


P2SC-ROB-WR-045- 20110124 Weekly report #45	P2SC Weekly report	
Period covered: Date: Written by: Released by:	Mon Jan 24 to Sun Jan 30 2010 Wed Feb 02 2011 Carlos Cabanas Anik De Groof	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

Active regions overview:

- NOAA 11147, rotated in the northern hemisphere near to the limb meanwhile producing low-level events (B-class flares).
- NOAA 11149 produced the following major events of the week:
 - C1.4 Start: 2011-01-24T05:56:00 End: 2011-01-24T06:32:00
 - C1.2 Start: 2011-01-27T11:53:00 End: 2011-01-27T12:05:00
 - M1.4 Start: 2011-01-28T00:44:00 End: 2011-01-28T01:10:00
 - C1.5 Start: 2011-01-28T04:02:00 End: 2011-01-28T04:35:00
 - C1.5 Start: 2011-01-28T10:05:00 End: 2011-01-28T10:30:00

This active region was the source of several eruptions during the week. They can be seen at:

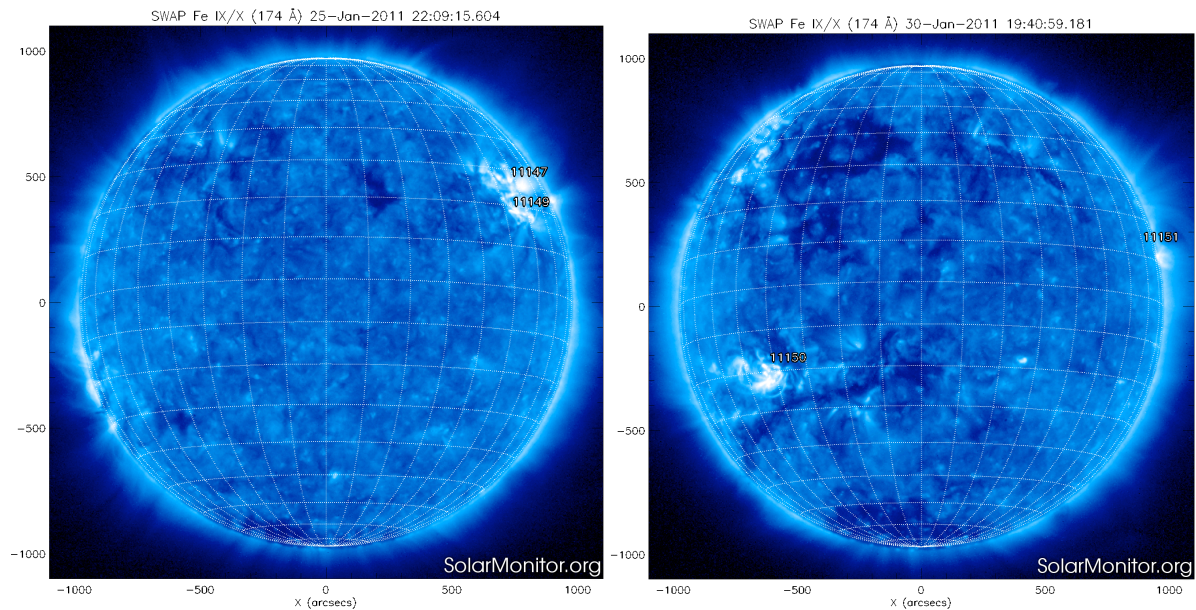
- http://proba2.sidc.be/swap/data/mpg/movies/2011/01/20110126_swap_movie.mp4
- http://proba2.sidc.be/swap/data/mpg/movies/2011/01/20110127_swap_movie.mp4

On January 27-28, several coronal waves were seen to accompany the eruptions. As they show up at the limb in SWAP, and in the middle of the disk in STEREO/EUVI-A, they are particularly interesting to study. Ines Kienreich, SWAP Guest Investigator visiting at the moment, is looking into these events.

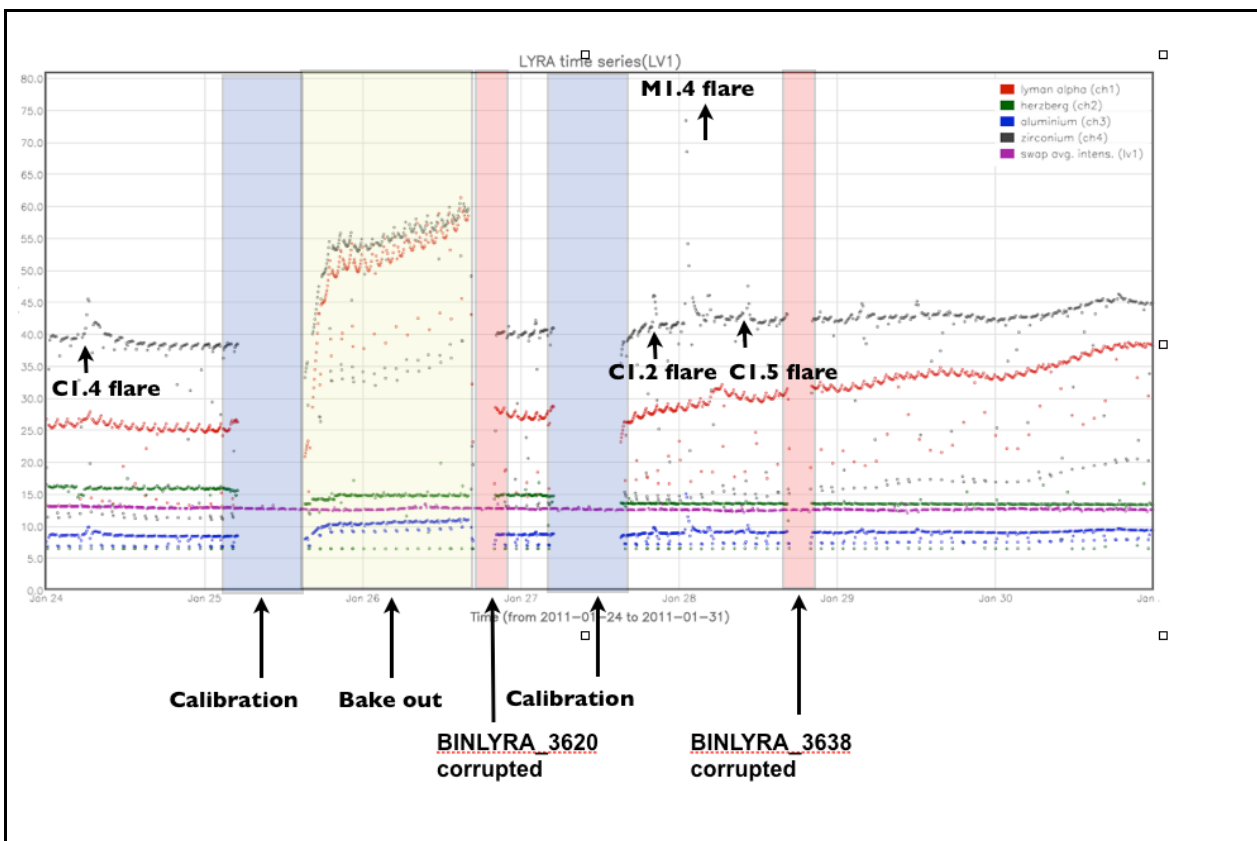
- A new active region, designated NOAA 11150, rotated on to the disk in the southern hemisphere on 29-Jan-2011 producing several flares of GOES class B.

- Close to NOAA 11150, a nice prominence eruption was recorded by SWAP on the southern limb on January 28 around 03:00 in the morning. It can be seen at:
 - http://proba2.sidc.be/swap/data/mpg/movies/2011/01/20110128_swap_movie.mp4
 The large filament of which a part erupted, is (at least partially) present on the solar disk since September 2010 and already produced several filament eruptions over the last months.

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



Standard LYRA FITS files are shown for the reported period:



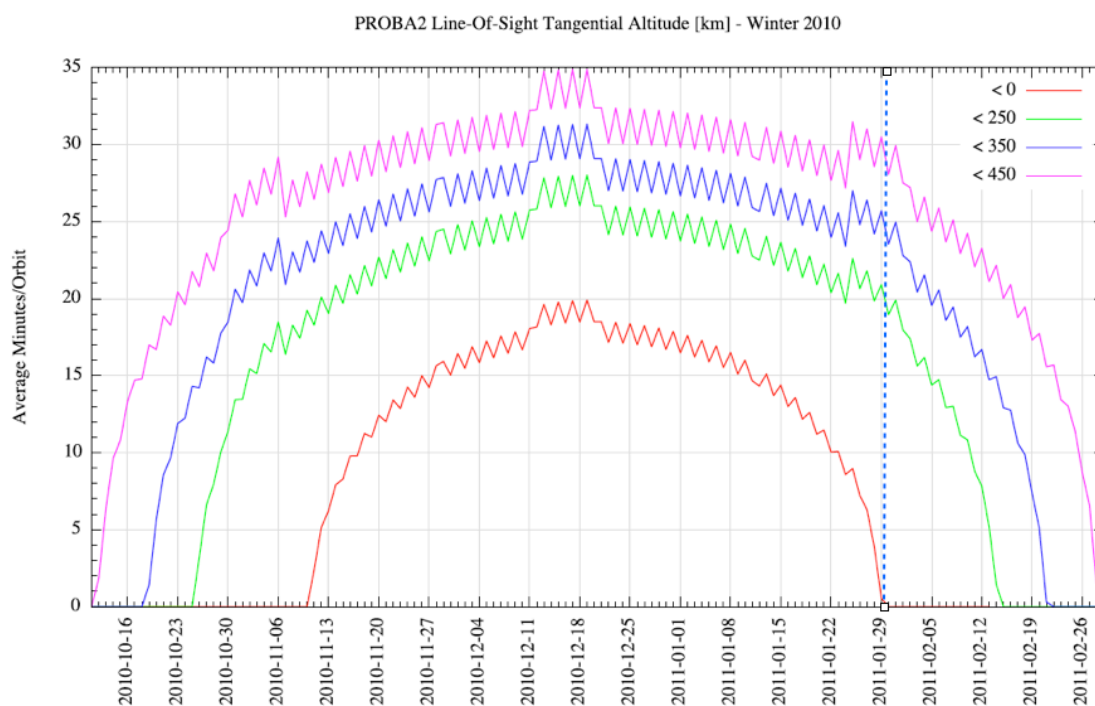
Scientific campaigns

LYRA is continuing its occultation campaigns as described below. SWAP did not do any specific campaign this week.

Occultation campaigns

The visible eclipsed season ended on January 30.

The atmosphere eclipses will persist until the end of February.



LYRA occultation campaigns were performed from Monday to Friday as usual. Below we can see the times sent to REDU to open and close cover 3:

- Jan 24 cover 3 opens at 04:45, close at 05:29
- Jan 25 cover 3 opens at 03:57, close at 04:38
- Jan 26 cover 3 opens at 18:00, close at 18:35
- Jan 27 cover 3 opens at 03:55, close at 04:35
- Jan 28 cover 3 opens at 04:40, close at 05:23

Outreach, papers, presentations, etc.

Monday 24:

'P2SC team' met with Cedric Tetard and Didier Fussen from the Aeronomy Insitute of Belgium to discuss about the 'eclipse' acquired data.

David Berghmans gave a presentation on SWAP and Ingolf Dammasch about LYRA.

Dedier Fussen presented GOMOS to P2SC team.

Collaboration is ongoing.

2. LYRA instrument status

Calibration

A LYRA bake out was performed from Jan. 25 from 16:00 to Jan. 26 16:00.

Two LYRA calibration campaigns took place before and after the bake out: on Jan. 25 from 05 to 15:00 and on Jan 27 from 05:00 to 15:00.

IOS & operations

Monday 24	Tuesday 25	Wednesday 26	Thursday 27	Friday 28	Saturday 29	Sunday 30
Nominal acquisition + Unit2/3 occultaion campaign	Nominal acquisition + Unit2/3 occultation campaign + Bake out + Calibration campaign	Nominal acquisition + Unit2/3 occultation campaign + Bake out	Nominal acquisition + Unit2/3 occultation campaign + Calibration campaign.	Nominal acquisition + Unit2/3 occultation campaign	Nominal acquisition	Nominal acquisition
(LYRA00140)	(LYRA00140)	(LYRA00140)	(LYRA00140)	(LYRA00140)	(LYRA00140)	(LYRA00140)

Temperatures

LYRA temperatures kept a increasing trend after the bake out. It may be explained since PROBA2 is reaching the hottest time of the year (right after eclipse season, at a time close to perihelion).

The LYRA detector temperatures increased around 6 degrees from the beginning to the end of

the week: from 44 degrees to 50 degrees Celcius.

LYRA temperatures show the switching on and off of the back up Units during the calibration campaigns right before and after the bake out (calibration campaigns).

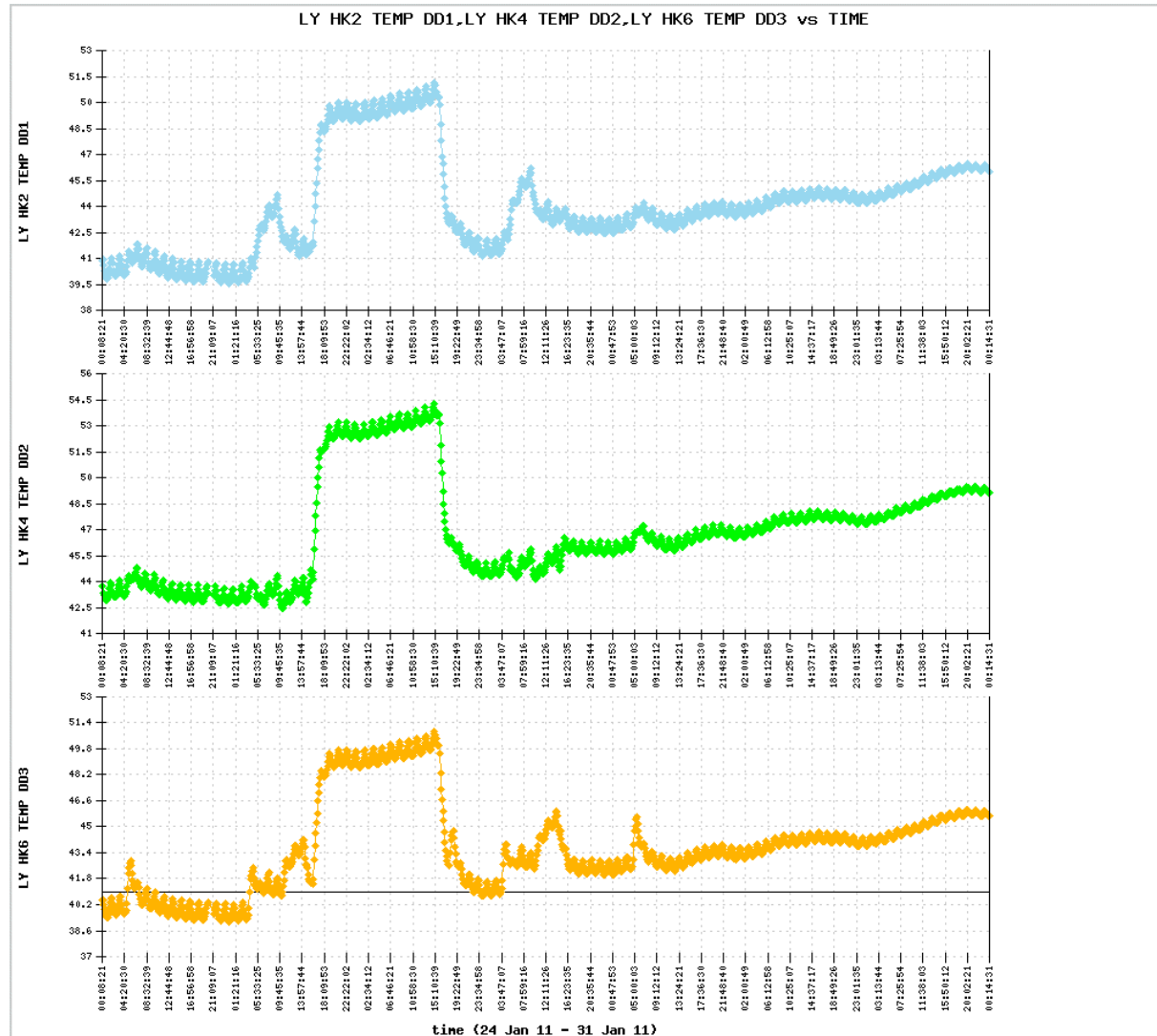


Figure: LYRA temperatures from 24Jan to 01Feb.

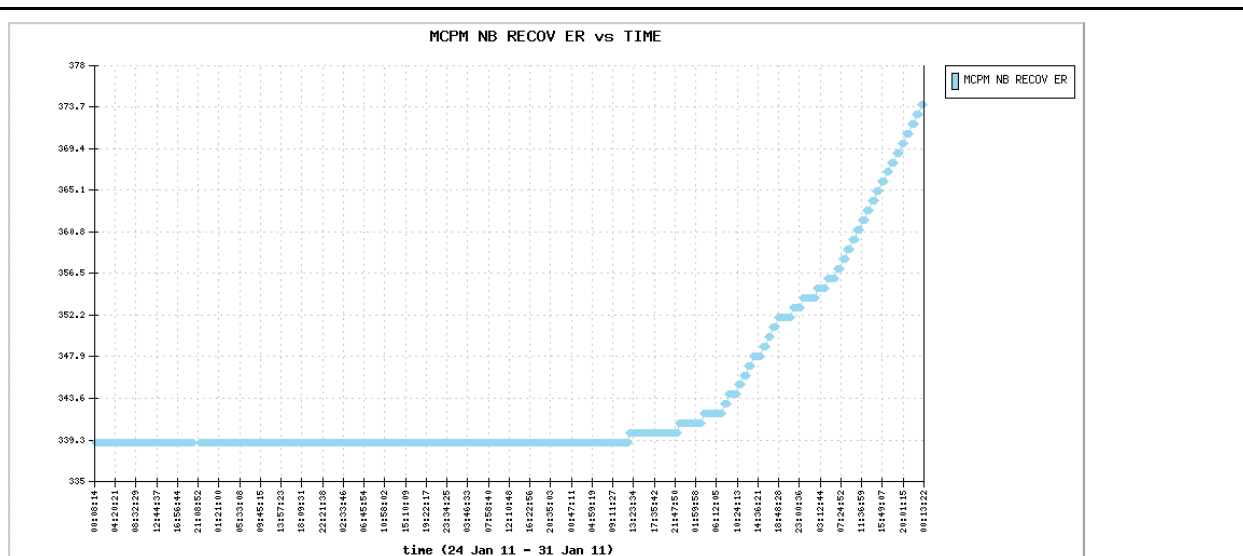
See Sect 3 for the LYRA (and SWAP) temperature evolution over the whole mission.

3. SWAP instrument status

MCPM errors

The number of MCPM recoverable errors increased from 339 to 374.

The number of MCPM unrecoverable errors remained 0.



IOS & operations

Monday 24 Jan.	Tuesday 25 Jan.	Wednesday 26 Jan.	Thursday 27 Jan.	Friday 28 Jan.	Saturday 29 Jan.	Sunday 30 Jan.
Nominal + eclip jumping	Nominal + eclips jumping	Nominal + eclip jumping + ESP test	Nominal + eclip jumping	Nominal + eclip jumping	Nominal + eclip jumping	Nominal + eclip jumping
Cadence:85 IOS00239	Cadence:85 IOS00239	Cadence:85 IOS00240	Cadence:85 IOS00240	Cadence:85 IOS00241	Cadence:85 IOS00241	Cadence:85 IOS00242

SWAP IOS 239

- jump the eclipsed periods from [Monday to Friday]

SWAP IOS 240

-to schedule the ESP test + jump over eclipsed periods.

SWAP IOS 241

- jump the eclipsed periods during the weekend.

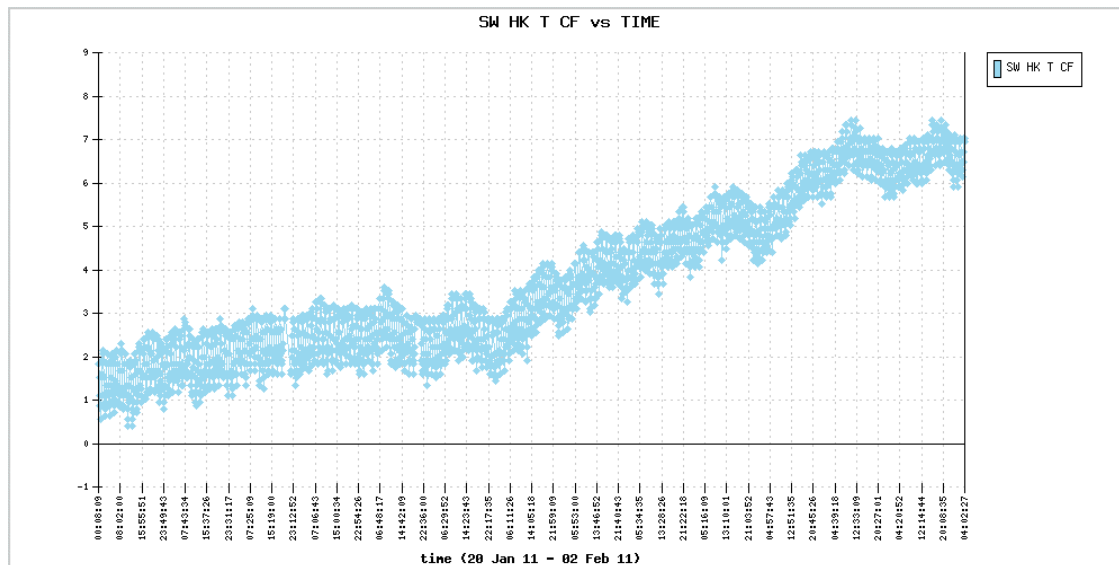
SWAP IOS 242

- support LYRA occultation campaign on Monday 31 Jan. + jump over eclipsed periods.

SWAP detector and IIU temperature

Seasonal effects were as well perceived by SWAP.

The SWAP cool finger temperatures increased around 4 degrees from the beginning to the end of the week: from 2.4 degrees to 6.4 degrees.

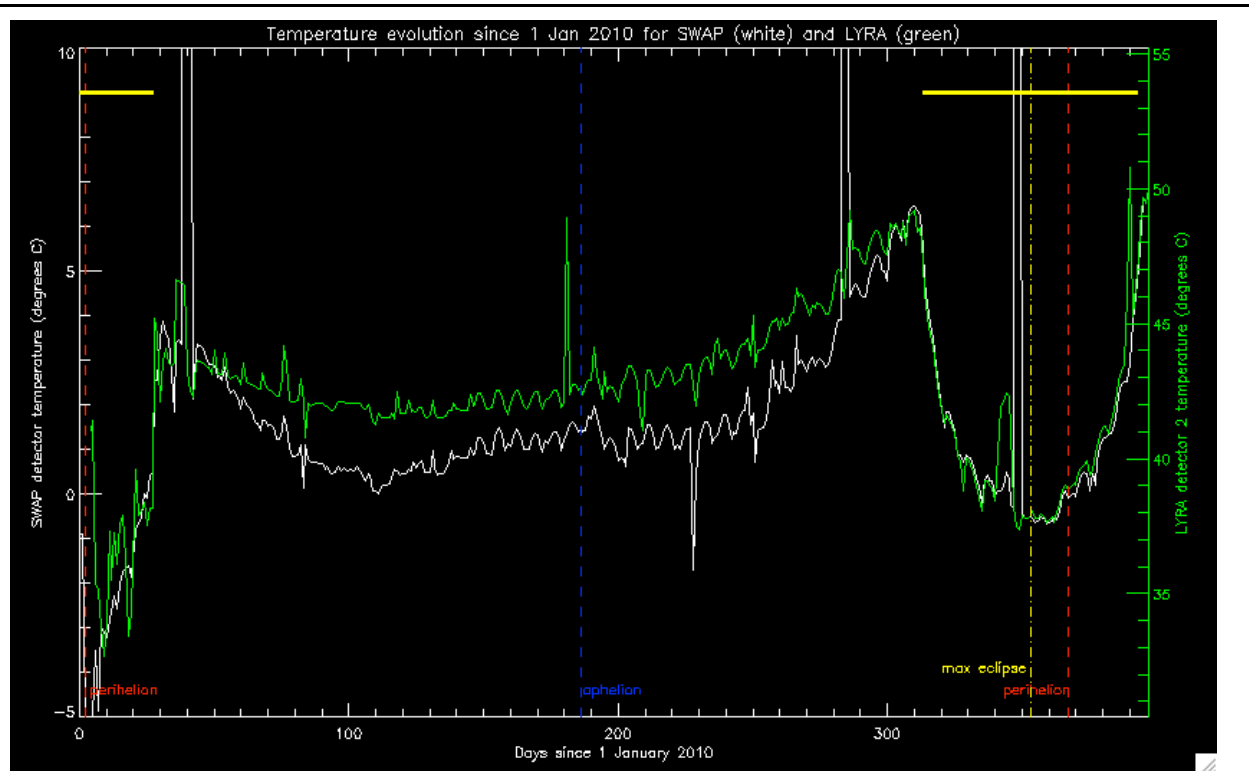


SWAP & LYRA temperature evolution

Below, the temperature evolution of both detectors is plotted against time, starting on 1 Jan 2010 and ending a few days ago (2 Feb).

The white curve is SWAP (see left axis for temp), the green curve LYRA unit2 (see right axis). They follow a very similar trend during the 2 eclipse seasons, depicted by the yellow lines on the top. During the non-occulted phase of the mission, the SWAP temperature drops faster than the LYRA one. This could be due to the SWAP radiator (passive cooling) which LYRA has not. Peaks both in SWAP and LYRA temps are due to bake out campaigns.

The vertical lines depict the times at which PROBA2 is closest to the Sun (in red) or farthest away (blue). The yellow dotted-dashed line gives the time at which the eclipse was maximal. This corresponds approx. to the coolest days.

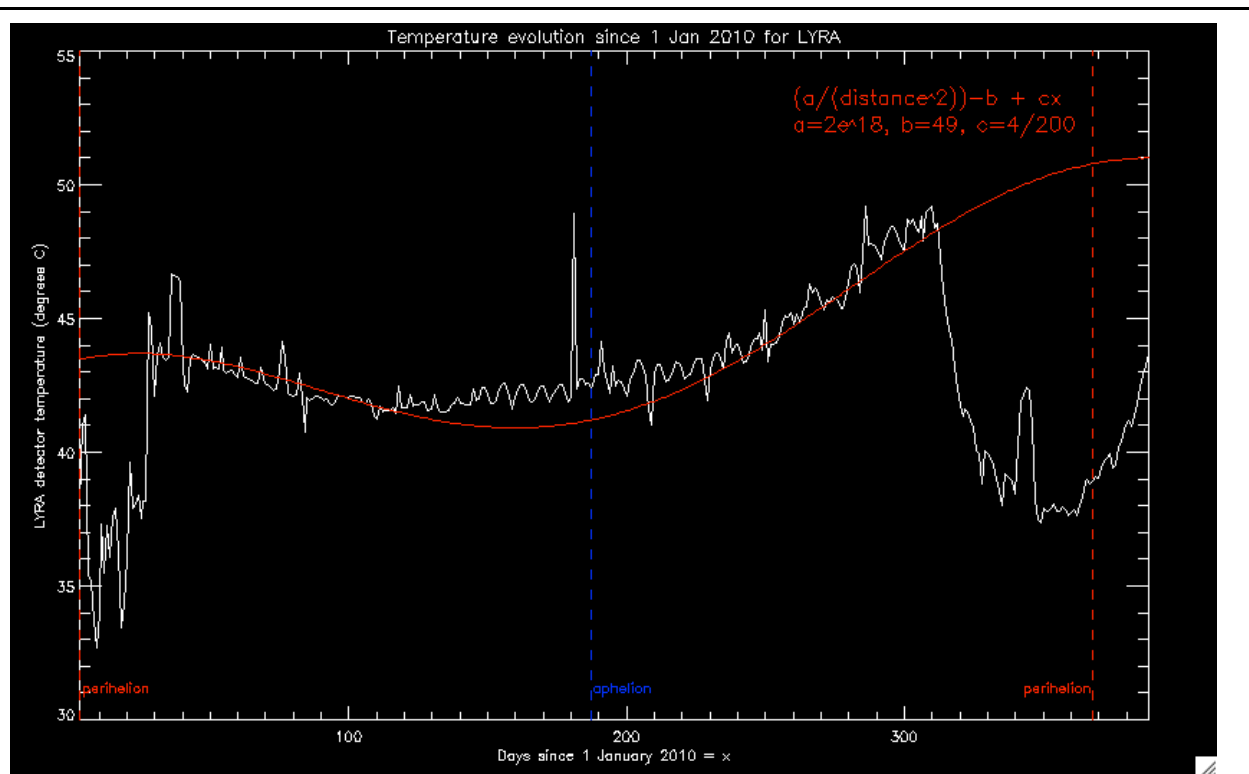


The blue line however does NOT correspond to the coolest time of the non-eclipsed period. It could be that apart from the seasonal effect caused by distance to the Sun, also an increasing trend is present.

To test this, LYRA temperature evolution (not influenced by passive cooling) is plotted below and fit it very roughly with a function consisting of two parts:

$a/(\text{distance-to-sun})^2 - b$ -> the seasonal effect (a and b are chosen arbitrarily by trial and error)

$c \cdot \text{time}$ -> an increasing trend / linear function



This is a very rough approach, as no model of the PROBA2 temperature evolution inside the S/C was taken into account. Especially up to March (~day 100), commissioning phase was going on and not all instruments were running nominally. Later on, the weekly variability probably due to DSLP/TPMU campaigns shows up in the curves.

4. PROBA2 Science Center Status

Carlos Cabanas was operator during this week.

No updates were done in the P2SC data pipeline.

New PPT routines were added and committed to ~/P2SC_repos/trunk/p2sc/bin/OPSWEB/ :

- geometry_lo.py -> it calls the PPT to get the tangential altitude for a period of time (start time and sampling rate are set as parameters in the code)
- geometry_lar.py -> it calls the PPT to get the roll angle at points in time (start time and sampling rate are set as parameters in the code)
- geometry_dist.py -> it calls the PPT to get the distance to the sun for a period of time (start time and sampling rate are set as parameters in the code)

P2SC status at the end of the week

This is how the P2SC pipeline looked like at the end of the reported period (without dismissing any error/warning during the week):

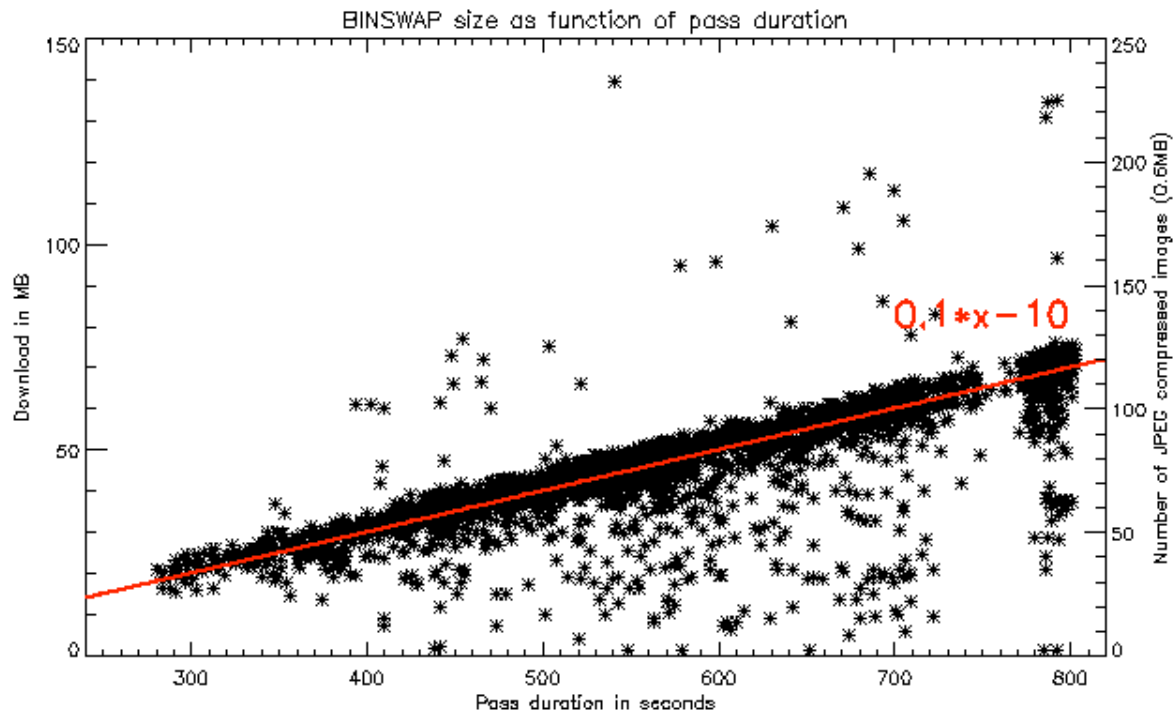
Jobs
LMAT 🟡8
IOSwriter
IOSsender
Report_Parser 🟡13
ADP 🔴1
LYTMR 🔴64
LYEDG
LYBSDG
SWTMR 🔴10 🟡25
SWEDG
SWBSDG 🔴78
DCVC 🔴828 🟡5551
PP_PROC 🔴1
PP_MAKEPLOT
EDP
TLE
CT_MOC
CT_TEMP
SWQLK
LYQLK
SWMPG
CLOG
SWAVINT

- **Logging, Monitoring and Activity Trigger** (LMAT) warned the operator 8 times, pointing that *Auxiliary Data Processor* (ADP), *Pass Planning Processor* (PP_MAKEPLOT) and *Data Consistency and Validation Checker* (DCVC) were taking too long and the status changed to not responding.
The maximum delay for the ADP was 480 seconds (LMATtools.ini). It has been modified to 600 seconds.
- **Report Parser**
The warnings pointed out images (numbers) missed in some SWAP packets.
- **Ancillary Data Processor** (ADP) logged one error during the week. It claimed that the 'AuxDB' was locked when trying to insert data. The packet
LYRA_AD_3615_RED3_2011.01.27T10.17.53.tar.gz was reprocessed.
- **LYRA Telemetry Reformatter** (LYTMR) logged 64 errors due to two BINLYRA corrupted packets: (BINLYRA_3638_SVA1_2011.01.28T20.29.55, BINLYRA_3620_SVA1_2011.01.26T20.32.10). (see more in section.5 under *Data coverage LYRA*)
- **SWAP Telemetry Reformatter** (SWTMR) detected 10 errors and 25 warnings due to 6 packets were corrupted (see more in section.5 under *Data coverage SWAP*)
- **SWAP Base Science Data Generator** (SWBSDG) logged 78 errors that can be explained in means of a lack of temperatures at the moment of generating the Scientific FITS files. It can happen for instance if a BINSWAP packet arrives before an ADP packet or if HK data got lost.
- **Data Consistency and Validation Checker** (DCVC) found 828 errors and 5551 warnings. All of them can be explained by the facts that
 - LYRA Cover 3 is being opened/closed directly by telecommand from REDU instead from ROB. Thus the ROB commanding_database does not contain this information, so when the housekeeping arrived these inconsistencies are noticed.

- NB RECOVER went up to 358 during the week. At the beginning the number was 338.
 - Errors produced by the temperatures that went above its maximum during the LYRA bake out and also after the LYRA bake out due to the seasonal effects.
- This tool is being improved in order to decrease the number messages sent to the operator.

Estimation of downloaded images per pass

A graph and function associated to the download of SWAP images per pass, as function of the pass duration, can be seen below.



This scatterplot is taking into account all passes over the mission up to last week.

On the x-axis, pass duration can be found in seconds, the download in MB is found on left y-axis, the number of nominal JPEG compressed images associated with that download size on the right.

The typical download can be fitted as follows: (pass duration in seconds)/10 - 10 = SWAP MBs downloaded during that pass

The number of raw images can be calculated as: SWAP MBs downloaded during that pass/1.5

5. Data reception & discussions with MOC

Data coverage HK

- OK
There was a little housekeeping gap of 54 minutes starting at 2011-01-24T20:13:45.000Z and ending at 2011-01-24T21:08:15.000Z.

Data coverage SWAP

The next packets arrived with corrupted images:

- BINLYRA_3572_RED3_2011.01.21T18.14.01
 - BINSWAP20110128170140000241731PROCESSED - Packet CRC does not validate
- BINSWAP_3630_SVA1_2011.01.27T23.37.42.tar
 - BINSWAP201101271924310000241199PROCESSED - Packet CRC does not validate
- BINSWAP_3629_RED3_2011.01.27T20.06.01.tar
 - BINSWAP201101271853020000241120PROCESSED - Packet CRC does not validate
 - BINSWAP201101271854270000241123
- BINSWAP_3620_SVA1_2011.01.26T20.32.11.tar
 - BINSWAP201101261709070000240358PROCESSED - Packet CRC does not validate
 - BINSWAP201101261751370000240368PROCESSED - Packet CRC does not validate
- BINSWAP_3604_SVA1_2011.01.25T03.07.21.tar
 - BINSWAP201101250203280000239167PROCESSED - Packet CRC does not validate
- BINSWAP_3601_RED3_2011.01.24T18.54.59.tar
 - BINSWAP201101232001330000238871PROCESSED - Packet CRC does not validate

Total number of images between 2011 Jan 24 OUT and 2011 Jan 31 OUT: 4640

Highest cadence in this period: 85 seconds

Average cadence in this period: 130.08 seconds

Number of image gaps larger than 300 seconds: 102 (eclipses + ESP test)

Largest data gap: 30.07 minutes

Data coverage LYRA

The next packets arrived corrupted to ROB:

- BINLYRA_3638_SVA1_2011.01.28T20.29.55
 - The size of some packets did no match with the expected value given in the header.
- BINLYRA_3620_SVA1_2011.01.26T20.32.10
 - The size of some packets did no match with the expected value given in the head
 - Some packets dit not match the naming conventions:
Ex. BINLYRA_195006140041360002292984RAW

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
DSLIP	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