


P2SC-ROB-WR-017-20100705 Weekly report #017	P2SC Weekly report	
Period covered: Date: Written by: Released by:	Mon July 5 to Sun July 11 2010 Mon July 12 2010 Carlos Cabanas Joe Zender	Royal Observatory of Belgium PROBA2 Science Center
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1. Science

Space weather events

Flares

Several B flares took place during the week, the most relevant ones on:

2010/07/09 with its peak at 15:14 UTC. (N21E84)

2010/07/09 with its peak at 22:22 UTC. (N21E75)

2010/07/09 with its peak at 22:49 UTC. (N21E65)

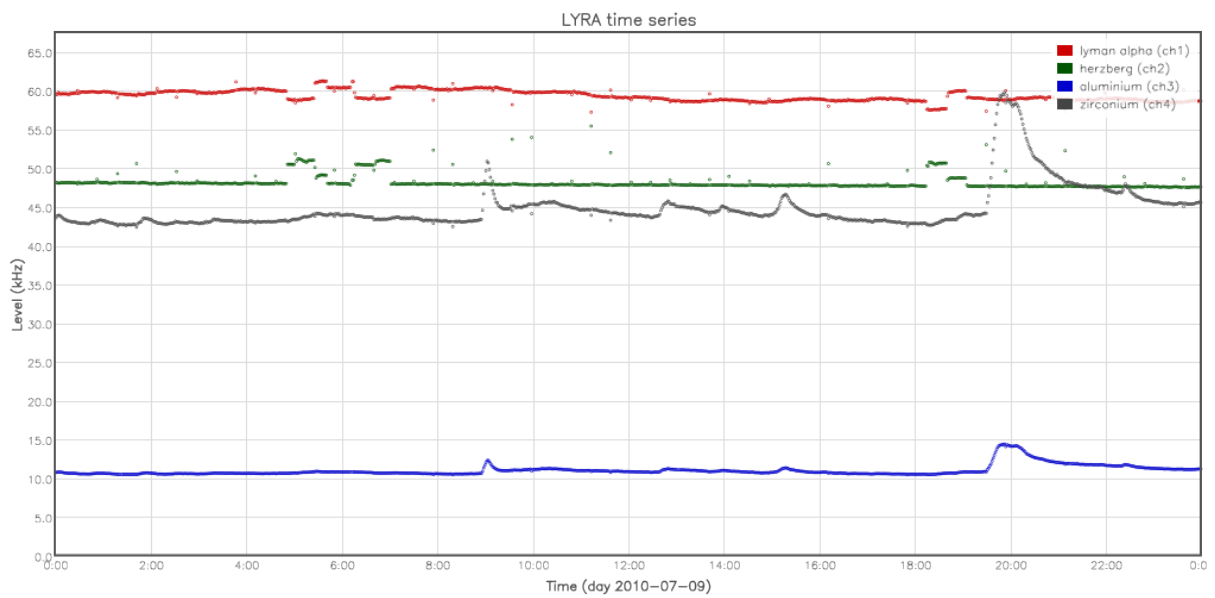
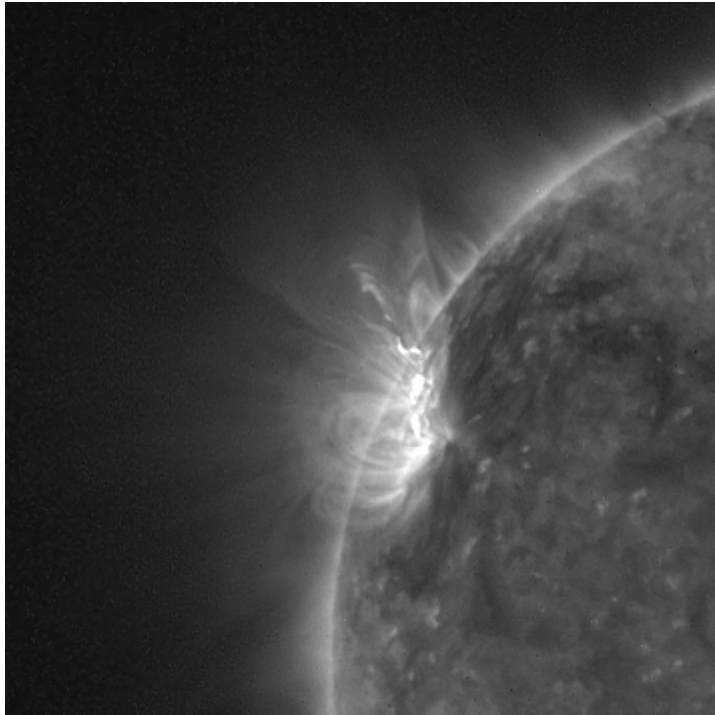
Three C flares happened during the week:

C1.2 on 2010/07/08 with its peak at 22:16 UTC. (N24E88)

C 1.8 on 2010/07/09 with its peak at 09:01 UTC. (N21E86)

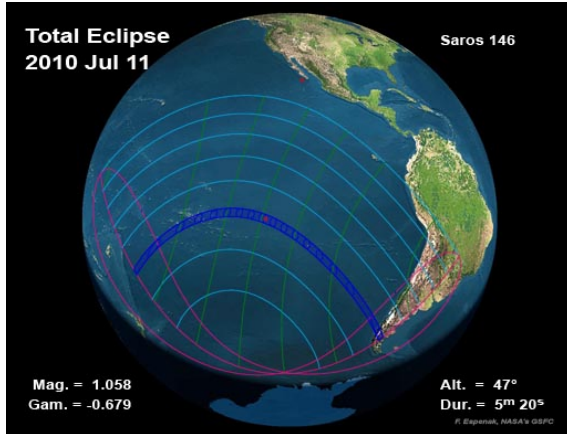
C 3.4 on 2010/07/09 with its peak at 19:51 UTC. (N22E76)

SWAP and LYRA saw all these flares. As an example, below we can see the C3.4 flare seen by LYRA and the associated eruption seen by SWAP.



July 11th eclipse

On Sunday, 2010 July 11, a total eclipse of the Sun was visible from within a narrow corridor that traverses Earth's southern Hemisphere. The path of the Moon's umbral shadow crossed the South Pacific Ocean where it made no landfall except for Mangaia (Cook Islands) and Easter Island (Isla de Pascua). The path of totality ended just after reaching southern Chile and Argentina. The Moon's penumbra shadow produced a partial eclipse visible from a much larger region covering the South Pacific and southern South America



The PROBA2 orbit fell outside the path of totality, so only a partial eclipse was seen – but it was still a valuable scientific opportunity. Occultations of the Sun by Moon as seen from PROBA2 happened during the following intervals:

Interval 0: Start time: 2010-07-11T17:23:23.772Z Stop time: 2010-07-11T17:35:00.138Z

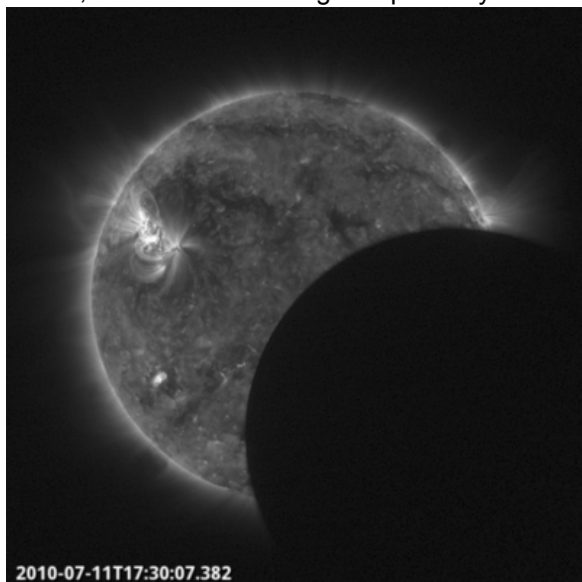
Interval 1: Start time: 2010-07-11T18:51:57.791Z Stop time: 2010-07-11T19:04:12.814Z

Interval 2: Start time: 2010-07-11T20:15:00.659Z Stop time: 2010-07-11T20:28:16.961Z

Interval 3: Start time: 2010-07-11T21:47:47.345Z Stop time: 2010-07-11T21:56:24.083Z

The SWAP telescope provided views of the fine structures of the Sun's corona at 17.4nm extreme ultraviolet (EUV) wavelength during the sun-moon transits.

Below, we can see an image acquired by SWAP during the first interval:

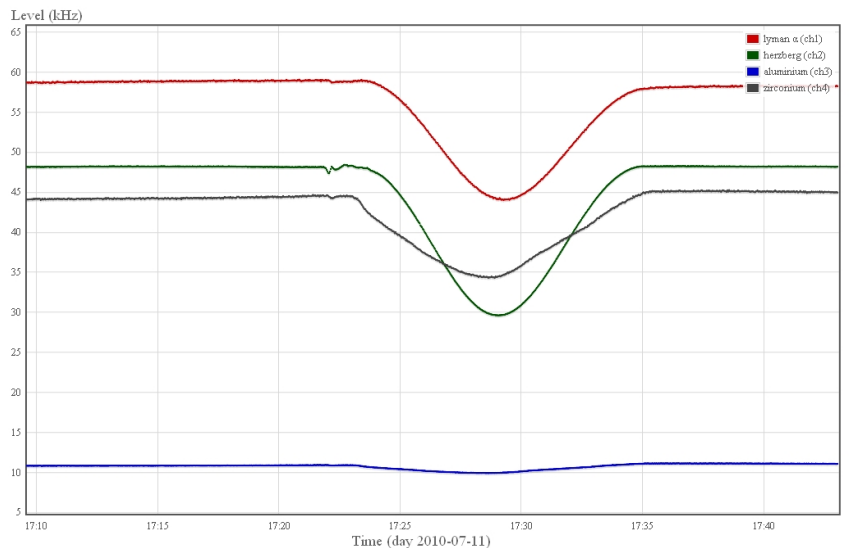


LYRA, gathered 'extinction curves' as the Moon gradually obscured the Sun.

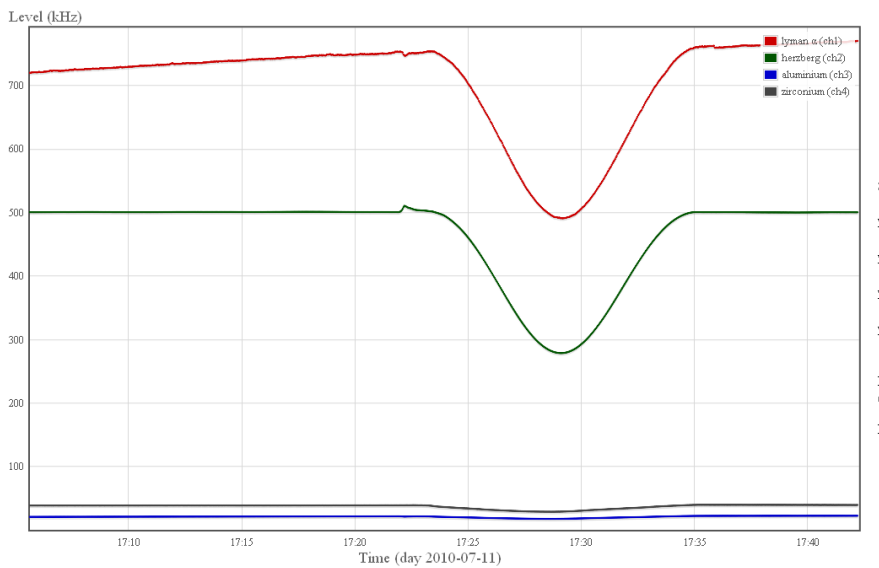
With the LYRA outcome, we can study how the light is distributed, and how the signal changes as we approach the Sun's edge.

Below, we can see an example for the expected v-shaped curves of the first transit:

Unit 2



Unit 1 (backup unit):



Scientific campaigns

1. Campaign to calculate the pixel variability from image to image.

Period1: 5 July 2010 from 03:59 to 04:53 UTC

Period2: 6 July 2010 from 03:30 to 06:24 UTC

Intentions: studying how the variability in a pixel from image to image depends on the average intensity in that pixel. To study variability, quick sequences (quick such that temperature variations are minimized, ~50 images) were needed. Images with different integration times were required to get different values of average intensity.

Overview of acquired images:

During the first period, 6 groups of 50 images were acquired:

- IT=1s , AT=10s, LED A on, off point 3 degree
- IT=2s , AT=10s, LED A on, off point 3 degree
- IT=3s , AT=10s, LED A on, off point 3 degree

- IT=1s , AT=10s, LED B on, off point 3 degree
- IT=2s , AT=10s, LED B on, off point 3 degree
- IT=3s , AT=10s, LED B on, off point 3 degree

During the second period, 5 groups of 50 images were acquired:

- IT=1s , AT=10s, off point 3 degree
- IT=2s , AT=20s, off point 3 degree
- IT=10s , AT=20s, off point 3 degree
- IT=30s , AT=60s, off point 3 degree
- IT=30s , AT=120s, off point 3 degree

IOS: SWAP_IOS00132 and SWAP_IOS00134 (overwriting IOS00133) handled this campaign.

Asked by: Katrien Bonte

2. Campaign to support HOP 165

Period: 4 different periods of 50 minutes between 2010/07/08 and 2010/07/10.

Intentions: study of quasi-stationary flows from Active Regions which are seen as “rays” and are stable for at least several hours (HOP 165). During each window of HOP 165, 50 images at 30s cadence were acquired to have reasonable S/N.

Overview of acquired images:

- From 2010/07/08 17:43:30 - 2010/07/08 18:33:30 (50 minutes, 100 images, IT=10, cadence = 30s)
- From 2010/07/09 04:50:00 - 2010/07/09 05:40:00 (50 minutes, 100 images, IT=10, cadence = 30s)
- From 2010/07/09 06:10:00 - 2010/07/09 07:00:00 (50 minutes, 100 images, IT=10, cadence = 30s)
- From 2010/07/09 18:13:30 - 2010/07/09 19:03:30 (50 minutes, 100 images, IT=10, cadence = 30s)
- From 2010/07/10 06:40:00 - 2010/07/10 07:30:00 (50 minutes, 100 images, IT=10, cadence = 30s)

IOS: SWAP_IOS00135

Asked by: Vladimir Slemzin

3. Campaigns to study the July 11th eclipse

SWAP’s observations were coordinated as part of a larger international scientific campaign. Astronomers will combine SWAP images with observations from the ground as well as images from other satellites such as Japan’s Hinode and NASA’s Solar Dynamics Observatory. Four campaigns took place during the eclipse.

3.1: Reconstruction of inner solar corona

Period1: 2010/07/11 from 03:00:00 to 06:15:00 UTC

Period2: 2010/07/11 from 04:20:00 to 06:00:00 UTC

Period3: 2010/07/11 from 11:47:00 to 15:30:00 UTC

Intentions: Creation of a mosaic with the Sun in the four different quadrants.

Overview of acquired images:

During Period1 and Period3 about 360 images were acquired respectively (90 images per each offpoint), with 10 seconds of integration time. The images were separated 30 seconds apart to avoid too much temperature differences. During this campaign LAR’s were jumped over and South Atlantic Anomalies periods were skipped.

During Period 2 a full orbit of dark acquisitions skipping SAA effects were acquired to calibrate the offpointing campaigns of Period1 and Period3. A total of 50 unprocessed images were generated.

IOS: It was part of SWAP_IOS00136-IOS0039

Asked by: Vladimir Slemzin

3.2: Continuous observing during eclipse.

Period: 2010/07/11 from 17:00:00 to 22:15:00 UTC

Intentions: Creation of a movie during the eclipse period.

Overview of acquired images:

5 hours 15 minutes of imaging at 1 minute cadence produced a total of 315 images.

This images were interleaved with campaigns 3.3 and 3.4 (during sun-moon transits), meaning that during this period the cadence was 30 seconds.

IOS: It was part of SWAP_IOS00136-IOS0039

Asked by: ROB team

3.3 : Stray light measurement

Period1: 8 minutes before and 8 minutes after the Moon-Sun transit Interval 0 (17:23 ... 17:35 UTC)

Period2: 8 minutes before and 8 minutes after the Moon-Sun transit Interval 1 (18:51 ...19:04

UTC) Period3: 8 minutes before the Moon-Sun transit Interval 2 (20:15 ... 20:28 UTC)

Period4: 8 minutes before and 8 minutes after the Moon-Sun transit Interval 3 (21:47 ... 21:56 UTC)

Intentions: Observe the moon in the off-limb part of the FOV before and after the lunar transits for stray light measurements.

Overview of acquired images:

The cadence was 1 minute (interleaved with campaign 2) and the integration time 20 seconds.

The image processing was based on JPEG compression and recoding [0-1300].

With the assumptions above, 62 images were acquired $(8+10)+(8+0)+(8+10)+(8+9)$.

IOS: It was part of SWAP_IOS00136-IOS0039

Asked by: Dan Seaton

3.4 : Creation of in-flight model of telescope's point-spread-function

Period1: Moon-Sun transit Interval 0 on 2010/07/11 from 17:23 to 17:35 UTC.

Period2: Moon-Sun transit Interval 1 on 2010/07/11 from 18:51 to 19:04 UTC.

Period3: Moon-Sun transit Interval 2 on 2010/07/11 from 20:15 to 20:28 UTC.

Period4: Moon-Sun transit Interval 3 on 2010/07/11 from 21:47 to 21:56 UTC.

Intentions: Short exposure times (to reduce the smearing caused by the lunar motion relative to SWAP) during the moon transits to get an in-flight model of the telescope's point-spread-function.

For this it is required to extract an intensity profile across the lunar limb:

Overview of acquired images:

7 unprocessed images were acquired per interval:

- 2 images with the moon and the sun disks tangential for the cross-limb profile-fitting.
- 5 images when moon and sun aligned to reduce the introduction of artifacts for solar EUV ((i.e., loops, bright points, coronal holes).)

Asked by: Shaun Bloomfield

Outreach, papers, presentations, etc.

The AOGS 2010 conference (Asia Oceania Geosciences Society) took place in Hiderrabad, India from 5th to 9th July. David Berghmans was invited to give a talk about SWAP and to present a poster of the General Investigator program.

July 11th eclipse outreach.

- Bogan Nicula created a very nice simulatoin of the Moon-Sun transits. It can be watched here: http://proba2.nicula.net/eclipse_2010-07-11_predict.mov

- ROB: <http://proba2.sidc.be/Events/2010-07-11-solarEclipse/> directory contains all the SWAP pictures

and movies related to the July 11 2010 eclipse.

- ESA web page http://www.esa.int/SPECIALS/Technology/SEMVDJZOFBG_0.html showed how the different payload onboard PROBA2 (SWAP, LYRA, DSLP and TPMU) observed the eclipse.

To be explored

2. LYRA instrument status

Calibration

IOS & operations

On Wednesday 07 2010, LYRA carried out the usual Calibration campaign. Results are being studied.

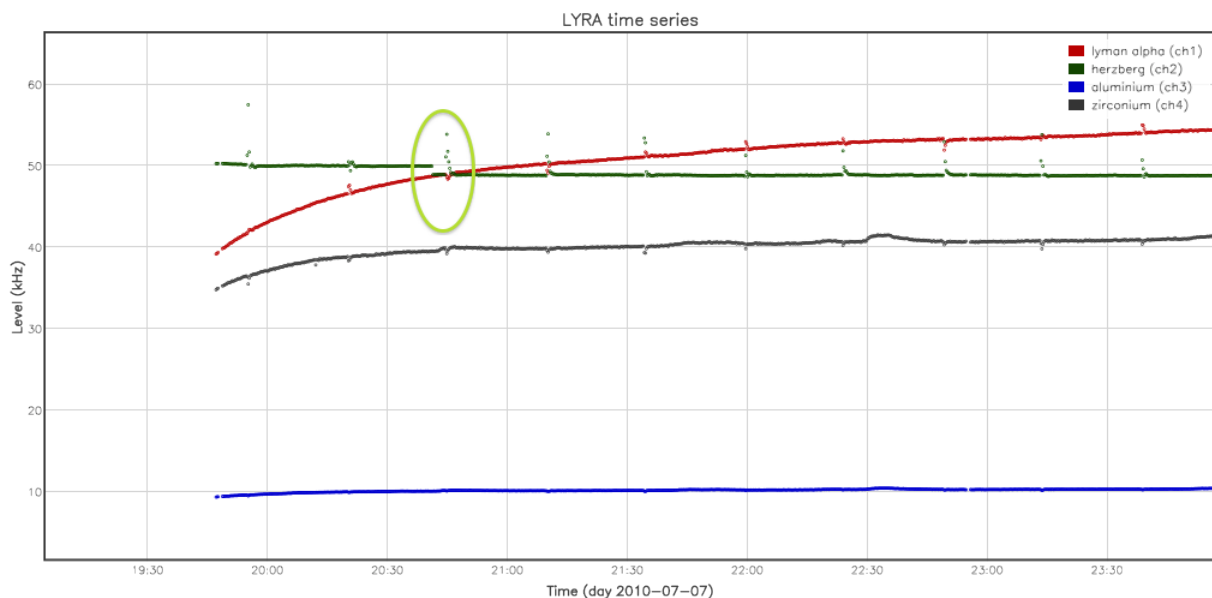
On Sunday 11 2010, LYRA performed a campaign which covered the eclipse period from 00:00 to 22:20 UTC :

- Attempt to reduce the time needed to stabilize the MSM detectors with using UV LEDs
- Acquisition with units 2 and 1 during the first transit in the eclipse region
- Acquisition with unit 2 and dark current of unit 1 during the second transit in the eclipse region
- Acquisition with units 2 and 3 during the third transit in the eclipse region
- Acquisition with unit 2 and dark current of unit 3 during the fourth transit in the eclipse region

This campaign was commanded via LYRA_IOS00073.

LYRA anomalies

After the calibration, there was again an unexplained jump in Herzberg signal.



To be explored

From time to time, the Data Consistency and Validation Checker (DCVC) reports a warning that the value of the HK parameter "LY HK22 FS" goes out of limit, i.e. it goes beyond the allowed interval 60621+-15

3. SWAP instrument status

MCPM recoverable errors

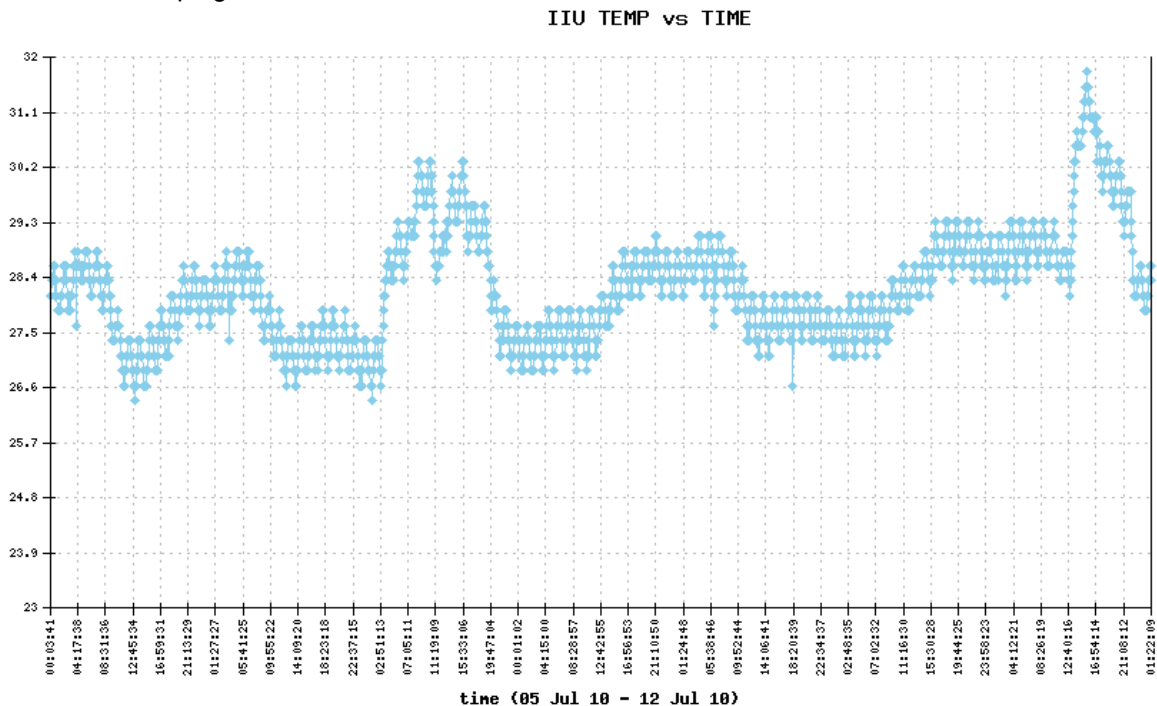
The number of MCPM recoverable errors did not increase. It remained fixed at 189 images.
The number of MCPM unrecoverable errors is still 0.

IOS & operations

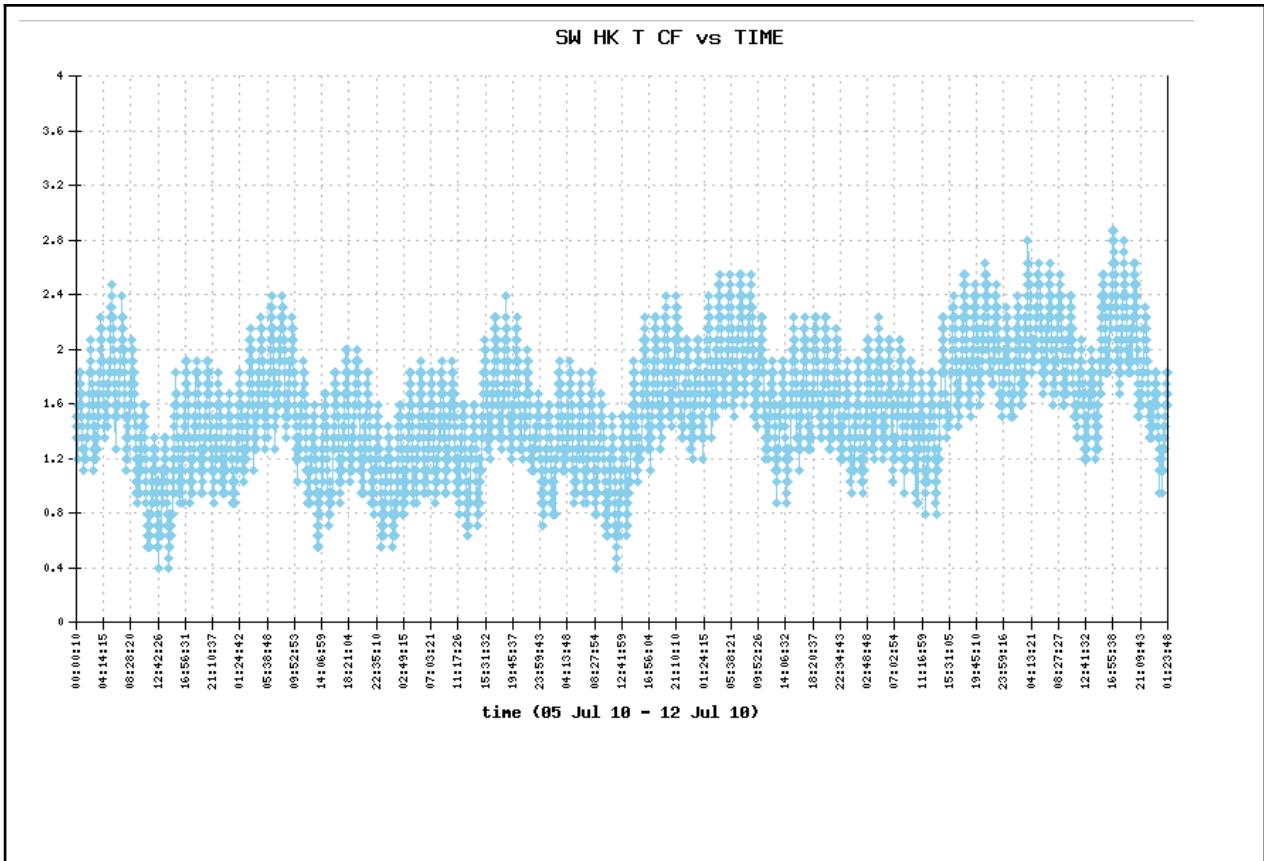
Several IOSs were sent out this week to carry out the different required campaigns:
To see what IOS was used to command each campaign, please see the *Science, Scientific Campaigns* section.

SWAP detector and IIU temperature

A LYRA calibration campaign took place on Wednesday from 00:00 to 19:47. The IIU temperature showed a bump as usual during this campaign.
On July 11th, around 15:50 the IIU temperature increased violently. It was produced another time due to a LYRA campaign where the heaters were set on.



SWAP detector temperature remained fix during the week, increasing slightly during the weekend, presumably due to the parallel campaigns of other instruments .



4. PROBA2 Science Center Status

Carlos Cabanas was operator during this week.

The LYRA EDG was operated manually. SWAP daily movies were also created manually.

The following tools were updated on the operational server:

- All operator scripts were put in the repository (r3406). They can now be found in /P2SC_repos/trunk/p2sc/bin/OPSWEB.
- A backup procedure for the development wiki (on sol042) and operator wiki (on p2wiki) was set in place.
- SWAP Planning Tool Interface was modified. An extra option was added so the operator can select the length of the IOS when launching the IOSwriter.
- The IOS writer was modified to be able to receive an extra input of the number of days to be included in the IOS.

5. Data reception & discussions with MOC

Passes Nominal
Data coverage HK Nominal
Data coverage SWAP

2010/07/05

- Pass 1728: 2 image numbers are missing.
- Pass 1703: it was missing at the beginning and then it was resent by Redu:
During the data processing of this file, 3 corrupted images were reported:
 - BINSWAP201007020126170000102425PROCESSED - JPEG data truncated: 65436 < 631743
 - BINSWAP201007020148170000102429PROCESSED - JPEG data truncated: 196476 < 638958
 - BINSWAP201007020259470000102442PROCESSED -JPEG data truncated: 196476 < 638958
- Pass 1734: 1 image number is missing.
- Pass 1735: 1 image number is missing in & one image was corrupted:
 - BINSWAP201007050543220000105079PROCESSED - JPEG data truncated: 65436 < 644772

2010/07/06

- Pass 1737: 7 image numbers are missing in & 1 image was corrupted:
 - BINSWAP201007051145220000105296PROCESSED - JPEG data truncated: 261996 < 633922
- Pass 1738: 1 image number is missing in & 1 image was corrupted:
 - BINSWAP201007060330450000105310PROCESSED - Uncompressed image data shorter than expected: 851680 < 1572864

2010/07/07

- Pass 1745: 1 image number missing in & 2 corrupted images:
 - BINSWAP201007060809130000105588PROCESSED - JPEG data truncated: 589596 < 642576
 - BINSWAP201007060821130000105590PROCESSED - Corrupted first packet
- Pass 1751: 3 images numbers are missing in.
 - BINSWAP201007071617160000106202PROCESSED - Packet CRC does not validate
 - BINSWAP201007071547160000106198PROCESSED - Packet CRC does not validate
 - BINSWAP_1751_RED3_2010.07.07T20.59.11.tar was copied to p2sc/MOC/redutop2sc/ failed/

2010/07/08

- Pass 1753: 7 images numbers are missing in.
 - BINSWAP201007070819140000106414PROCESSED - Packet CRC does not validate. Corrupted first packet
 - BINSWAP201007070901140000106421PROCESSED - Truncated packet: 11978 < 47386. Image content shorter than expected: 589600 < 636976
- Pass 1761: Images numbers are missing.
 - BINSWAP201007081745130000106994PROCESSED - Packet CRC does not validate
 - BINSWAP201007081756430000107017PROCESSED - Packet CRC does not validate

2010/07/09

- Pass 1763: 1 image number missing.

2010/07/10

Nominal

2010/07/11

Nominal

Data coverage LYRA

Nominal

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
DSLPL	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
IU	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