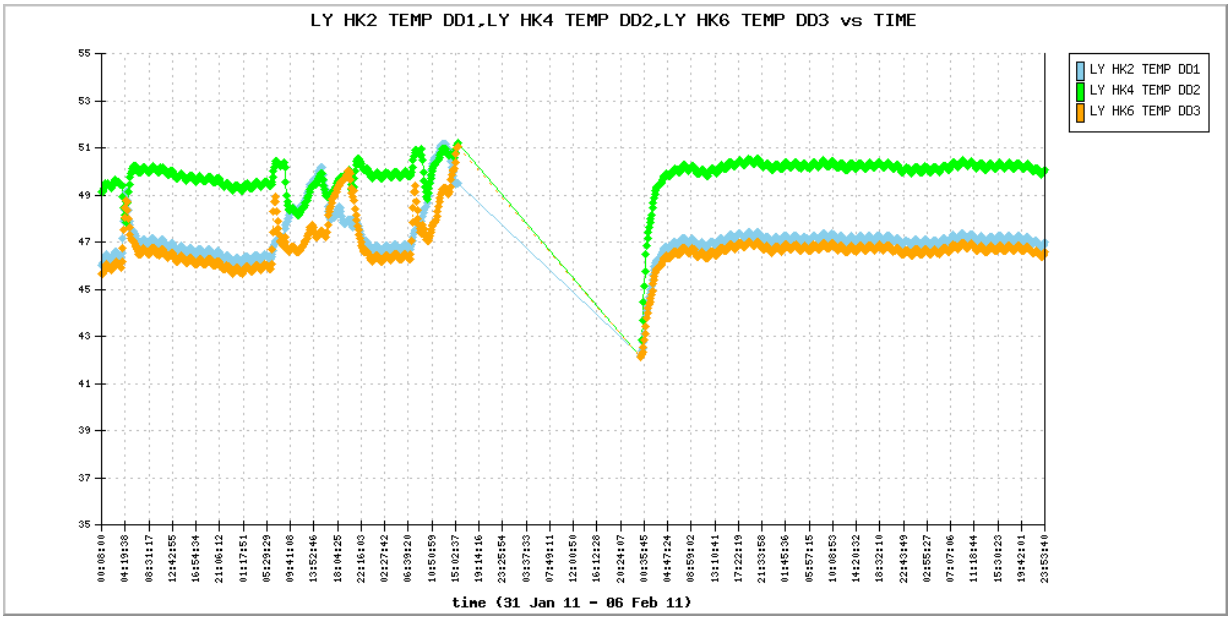
2. LYRA instrument status

Temperature evolution
LYRA switched off on Wed, February 2 at 15:22, and turned unavailable with the following event:

353 EVT_LYRA_TEMP_REFERENCE_FOOT_HIGH_LIMIT

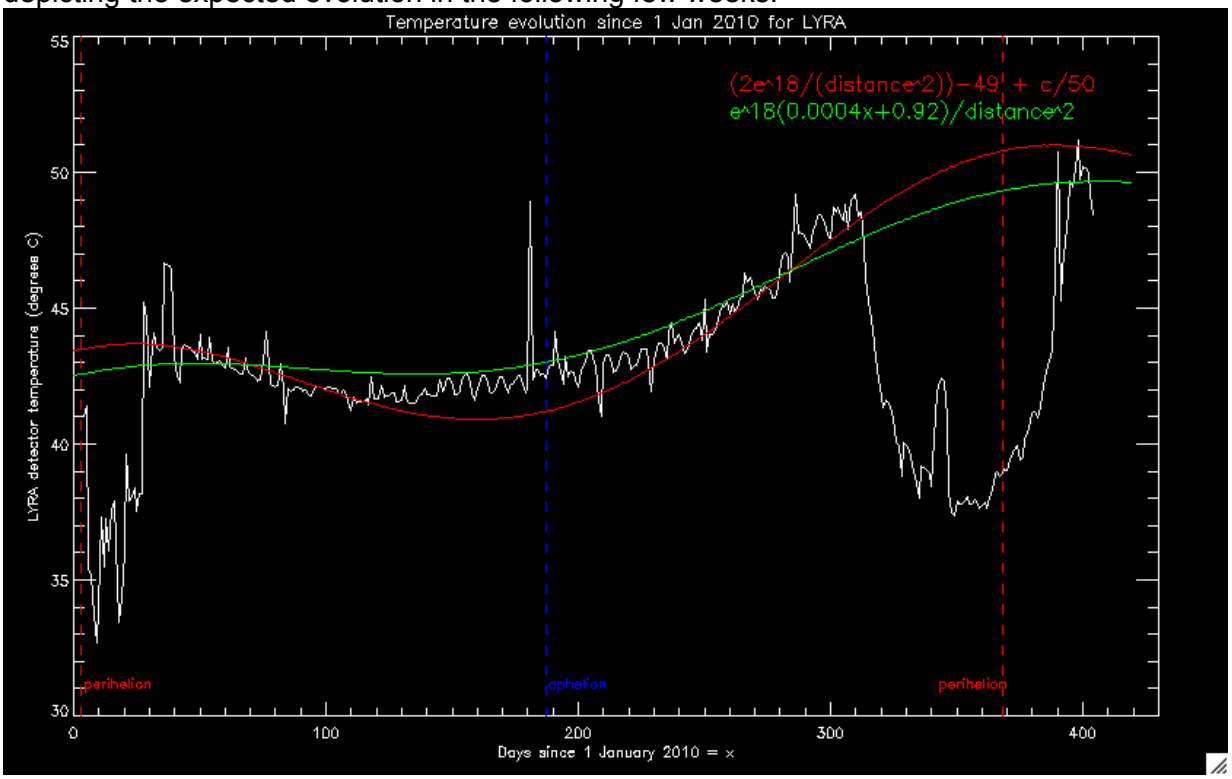
At that time, LYRA was performing a calibration campaign with 2 units (from 9UT onwards), and the Alcatel GPS experiment was running from 9:30 to 14:45.
In addition, due to seasonal effects (right after eclipse season, at a time close to perihelion), this week was one of the hottest of the year.

The evolution of LYRA detector temperatures during this week is depicted below:

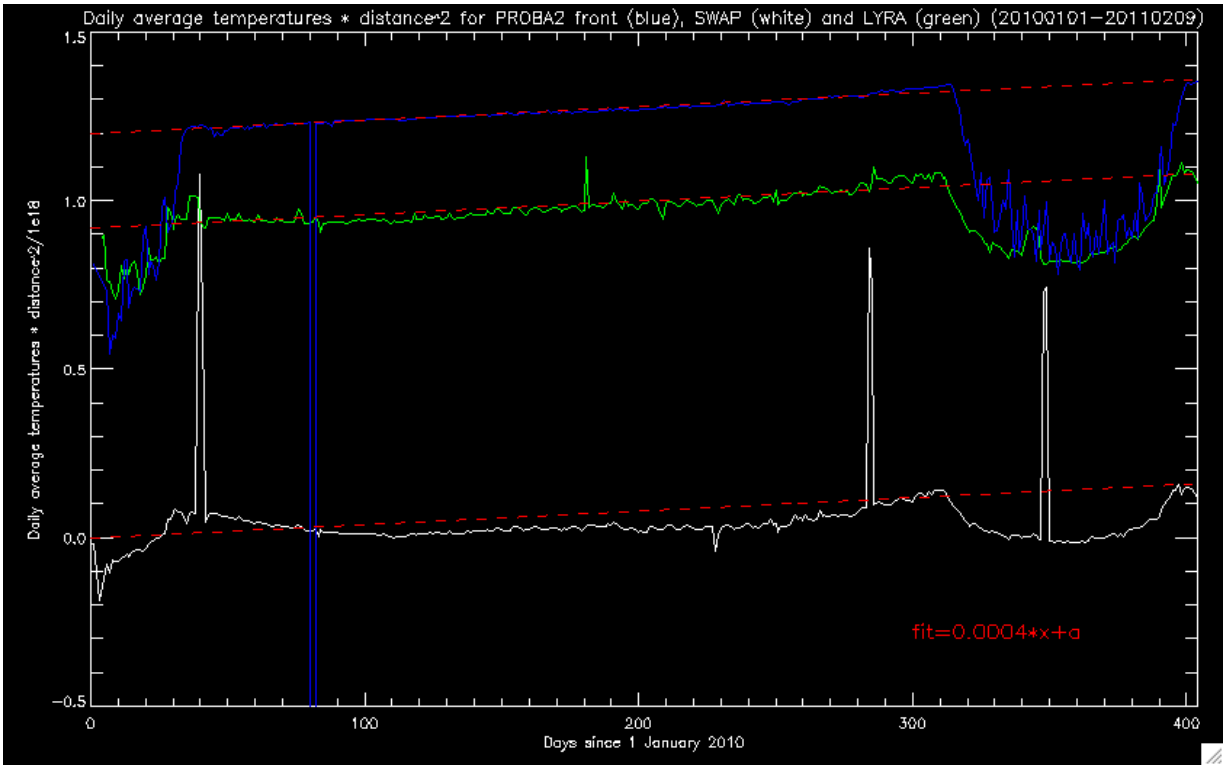


The temperature is still very close to the onboard safety limit of 50 degrees. We expect however that the temperatures will decrease soon as the distance Earth-Sun is increasing again.

Below the temperature evolution of LYRA detector 2 is drawn, with two models overlaid depicting the expected evolution in the following few weeks.



The red model is a very rough one, simulating the expected seasonal effect due to varying distance from the Sun + a linear trend added.
The green model is based on the linear trend which was seen in PROBA2 front panel, SWAP detector, and LYRA detector temperatures adjusted for the seasonal effect, as depicted below:

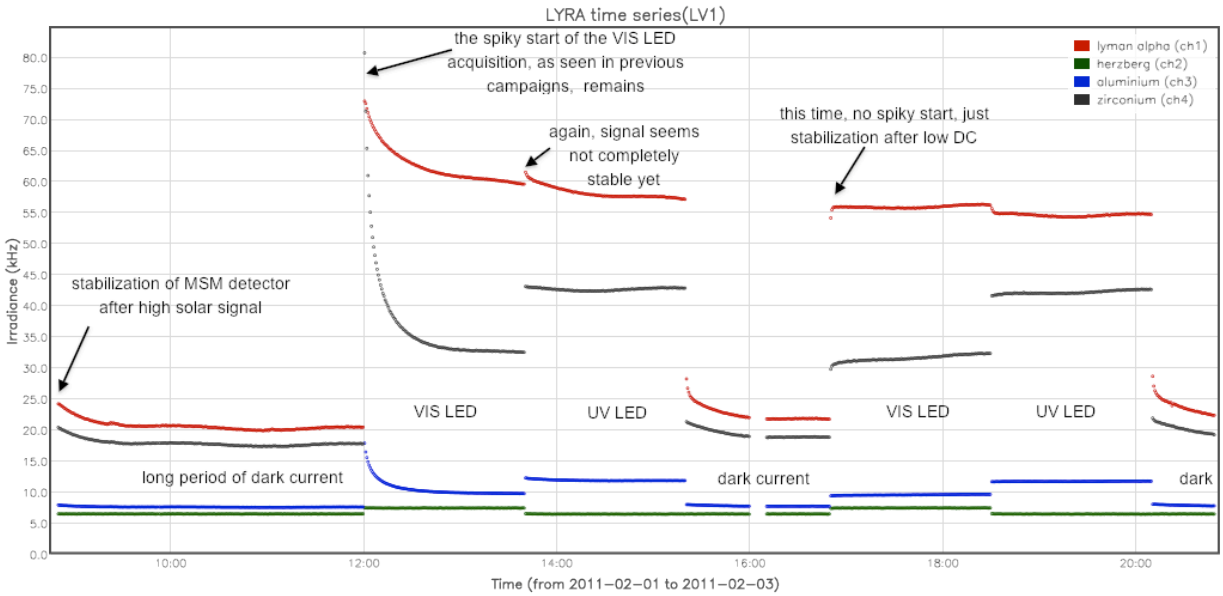


Calibration

There were 2 calibration campaigns performed this week, to collect more information on how LYRA LEDs are behaving and to understand all peaks and stabilization effects seen in calibration data up to now.

The first campaign ran from Feb 1, 8:50 to 20:50UT and was a nominal one, except the large period of dark current at the beginning. It was expected that the long acquisition of dark current would completely stabilize the signal, i.e. release all electrons trapped in the defects in the cristalline structures. In this way, the pure LED signals were expected to be acquired, avoiding a continuation of the de-trapping process.

This hypothesis seems not completely true as the campaign led to a very similar outcome as the previous ones. After the switch-on of the visual LED, a high peak and slow stabilization was recorded by the MSM detectors of unit 2:

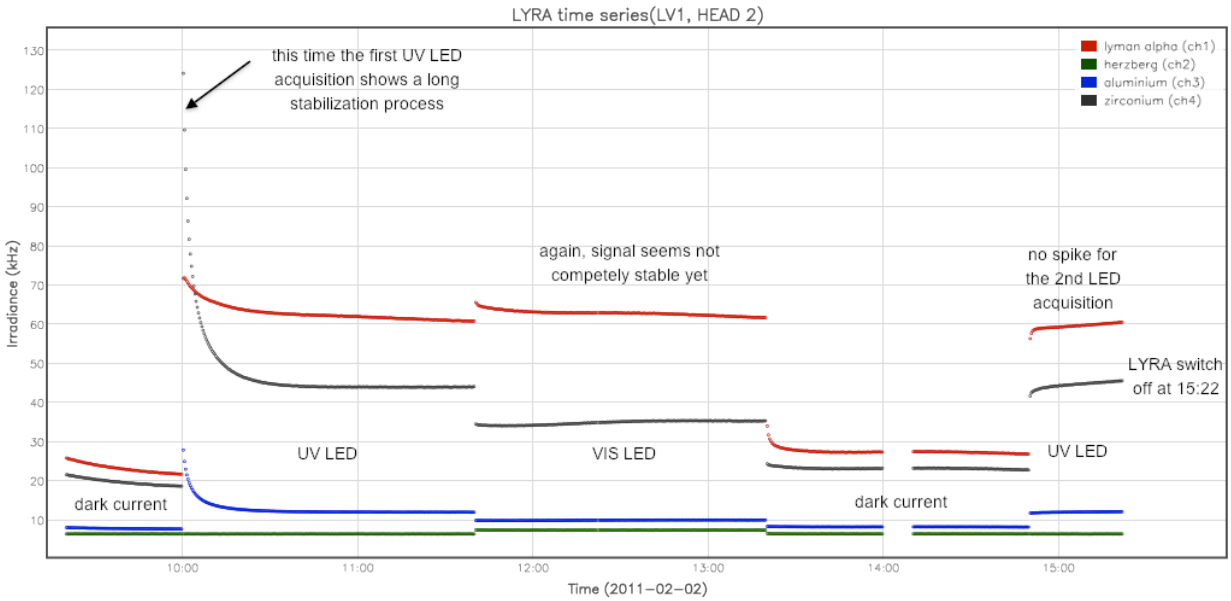


Unit 1 (also mainly MSM) does not see this slowly decreasing signal throughout the LED signals, but also did not acquire solar signal prior to the calibration. Unit 3 does not show any stabilization at all (as expected with Si detectors), just a little peak of 2-3 minutes at the time a LED switches on.

The second calibration campaign started on Feb 2, 9:20 and was interrupted at 15:22 by the LYRA switch-off triggered by a too high temperature.
In this campaign, several parameters were changed to explore the outcome:

- unit 1 and unit 3 were selected as nominal units, while unit 2 acquired as backup unit (all covers closed, so data ended up in CAL and BCA files respectively)
- the UV LED was selected first, followed by VIS LED, and dark current again

The outcome of unit 2 (in BCA) is shown below:



Unit 1 and unit 3 show similar outcome as in the Feb 1st campaign. Changing the order of LEDs switching on or nominal/backup unit does not seem to matter.

The main conclusions from those 2 campaigns are the following:
- The first LED acquisition after the initial dark current acquisition starts off with a long, slow stabilization process. It is independent on the type of LED used, and it is not visible in the second part of the campaign (which is identical to the first half in case of unit 2).
- It is still possible that the stabilization effect is due to solar signal electrons trapped in the defects in the cristalline structures, which are still to be released after the covers have closed. But a longer dark current acquisition does not completely release them. Stronger signals (LEDs) seem necessary to release the trapped electrons.
- At first sight, the way the campaign is build up (nominal/backup units, order of LEDs) does not seem to matter for the data outcome.
- We need more analysis to completely understand the signals during calibration campaigns.

IOS & operations

Monday 31 Jan	Tuesday 1 Feb	Wednesday 2 Feb	Thursday 3 Feb	Friday 4 Feb	Saturday 5 Feb	Sunday 6 Feb
Nominal acquisition + Unit2/3 occultation campaign (LYRA00142)	Nominal acquisition + Unit2/3 occultation campaign + Calibration campaign (LYRA00143)	Nominal acquisition + Unit2/3 occultation campaign + Calibration campaign + LYRA switch off (LYRA00144)	LYRA off (LYRA00145)	Nominal acquisition (LYRA00146) (LYRA00147)	Nominal acquisition (LYRA00147)	Nominal acquisition (LYRA00147)

IOS00142 was sent to switch off CD heaters as this was forgotten after the bakeout campaign on Jan 26. However, we realised later that the heaters got switched off automatically at the warmup command on Jan 26 16UT.

IOS00146 got only partially uploaded on pass 3691 due to a TC acceptance not received. The upload report on the other hand gave 0 as number of TC commands successfully uploaded. The TCs could also not be resend at the next pass because the first TC of the IOS was in the past by then - this blocked the LYRA stack, which had to be unlocked manually by the Redu operator.
IOS00147 was sent with all commands that did not get uploaded at first.

An ASIC reload (automatically scheduled onboard every 100 orbits) took place on Feb 4 at 18:42.

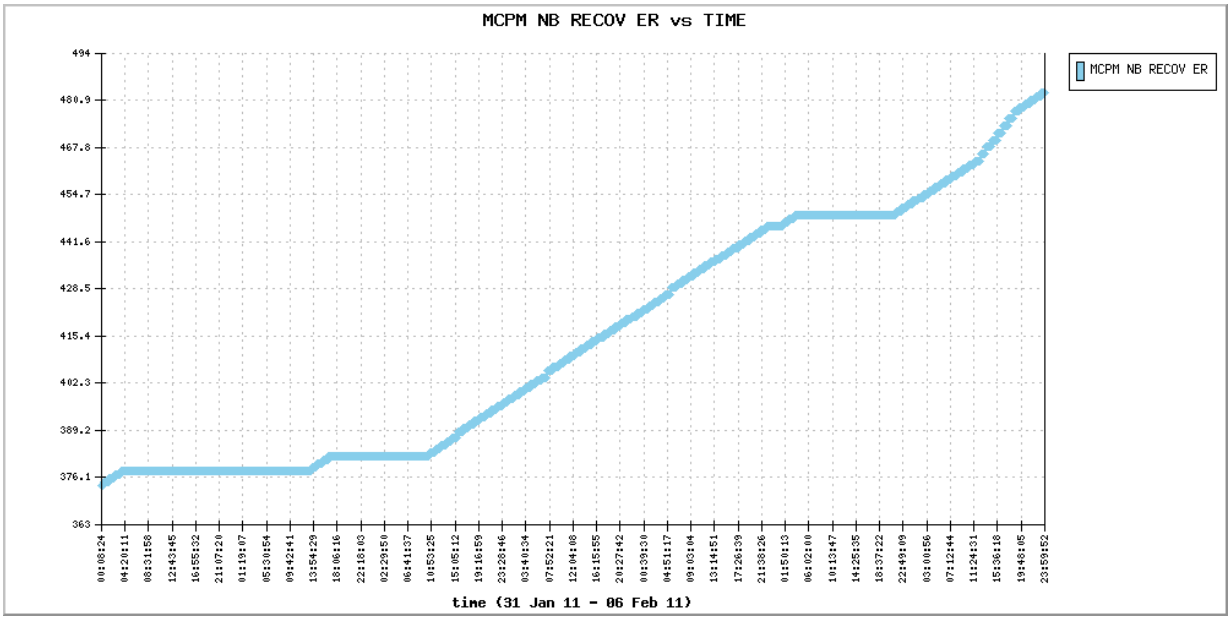
To be explored

More detailed analysis is needed to understand stabilization effects in calibration campaigns.

3. SWAP instrument status

MCPM recoverable errors

increased from 374 to 483 during this week. The plot below shows that during several long periods, the number of errors increased by 1 every hour (MCPM scrubbing period).:



On Feb 6, there was a small period with 2 errors per hour.

Two MCPM registers where dumped to study the problem:

- MCPM MERR_count register: counter of MCPM RV errors.
- Dump MCPM LMERR register : register which points to the last address where a problem was found.

Conclusions:

- The incrementation of the counter every hour is not a OBSW issue, the value which the OBSW reports to ground is really the value read from the MCPM.
- The pointer to the address where the last error was seen remains the same: it looks like the bit flip was never resolved.

More investigation is ongoing.

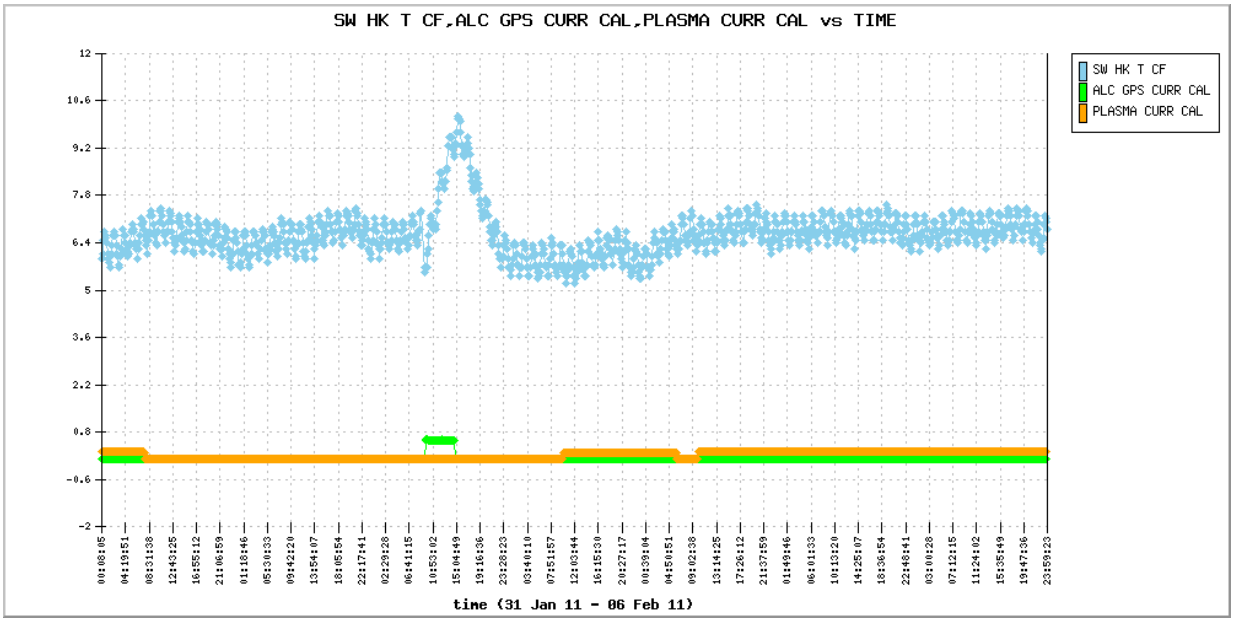
The number of MCPM unrecoverable errors is still 0.

IOS & operations

Monday 31 Jan.	Tuesday 1 Feb	Wednesday 2 Feb	Thursday 3 Feb	Friday 4 Feb	Saturday 5 Feb	Sunday 6 Feb
Nominal + eclipse jumping + high cadence occultation campaign Cadence:85	Nominal + eclipse jumping + LED campaign Cadence:85	Nominal + eclipse jumping Cadence:100	Nominal + eclipse jumping + ESP test Cadence:100	Nominal + eclipse jumping Cadence:100	Nominal + eclipse jumping Cadence:100 IOS00245	Nominal + eclipse jumping Cadence:100 IOS00245

IOS00242	IOS00243	IOS00244	IOS00245	IOS00245		

SWAP detector and IIU temperature
The SWAP Cold Finger Temperature fluctuated between 5 and 10.2 degrees Celsius, with the highest temperature (absolute maximum over the whole mission) on February 2.
This was the hottest week of the mission up to now. Seasonal effects definitely played a roll, together with the increasing trend over the mission.
The highest peak was affected by a LYRA calibration going on & the Alcatel GPS experiment being performed at the same time.
The lower temperatures in the middle of the week were due to LYRA being switched off.



In the following weeks, we expect SWAP temperatures to drop (see overall trend Sect. 2).

4. PROBA2 Science Center Status

Anik De Groof was operator during this week.

The following tools were updated on the operational server:

Software name	Update	Date	Comment
CT (cleaning tool)	r3890	01-02-2011	It will clean the interface directory between LYEDG and LYBSDG (/temp/lyedg/fits) by removing all fits files older than 20 days.
global.ini	r3894	02-02-2011	To complete the installation of CT.

On Feb 2, a parallel processing of all BINLYRA files was started on the main server (s2) and the test server (sol020). All files were processed both by the old software of LYEDG (s2) and by the new can complete LYRA pipeline on sol020 (LYTMR, LYEDG 2.1 and calibration software

LYBSDG 0.5).
The test was successful and next week, the complete reprocessing of LYRA data from 1 Jan 2010 onwards will start.

5. Data reception & discussions with MOC

Passes
Most passes went fine, although there were some passes with disturbances in the signal which caused some SWAP packets to get corrupted or truncated (see below).
For pass 3694, the end of the image download was scheduled wrongly and the MCPM kept on downloading when the pass had finished. All 252 in the processed buffer were sent to the ground but only 63 were received. 189 SWAP images got lost.

Data coverage HK
All fine.

Data coverage SWAP
The following passes had corrupted, truncated, or missing data:

- Pass 3666:
    - 7 images (numbers) missing.
    - BINSWAP20110131213204000024379 2PROCESSED - Corrupted first packet
- Pass 3683: 1 image (number) missing.
- Pass 3684: BINSWAP20110202192129000024472 8PROCESSED - Corrupted first packet
- Pass 3686: BINSWAP20110203033222000024485 8PROCESSED - Corrupted first packet
- Pass 3691:
  BINSWAP20110203165118000024512 6PROCESSED - Corrupted first packet
  BINSWAP20110203172118000024513 2PROCESSED - Corrupted first packet
- Pass 3693: 3 images (numbers) missing.
- Pass 3694:
  The end of download was scheduled wrongly and the MCPM kept on downloading when the pass had finished -> 252-63 = 189 images got lost
  BINSWAP20110203184811000024544 7PROCESSED - JPEG data truncated
- Pass 3700:
  1 image (number) missing.
  BINSWAP20110204174058000024578 0PROCESSED - JPEG data truncated
  BINSWAP20110204180558000024578 5PROCESSED - JPEG data truncated
  BINSWAP20110204181058000024578 6PROCESSED - Corrupted first packet
- Pass 3708:
  1 image (number) missing.
  BINSWAP20110205050819000024641 0PROCESSED - Corrupted first packet

The overall data coverage was fine except on Feb 3, where many images are missing due to the problems with pass 3694. There were also several images that got overwritten onboard during the first part of the week. The passes were very short, eclipse durations decreased

quickly and the image cadence was not adapted for that. The cadence was decreased to 100s on Feb 2 0UT.

We did not reach that cadence completely because of several overwriting periods (passes were really short). NO big gaps other than eclipses.

Statistics for complete week:

Total number of images between 2011 Jan 31 0UT and 2011 Feb 07 0UT: 4074
Highest cadence in this period: 19 seconds
Commanded cadence: 85s up to Feb 2 and 100s from Feb 2 0UT onwards
Average cadence in this period: 148.43 seconds
Number of image gaps larger than 300 seconds: 101 (all eclipse periods + ESP test)
Largest data gap: 66.67 minutes (eclipse + ESP)

Data coverage LYRA
LYRA off from Feb 2 15:22 upto Feb 4 00UT. The rest of the data are complete.

6. APPENDIX Frequently used acronyms

ADP	Ancillary Data Processor
ADPMS	Advanced Data and Power Management System
AOCS	Attitude and Orbit Control System
APS	Active Pixel image Sensor
ASIC	Application Specific Integrated Circuit
BBE	Base Band Equipment
CME	Coronal Mass Ejection
COGEX	Cool Gas Generator Experiment
CRC	Cyclic Redundancy Check
DR	Destructive Readout
DSLP	Dual Segmented Langmuir Probe
EIT	Extreme ultraviolet Imaging Telescope
FITS	Flexible Image Transport System
FOV	Field Of View FPA Focal Plane Assembly
FPGA	Field Programmable Gate Arrays
GPS	Global Positioning System
HAS	High Accuracy Star tracker
HK	Housekeeping
ICD	Interface Control Document
IIU	Instrument Interface Unit
IOS	Instrument Operations Sheet
LED	Light Emitting Diode
LEO	Low Earth Orbit
LYRA	LYman alpha RAdiometer
LYTMR	LYRA Telemetry Reformatter (software module of P2SC)
LYEDG	LYRA Engineering Data Generator (software module of P2SC)
MCPM	Mass Memory, Compression and Packetisation Module
MOC	Mission Operation Center
NDR	Non Destructive Readout
OBET	On board Elapsed Time

OBSW	On board Software
PE	Proximity Electronics
PGA	Programmable Gain Amplifier
PI	Principal Investigator
P2SC	PROBA2 Science Center
PPT	Pointing, Positioning and Time (software module of P2SC)
ROB	Royal Observatory of Belgium
SAA	South Atlantic Anomaly
SCOS	Spacecraft Operation System
SEU	Single Event Upset
SOHO	Solar and Heliospheric Observatory
SWAP	Sun Watcher using APS detector and image Processing
SWBSDG	SWAP Base Science Data Generator
SWEDG	SWAP Engineering Data Generator (software module of P2SC)
SWTMR	SWAP Telemetry Reformatter (software module of P2SC)
TBC	To Be Confirmed
TBD	To Be Defined
TBW	To Be Written
TC	Telecommand
TPMU	Thermal Plasma Measurement Unit
UTC	Coordinated Universal Time
UV	Ultraviolet