P2SC-ROB-WR-368 - 20170410 Weekly report #368	**P2SC Weekly report**	
Period covered: Date: Written by: Approved by:	Mon Apr 10 to Sun Apr 16, 2017 18 Apr 2017 Laurence Wauters Matthew West	Royal Observatory of Belgium - PROBA2 Science Center
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1. Science

Solar & Space weather events

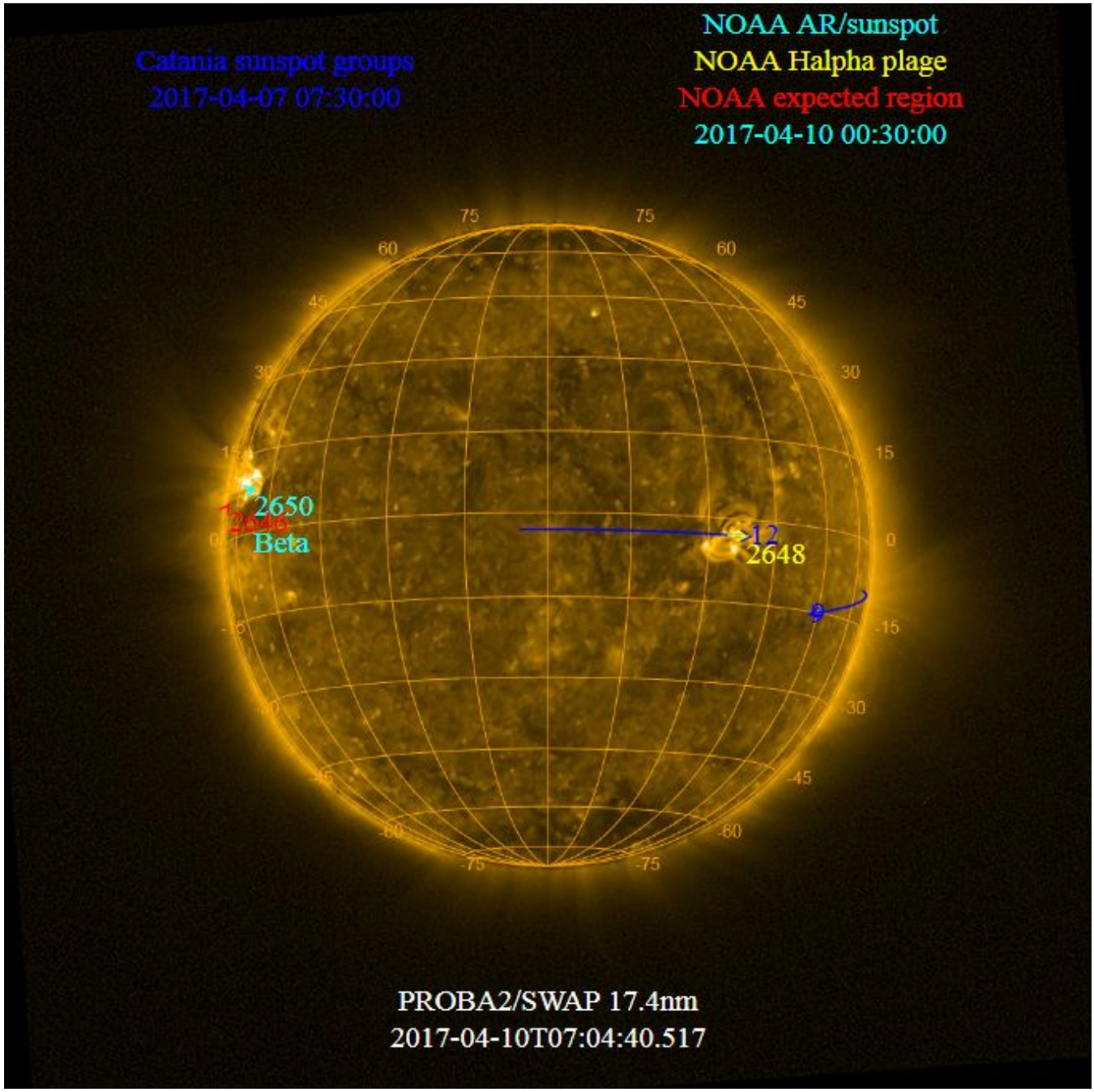
The level of solar activity[1] was **very low** this week.

Only M- and X-flares are mentioned, the most energetic one(s) per day are presented in **bold**:

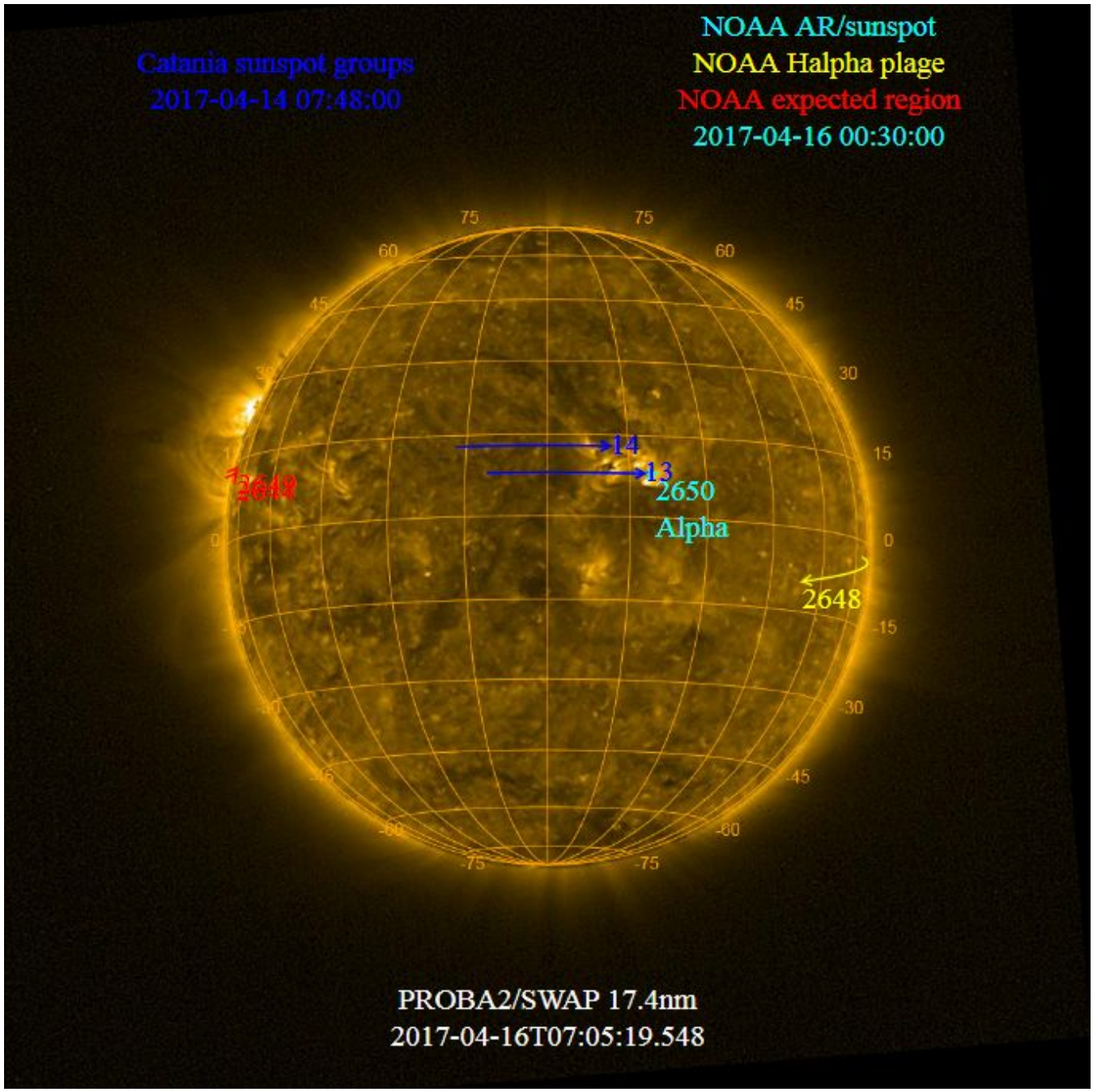
	Monday 10 Apr	Tuesday 11 Apr	Wednesday 12 Apr	Thursday 13 Apr	Friday 14 Apr	Saturday 15 Apr	Sunday 16 Apr
Activity	very low	very low	very low	very low	very low	very low	very low
Flares	-	-	-	-	-	-	-

[1] See appendix. All timings are given in UT.

The SWAP images of Apr 10 and Apr 16 are shown below, with annotated active regions.



http://sidc.be/soteria/soteria.php


Catania sunspot groups
2017-04-14 07:48:00
NOAA AR/sunspot
NOAA Halpha plage
NOAA expected region
2017-04-16 00:30:00
14
13
2650
Alpha
2648
2648
PROBA2/SWAP 17.4nm
2017-04-16T07:05:19.548

Solar Activity

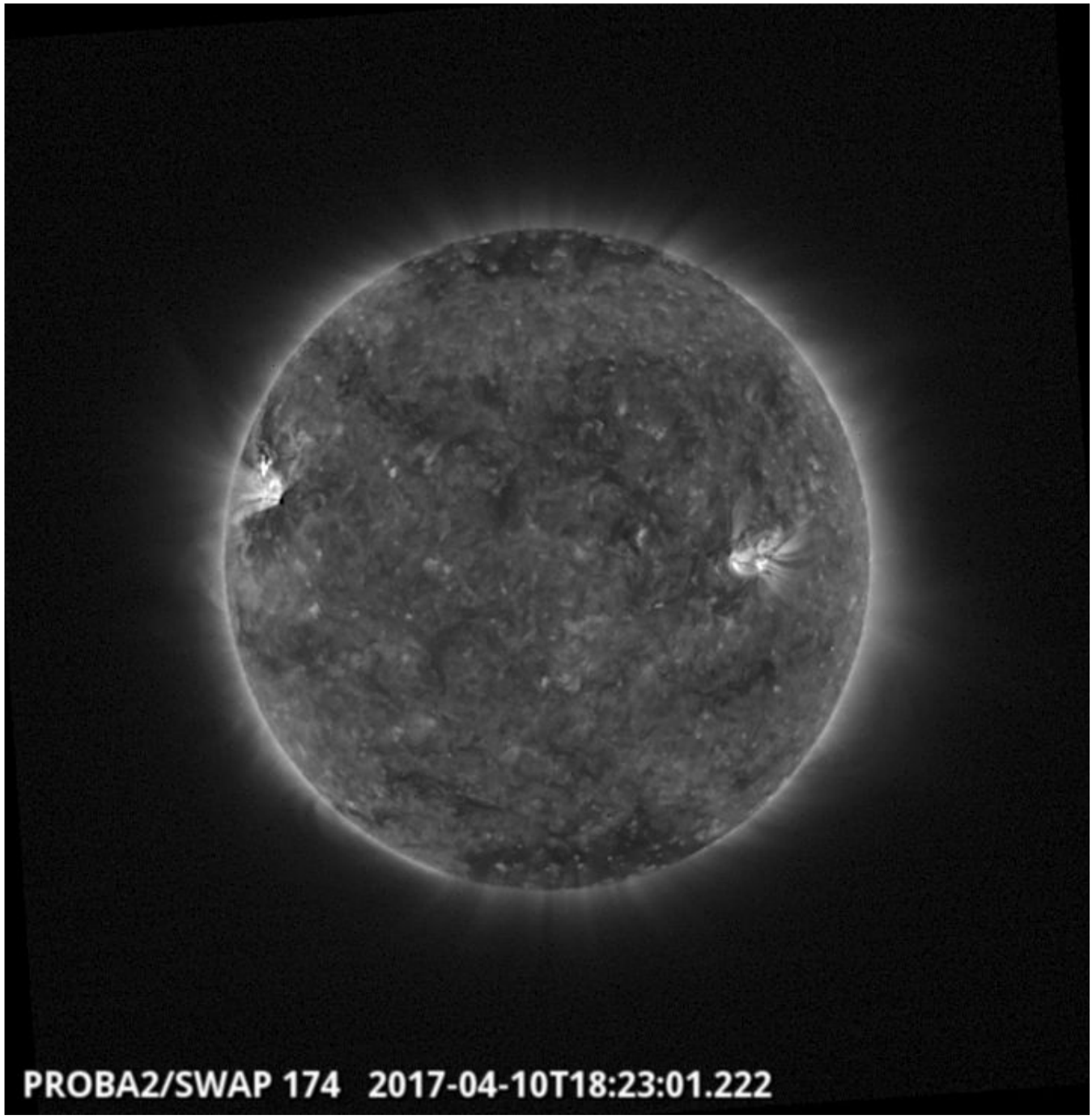
Solar flare activity was very low during the week.
In order to view the activity of this week in more detail, we suggest to go to the following website from which all the daily (normal and difference) movies can be accessed: http://proba2.oma.be/ssa
This page also lists the recorded flaring events.

A weekly overview movie can be found here (SWAP week 368).

Details about some of this week's events, can be found further below.

If any of the linked movies are unavailable they can be found in the P2SC movie repository here

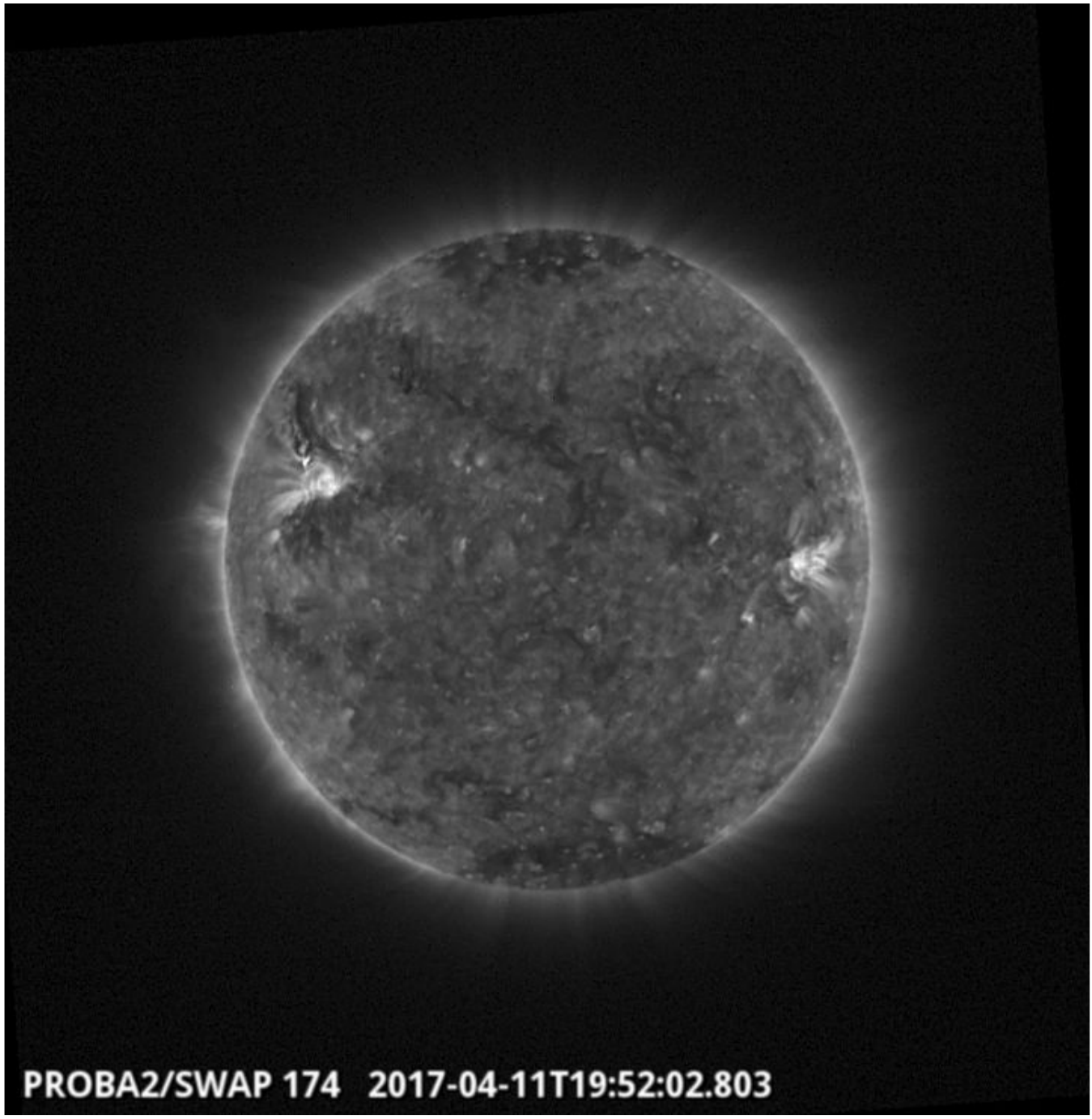
Monday Apr 10



The largest flare of the week was a B4.8 class flare, peaking at 18:23 UT on 2017-Apr-10 produced by the NOAA region 2650, which is visible in the North East Quadrant of the above SWAP image

Find a movie of the events **here** (SWAP movie)

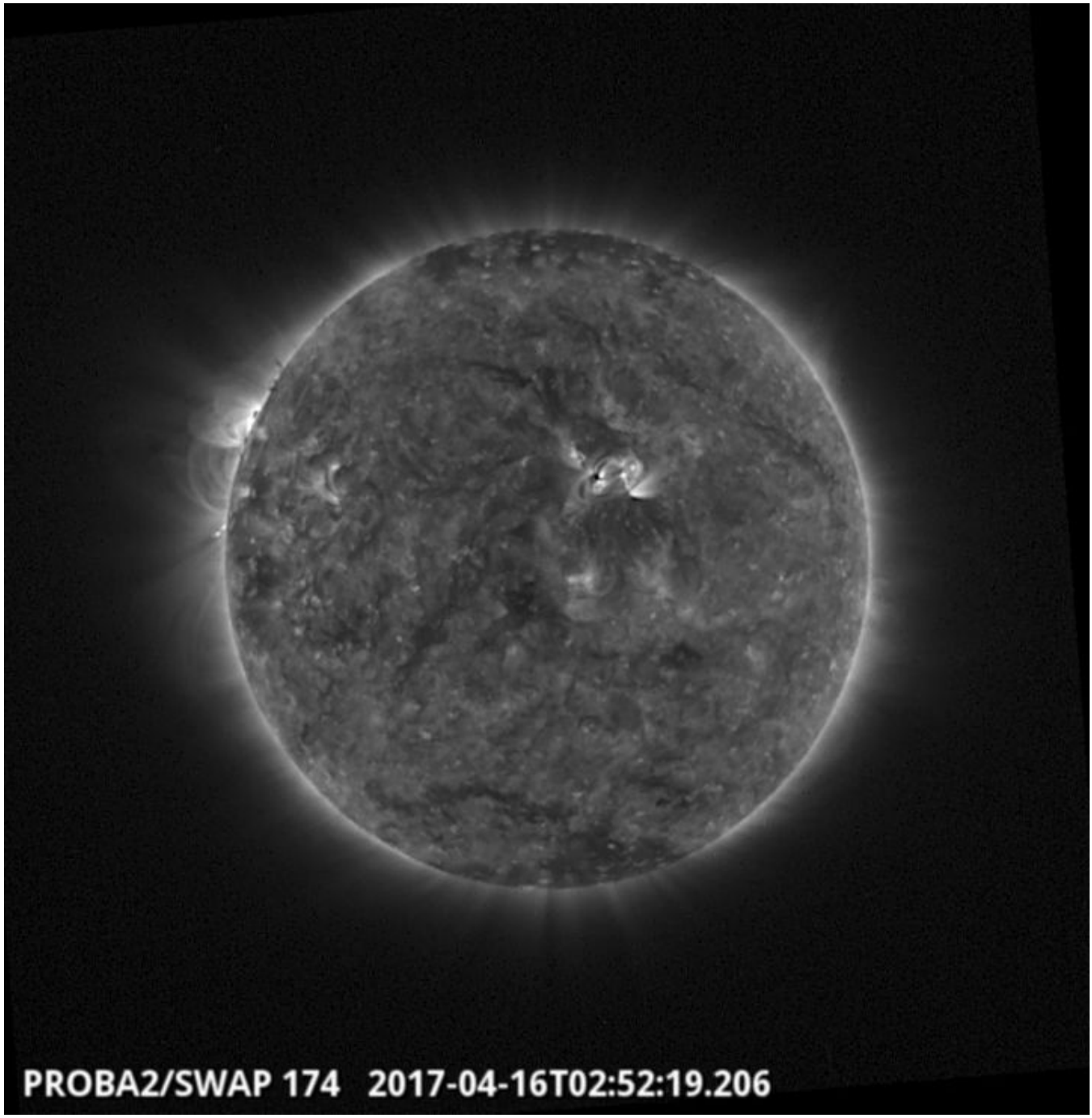
Tuesday Apr 11



A flare (B1.4 class) followed by a filament eruption was visible in the North East Quadrant of the Sun on 2017-Apr-11 - SWAP image

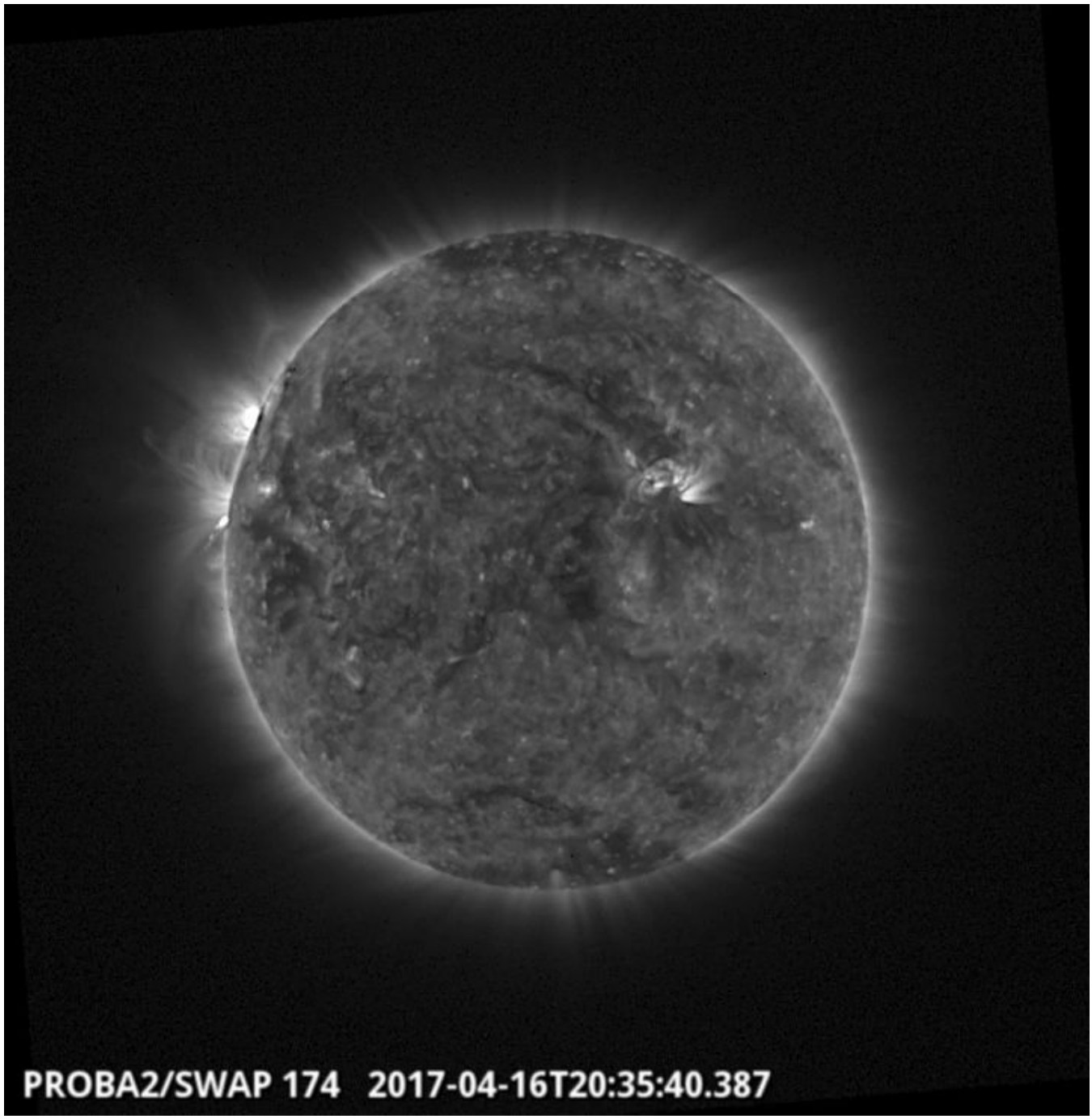
Find a movie of the events **here** (SWAP movie)

Sunday Apr 16



A bright flow associated with a CME was visible on the East Limb of the Sun at 02:52 UT on 2017-Apr-16 - SWAP image

Find a movie of the event **here** (SWAP movie)

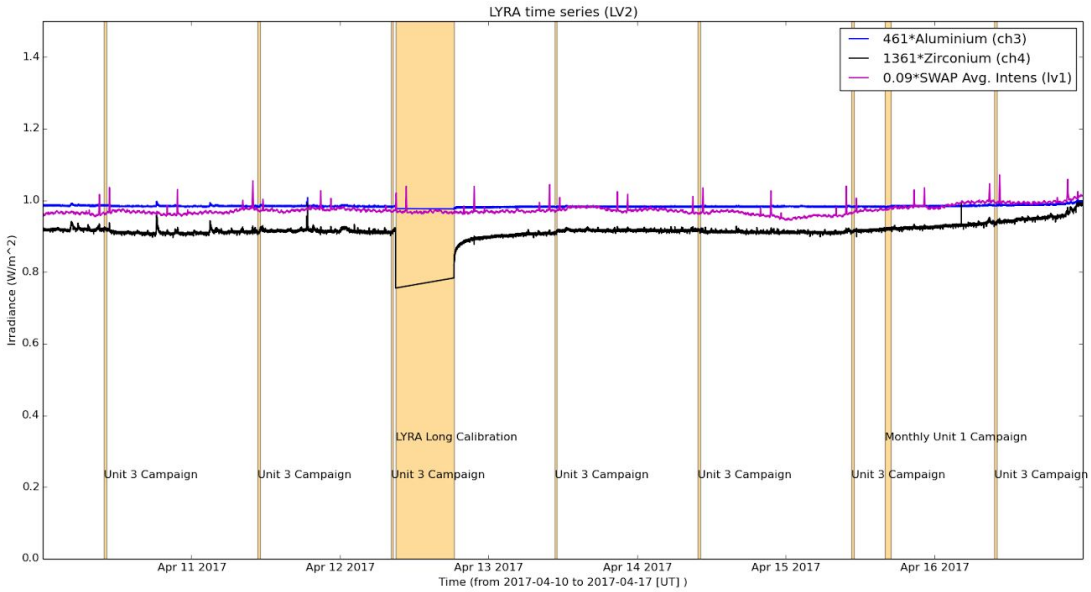


A bright flow erupted on the East Limb at 20:35 UT. It may be the return of NOAA 12644 that produced several M-class flares 2 weeks ago
- SWAP image

Find a movie of the event **here** (SWAP difference movie)

An overview of the weekly LYRA & SWAP data is provided below:
The following curves are visible:

- black: Zirconium Channel LYRA Unit 2
- blue: Aluminium Channel of LYRA Unit 2
- purple: SWAVINT (SWAP Average Intensity; integrated solar intensity per SWAP image pixel)



The blue shaded periods correspond to, from left to right:

- None

The orange shaded periods correspond to, from left to right:

- Daily Unit 3 campaign, 2017-04-10
- Daily Unit 3 campaign, 2017-04-11
- Daily Unit 3 campaign, 2017-04-12
- Long Calibration, 2017-04-12
- Daily Unit 3 campaign, 2017-04-13
- Daily Unit 3 campaign, 2017-04-14
- Daily Unit 3 campaign, 2017-04-15
- Monthly Unit 1 campaign, 2017-04-15
- Daily Unit 3 campaign, 2017-04-16

The red shaded period corresponds to:

- None

Outreach, papers, presentations, etc.

Please consult http://proba2.oma.be/science/publications for a list of interesting articles using SWAP & LYRA data, as well as a link to the complete article list.

The science section of this weekly report is also published in the weekly STCE newsletter (http://www.stce.be/newsletter/newsletter.php).

Hautesserres et al. published a paper titled "Intermediary LEO propagation including higher order zonal harmonics". Intermediary orbits provide approximate analytical solutions to the artificial satellite orbit problem. In this paper the authors propose two new analytical intermediary orbits. The analytical solutions include higher order effects of the Geopotential, and are obtained by means of a torsion transformation applied to the quasi-Keplerian system resulting after the elimination of the parallax simplification, for the first intermediary, and after the elimination of the parallax and perigee simplifications, for the second one. To test the performance of the analytical solutions the initial conditions corresponding to the orbital elements of several satellites including PROBA2 were used (See Table 1). The results were compared favourably to the satellites.

Guest Investigator Program

- None

2. LYRA instrument status

Calibration

Long calibration campaign on Wednesday this week.

IOS & operations

Monday 10 Apr	Tuesday 11 Apr	Wednesday 12 Apr	Thursday 13 Apr	Friday 14 Apr	Saturday 15 Apr	Sunday 16 Apr
Nominal acquisition + daily U3 LYIOS00611	Nominal acquisition + daily U3 LYIOS00612	Nominal acquisition + daily U3+ Long calibration LYIOS00612	Nominal acquisition + daily U3 LYIOS00612	Nominal acquisition + daily U3 LYIOS00612	Nominal acquisition + daily U3 + Monthly 1 campaign LYIOS00612	Nominal acquisition + daily U3 LYIOS00612

The following science campaigns were performed by LYRA:

From 2017-Apr-10 to 2017-Apr-16:
- daily U3 observations campaign

On 2017-Apr-12
- Long calibration

On 2017-Apr-15
- Monthly Unit 1 campaign

LYRA detector temperature

LYRA detector 2 temperature globally varied between 47.64 and 49.97 °C.

3. SWAP instrument status

Calibration

None

MCPM errors

The number of MCPM recoverable errors increased from 8360 and 8552.
The number of MCPM unrecoverable errors remained at 0.

IOS & operations

Monday 10 Apr	Tuesday 11 Apr	Wednesday 12 Apr	Thursday 13 Apr	Friday 14 Apr	Saturday 15 Apr	Sunday 16 Apr
Nominal acquisition IOS00699 703 images	Nominal acquisition IOS00699 687 images	Nominal acquisition IOS00699 706 images	Nominal acquisition IOS00700 701 images	Nominal acquisition IOS00700 710 images	Nominal acquisition IOS00700 690 images	Nominal acquisition IOS00700 650 images

Special operations for SWAP, this week:

- None

SWAP detector temperature

The SWAP Cold Finger Temperature globally varied between -1.05 and 0.07 °C.

4. PROBA2 Science Center Status

The main operator is Laurence Wauters.

The following changes were made to the P2SC:

- None.

5. Data reception & discussions with MOC

Passes

The delivery of the passes for this week (passes 23710 and 23774) was nominal, except for:

- None.

Data coverage HK

All HK data files (LYRA_AD) have been received, except:

- None.

Data coverage SWAP

All SWAP Science data files (BINSWAP) have been received, except:

- None.

Total number of images between 2017 Apr 10 00:00 UT and 2017 Apr 17 00:00 UT: 4900
Highest cadence in this period: 110 seconds
Average cadence in this period: 123.43 seconds
Number of image gaps larger than 300 seconds: 98
Largest data gap: 11.00 minutes

Data coverage LYRA

All LYRA Science data files (BINLYRA) have been received, except:

- None

6. APPENDIX: Frequently used acronyms

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
DAC	Data Acquisition Controller
DBR	Deployment, backup & recovery
DDA	Decommutated data archive
ESP	Experimental Solar Panel
FITS	Flexible Image Transport System
FOV	Field Of View FPA Focal Plane Assembly
FPGA	Field Programmable Gate Arrays
GPS	Global Positioning System
HK	Housekeeping
IOS	Instrument Operations Sheet
LED	Light Emitting Diode
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
OBSW	On board Software
PI	Principal Investigator
P2SC	PROBA2 Science Center
ROB	Royal Observatory of Belgium
SAA	South Atlantic Anomaly
SEU	Single Event Upset
SoFAST	Solar Feature Automated Search Tool
SWAP	Sun Watcher using APS detector and image Processing
SWAVINT	SWAP AVerage INTensity
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
TC	Telecommand
UTC	Coordinated Universal Time
UV	Ultraviolet
VFC	Voltage to Frequency Converter

7. APPENDIX Solar Activity Definitions

In the science section we use the following solar activity standards.

The standard scale for solar activity is:
- very low (almost no flares, only B)
- low (a few C flares)
- moderate (many C flares and at least an M flare)
- high (several M flares and an X flare)
- very high (continuous background of C flares, numerous M flares, more than one X flare)