P2SC-ROB-WR-042-20110103 Weekly report #42	**P2SC Weekly report**	
Period covered: Date: Written by: Released by:	Mon January 3 to Sun January 9 2011 Mon January 10 Anik De Groof Marie Dominique	Royal Observatory of Belgium PROBA2 Science Center
To:	LYRA PI, marie.dominique@sidc.be SWAP PI, david@sidc.be	http://proba2.sidc.be ++ 32 (0) 2 373 0 559
cc:	ROB DIR, ronald@oma.be ESA Redu, Etienne.Tilmans@esa.int ESA D/SRE, Joe.Zender@esa.int ESA D/TEC, Karsten.Strauch@esa.int	

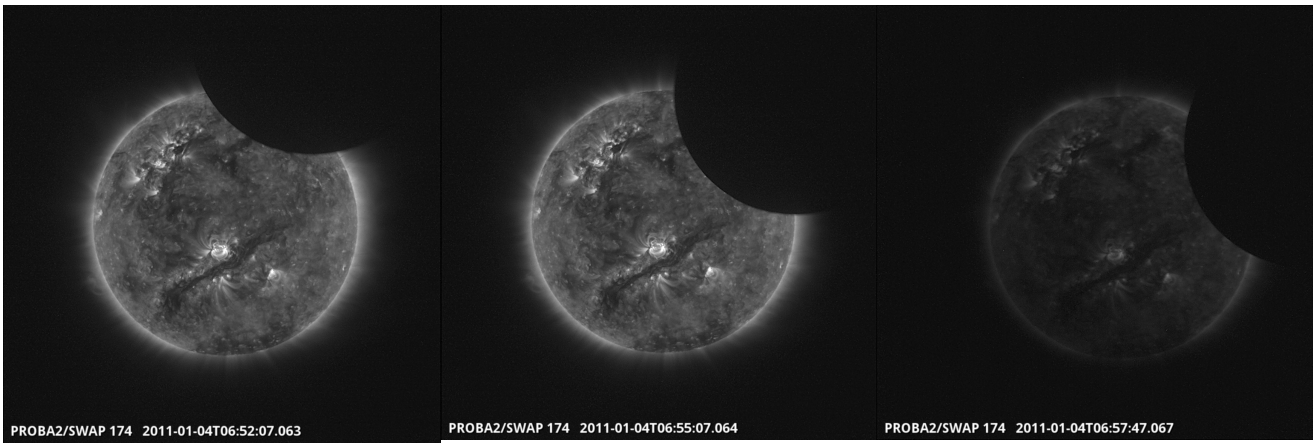
1. Science

Solar & Space weather events

Partial solar eclipse

On January 4, SWAP and LYRA observed a solar eclipse: part of the solar disk got obscured by the Moon. PROBA2 passed 3 times through the eclipse path but all 3 partial eclipses were influenced by the fact that PROBA2 moved into the shadow of the Earth or its atmosphere during part of the eclipse. Only the first passage could be followed from the first contact to the maximal coverage.

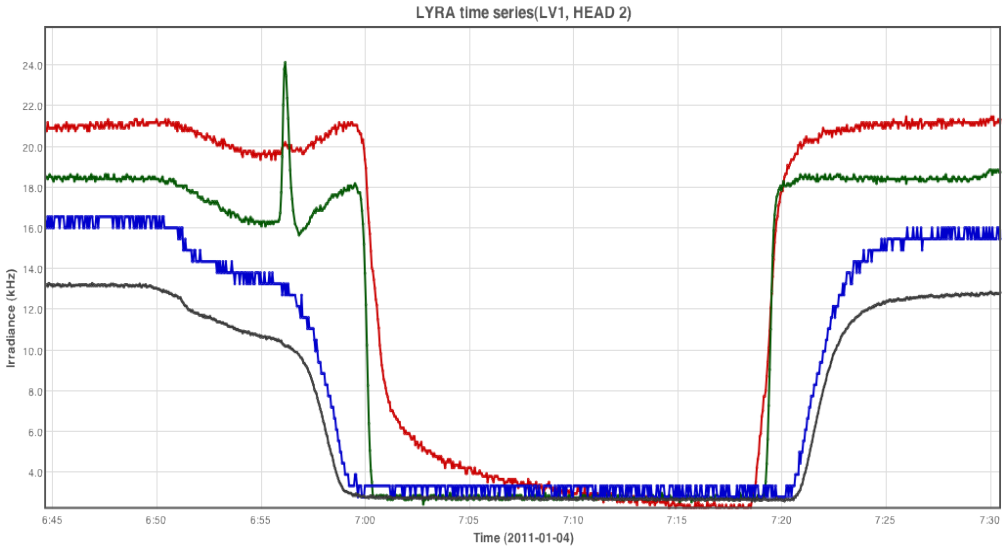
First passage - January 4, 2011 06:48-06:58

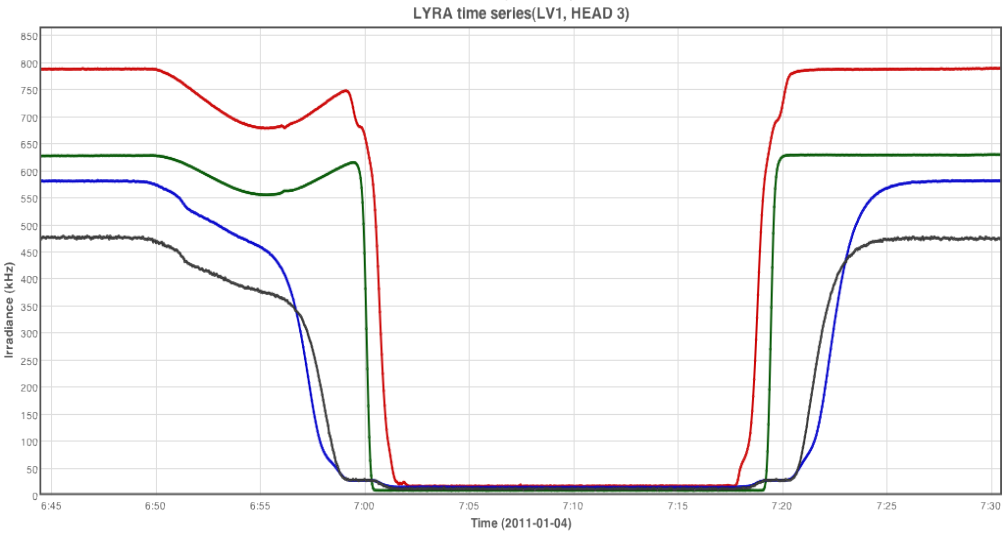


The SWAP movie available at http://proba2.sidc.be/swap/data/mpg/movies/campaign_movies/20110104_SWAP_EclipseMovie.mp4
shows both the first phase of the partial eclipse, as the EUV occultation by the Earth's atmosphere.

LYRA observed the double eclipse with both unit 2 and 3 at 10ms cadence - see the uncalibrated,

and rescaled curves for both units below. The first drop in signal (in all 4 channels) is due to the partial eclipse, the second drop to dark current level is due to the EUV occultation by the Earth.

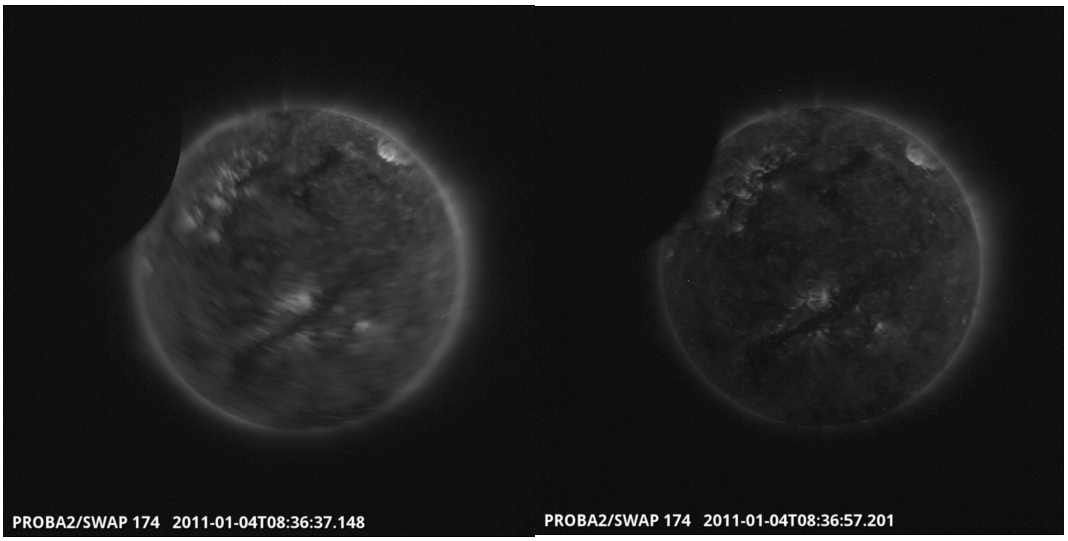




Some remarks about these plots:

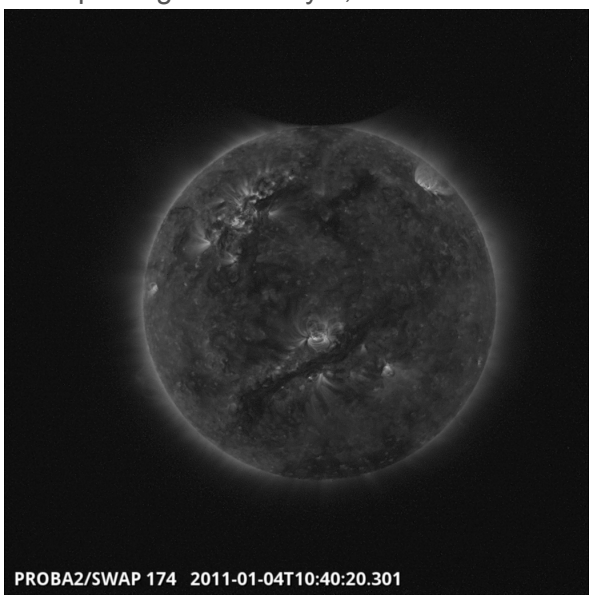
- There is a latency in the Ly alpha & Alum channels of unit 2 due to the MSM detectors which need time for signal stabilization. This causes the assymetries in the EUV occultation top plot, as compared to the bottom curves.
- The extra noise on unit 2/Aluminium (blue in the top plot) is due to discretisation errors which occur by overscaling the signal. The effect is increased because of the high cadence (10ms) at which this signal is acquired.
- The shoulder in the EUV occultation signal of unit 3/Ly alpha was also visible in the unit 2 data right after launch. It is believed that parts of the spectrum the Ly alpha channel was sensitive to have been degraded.
- Why does the Al channel fall off faster and rise later than Zr in unit 3 and not in unit 2? The fall off could be partially explained by the stabilisation time needed for unit 2 /Alum, but not the difference at eclipse end.

Second passage - January 4, 2011 08:36-08:37



The first contact of the 2nd partial eclipse was observed in SWAP during a LAR and right at the start of an EUV occultation.
The effect on the LYRA signals was too small to distinguish it from the LAR and start of EUV occultation.

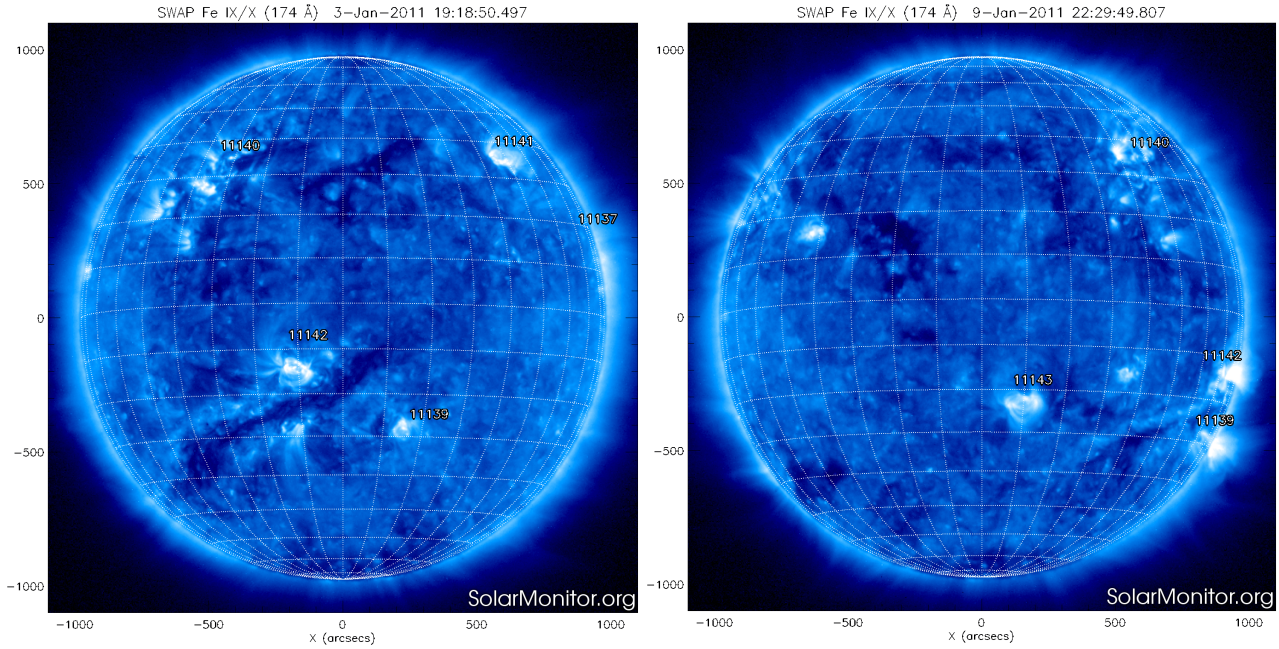
Third passage - January 4, 2011 10:40-10:42



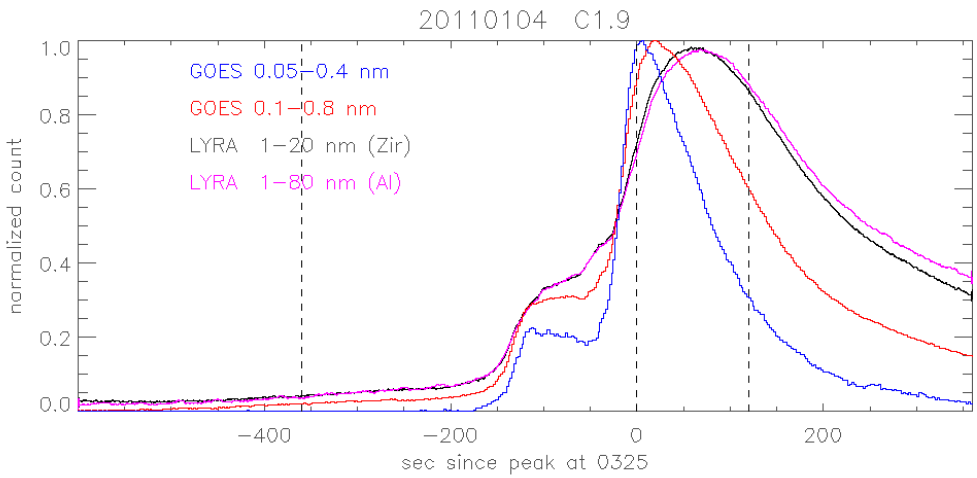
Only 2 SWAP images show a glimpse of the end of the 3rd partial eclipse, when PROBA2 moved out out of the shadow of th Earth's atmosphere and the lunar disk shifted out of the solar North pole.
In LYRA no clear effect can be seen.

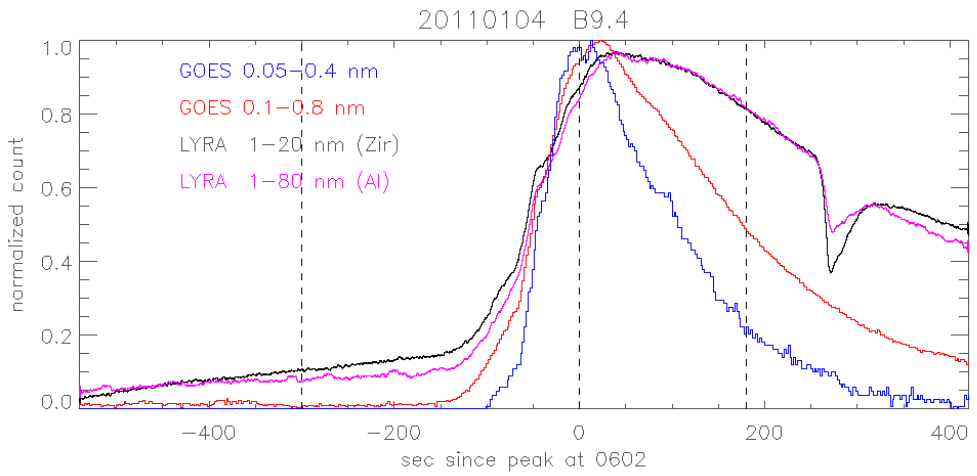
Solar activity

The Sun was extremely quiet this week. Only 2 C-flares were seen, both of class C1, both in the night from January 3 to 4. AR 1141 was the most active one, producing several small flares over Jan 3-4.
The rest of the week, AR 1140 and 1143 showed some minor activity.
The most prominent feature on the solar disk was the large filament extending from South East to the equator all over the Southern hemisphere. The filament stretches the same area which featured a long filament one rotation ago, that erupted on Dec. 6, 2010 (see the so-called Sinterklaasevent) and reformed itself during the last 4 weeks.



Below the LYRA and GOES curves are plotted for the most interesting flares: he C1.9 flare and B9.4 flare on January 4.





Remarkable in the C-flare is the pre-flare bump. At first sight, the flaring region in SWAP is too small to explore where it comes from.

Scientific campaigns

- SWAP high cadence campaigns during the partial solar eclipses (Jan 4) - IOS00227
- LYRA occultation campaigns with unit 2&3 during the partial solar eclipse, and on Jan 3, 5, 6, 7 around 8-9UT

Outreach, papers, presentations, etc.

- A. De Groof gave an interview on TV Brussel on the partial solar eclipse (in Dutch). A PROBA2/SWAP movie was used to show the observations and was broadcasted on TV.
- C. Marqué (ROB) gave an interview on RTL-TVI on the partial solar eclipse (in French). Again the PROBA2/SWAP movie was used as illustration in the news flash.
- The same SWAP movie was also shown on the BBC programme Stargazing Live, broadcasted on Jan 4 at 8pm UT.
- A SWAP image of the solar eclipse was published on Boston.com's Big Picture photo blog: http://www.boston.com/bigpicture/2011/01/the_first_solar_eclipse_of_201.html
- An article on the PROBA2 eclipses was published on the ESA webpage: http://www.esa.int/esaCP/SEMEAL0SDIG_index_0.html
- Similar images and movies were posted on YouTube & Wikipedia

No Guest investigators were visiting this week.

To be explored

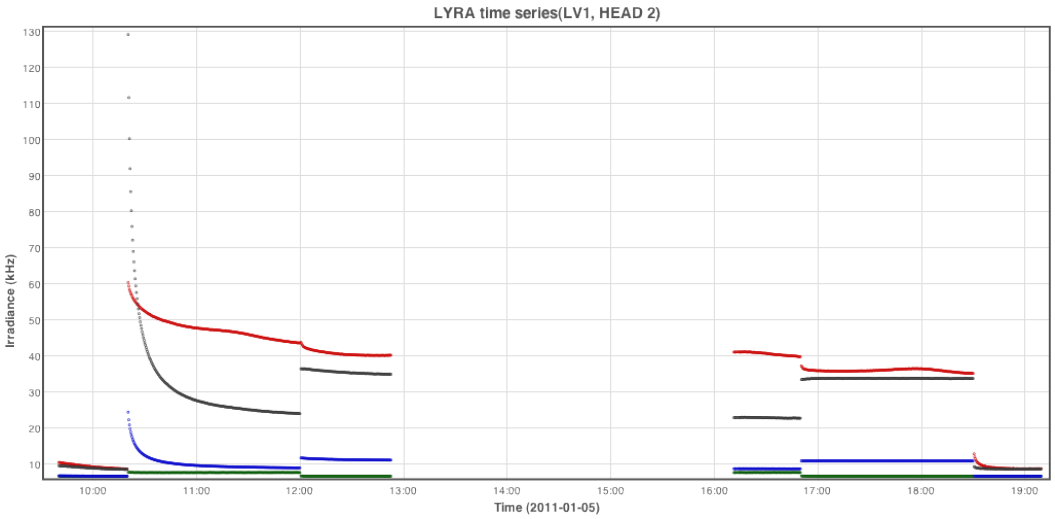
2. LYRA instrument status

Anomaly

Jan 3: A small anomaly occurred in cover 3 closing at the end of the occultation campaign: the cover seemed closed (unit 3 starts acquiring dark current at the right moment) but the cover status is ambiguous after the commanded closing: LY COV3 OPEN=0 & LY COV3 CLOSED=0.
It was fixed by giving a warmup command which scheduled another closure of cover 3 around 18UT.
The LYRA data were NOT affected by this problem.

Calibration

A LYRA calibration campaign was performed on January 5, together with backup acquisition with unit 2&3.
The middle part of the calibration (end of vis LED, dark current and begin of second UV LED) is missing because of pass 3422 which was not recorded at Svalbard.



The backup acquisition (unit 2/3) was done during the start of an EUV eclipse.

IOS & operations

- LYIOS00126: occultation campaigns on Jan 3 and Jan 4 (during solar eclipse)
- LYIOS00127: LYRA occultations for rest of the week after solar eclipse.
- LYIOS00128: Warmup command on Jan 3 18UT to properly close unit 3 + repetition of commands for rest of the week
- LYIOS00129: LYRA calibration & backup acquisition with unit 2/3 on Jan 5 + occultation campaigns on Jan 6&7

An ASIC reload (automatically scheduled onboard every 100 orbits) took place on Jan 8, from 9:43 to 9:46.

To be explored

More work should be done in comparing unit 2 and unit 3 data, from occultation campaigns and back-up acquisition campaigns.

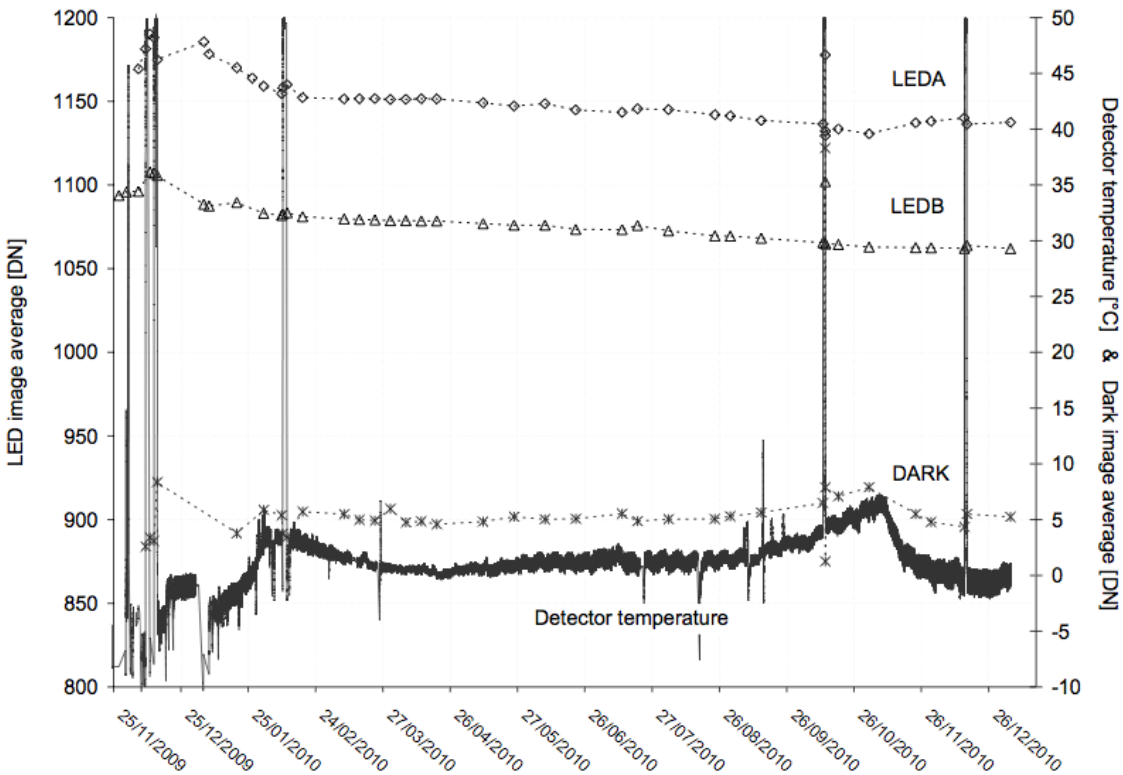
3. SWAP instrument status

MCPM recoverable errors

increased from 211 to 213 on January 8 at time 23:25.
The number of MCPM unrecoverable errors remained 0.

Calibration

A SWAP LED campaign was performed on January 5. The LED signal was stable compared to the last measurements on December 16, 2010.



IOS & operations

- IOS00226: eclipse jumping until Jan 3 midnight
- IOS00227: solar eclipse observations: periods of high cadence + SWAP darks for calibration purposes - right after the first partial eclipse on Jan 4
- IOS00228 overwritten by IOS00229: SWAP LED campaign on Jan 5 + eclipse jumping rest of the week
- IOS00230: eclipse jumping from Jan 8 onwards

SWAP detector and IIU temperature

The SWAP Cold Finger Temperature fluctuated between -1.3 and 1.5 degrees Celsius and was slowly rising in the second part of the week.

To be explored

The uncompressed dark images taken during the last few weeks should be analysed to make a new pixel map.

4. PROBA2 Science Center Status

Anik De Groof was operator during this week.
All tools were running automatically. The LYRA preliminary calibration (dark current subtraction and degradation compensation) was running on a test server in parallel.

No tools were updated on the operational server this week.

5. Data reception & discussions with MOC

Passes

All passes were received in good order (apart from missing packets/images here and there) except:
- Pass 3422 (Jan 5), which was not recorded at Svalbard due to a full disk on the server
- Pass 3442 (Jan 7): Due to a drop of signal at the beginning of the pass, some SWAP and LYRA data were lost and several images/lumps got corrupted (see details below).

Data coverage HK

The coverage of the received HK data was complete during the period except a data gap on Jan 5 between 13UT and 16:15 (missing pass 3422) and around 18:30 (drop of signal during pass 3424). Because of these data gaps, the associated SWAP images are not fully processed.

Data coverage SWAP

Several images got lost due to corruption or problems during the download. Below an overview is given per pass.

- pass 3404: 3 JPEG truncated images
- pass 3405: 1 missing image, 1 JPEG truncated and 1 corrupt image (first packet corrupted)
- pass 3416: 1 missing image
- BINSWAP_3422 was not received at all
- Pass 3423: 1 truncated JPEG image
- Pass 3424 (drop of signal): 6 images missing and 1 truncated JPEG image

- Pass 3425: 1 missing image, 1 truncated JPEG image and 1 corrupt image (first packet corrupted)
- Pass 3434: 1 truncated JPEG image
- Pass 3441: 4 missing images, 1 truncated JPEG image and 2 corrupt images (first packet corrupted)
- Pass 3442: 2 images missing
- Pass 3445: 6 images missing
- Pass 3449: 1 truncated JPEG image
- Pass 3450: 6 images missing, 1 truncated JPEG image and 2 corrupt images (first packet corrupted)
- Pass 3452: 1 image missing and 1 corrupt image (first packet corrupted)
- Pass 3459: 1 truncated JPEG image
- Pass 3461: 4 missing images

The overall data coverage was still allright. Every orbit, there was a typical gap of 29,4 to 30 minutes due to an EUV occultation in which no images were taken. Apart from those gaps, there were only a few extra gaps larger than 6 minutes. Some eclipse gaps were increased upto 35 minutes due to missing images.

The default commanded cadence in between the eclipses was 80 or 85s.

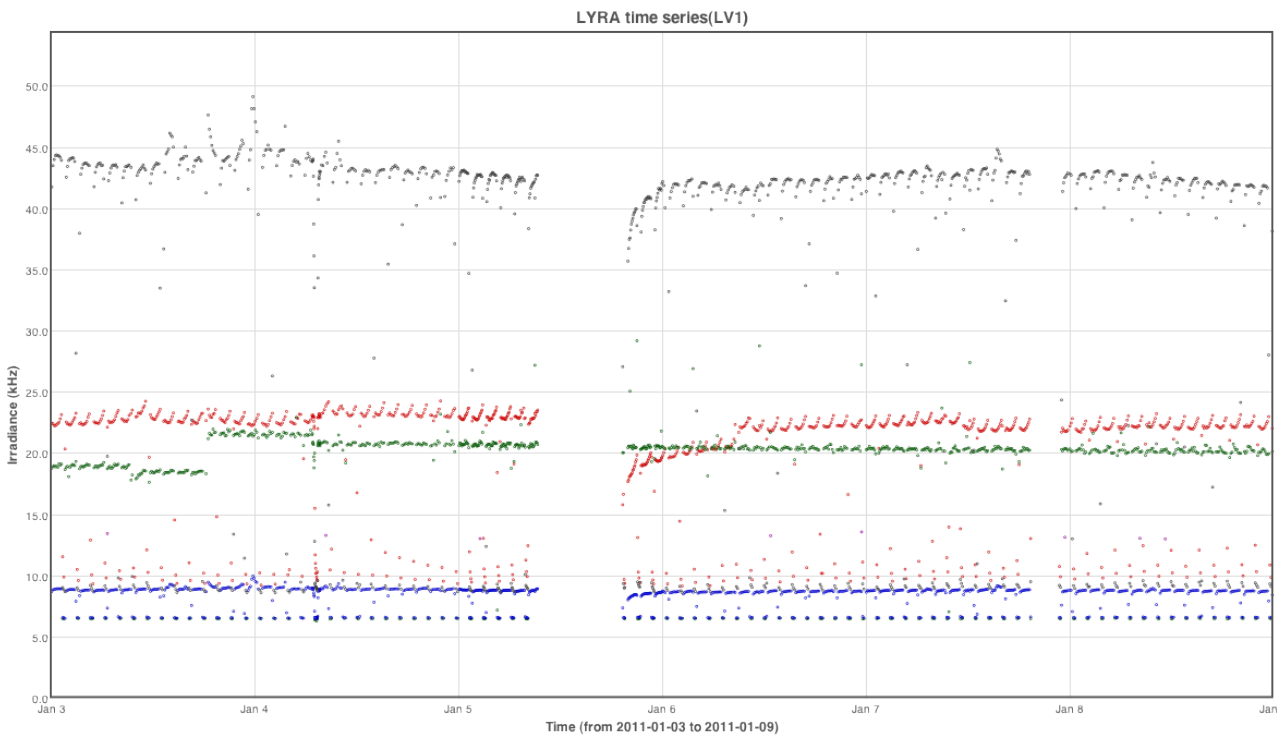
Statistics for complete week:

Total number of images between 2011 Jan 03 0UT and 2011 Jan 10 0UT: 4843
Highest cadence in this period: 19 seconds
Average cadence in this period: 124.88 seconds
Number of image gaps larger than 300 seconds: 101 (of which 4 small gaps due to missing images)
Number of image gaps larger than 1760 seconds: 97 (typically eclipse interruptions)
Number of image gaps larger than 1800 seconds: 9 (increased eclipse gaps due to missing images)
Largest data gap: 35.50 minutes

Data coverage LYRA

Due to the missed pass 3422, there is a gap in LYRA data on Jan 5 between ~13UT and ~16:15UT. The partially lost and partially corrupted data of pass 3442 resulted in a data gap on January 7 from 19:25 to 22:45.

The complete LYRA timeline over the week is as follows:



The first gap is due to the LYRA calibration, the second gap is due to a partially missed pass. Jumps in Herzberg and once in Lyman alpha were observed at times of cover 3 closure/opening.

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