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| P2SC-ROB-WR-338 - 20160912 Weekly report #338 | P2SC Weekly report |  |
| Period covered: Date: Written by: Approved by: | Mon Sept 12 to Sun Sept 18, 2016 21 Sept 2016 Laurence Wauters Matthew West | Royal Observatory of Belgium - PROBA2 Science Center |
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1. Science

Solar & Space weather events

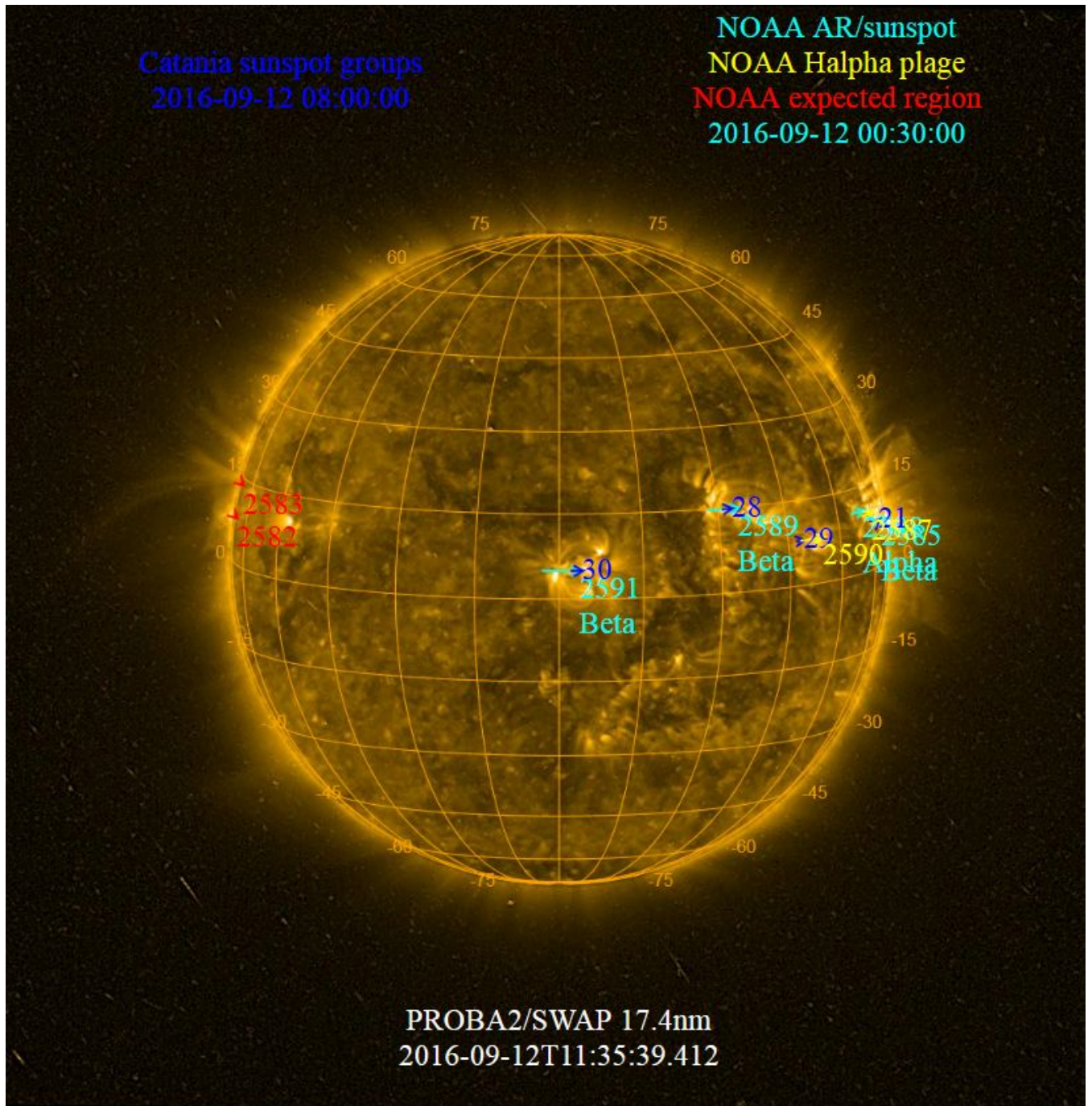
The level of solar activity¹ was **very low** this week.

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

| | Monday 12 Sept | Tuesday 13 Sept | Wednesday 14 Sept | Thursday 15 Sept | Friday 16 Sept | Saturday 17 Sept | Sunday 18 Sept |
|----------|-------------------|--------------------|----------------------|---------------------|-------------------|---------------------|-------------------|
| 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.

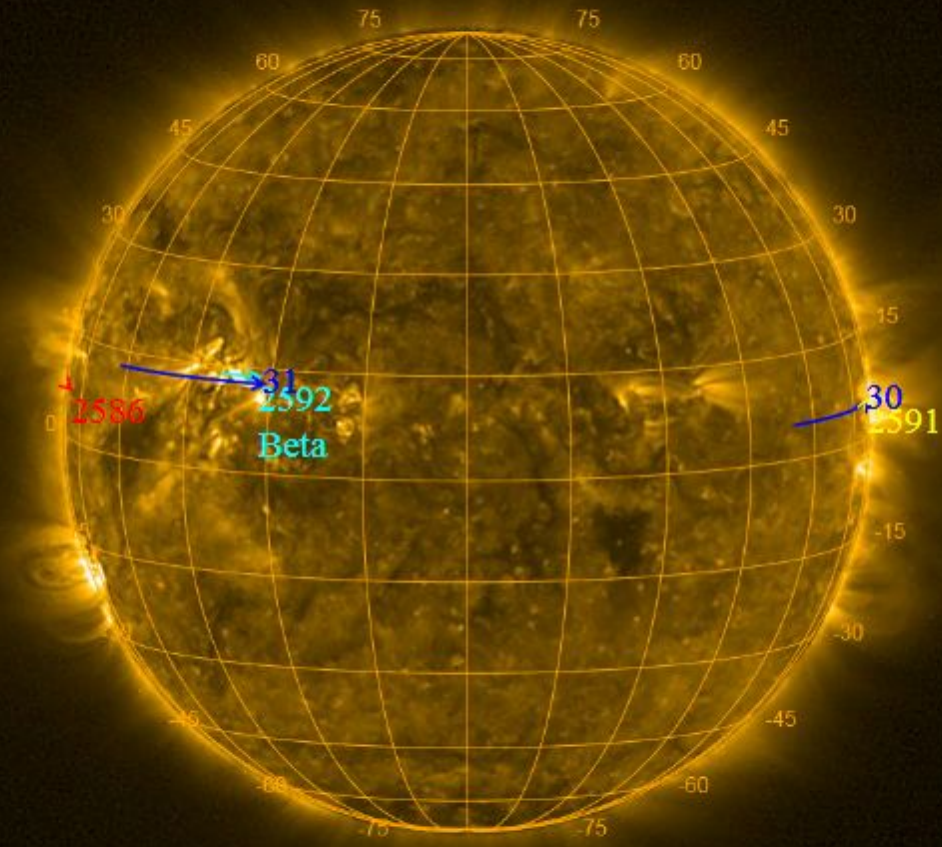
The SWAP images of Sept 12 and Sept 18 are shown below, with annotated active regions.



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

Catania sunspot groups
2016-09-16 09:00:00

NOAA AR/sunspot
NOAA Halpha plage
NOAA expected region
2016-09-18 00:30:00



PROBA2/SWAP 17.4nm
2016-09-18T11:41:48.486

Solar Activity

Solar flare activity fluctuated between quiet and 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>

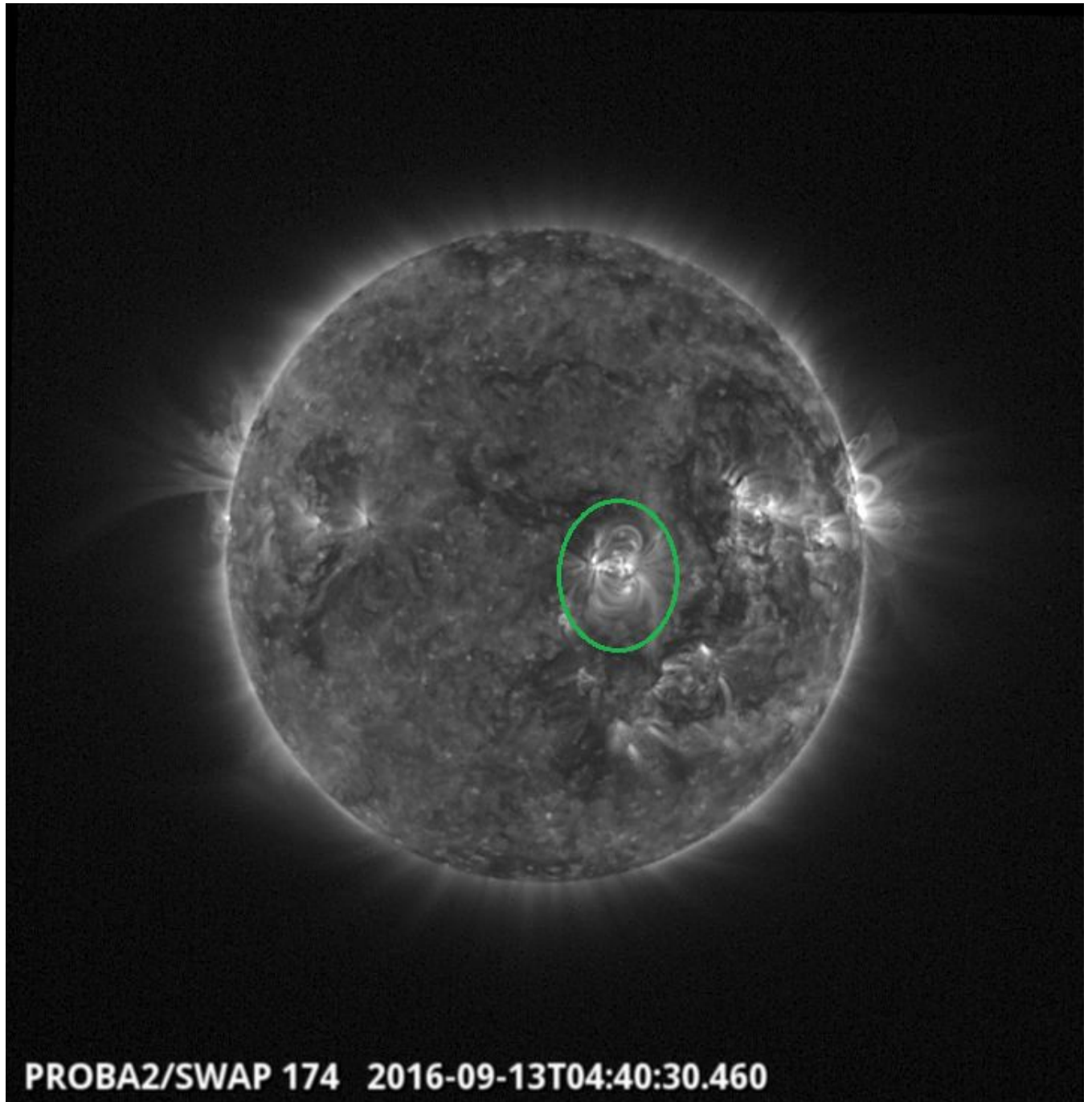
This page also lists the recorded flaring events.

A weekly overview movie can be found [here](#) (SWAP week 338).

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

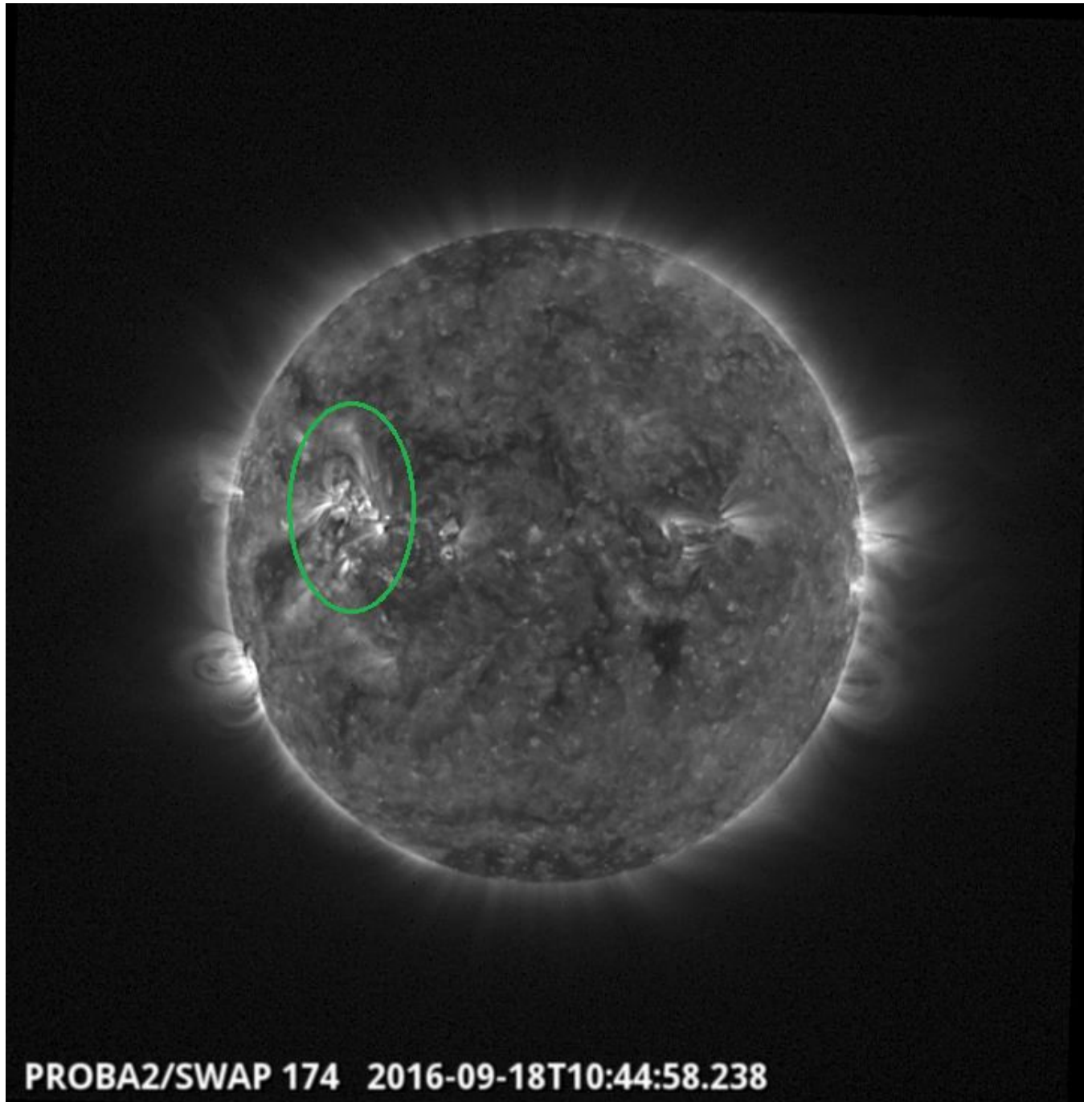
If any of the linked movies are unavailable they can be found in the P2SC movie repository [here](#)

Tuesday Sep 13



AR 2591, located close to the central meridian produced several B-class flares on 2016-Sep-13.
Find a movie of the AR [here](#) (SWAP movie)

Sunday Sep 18



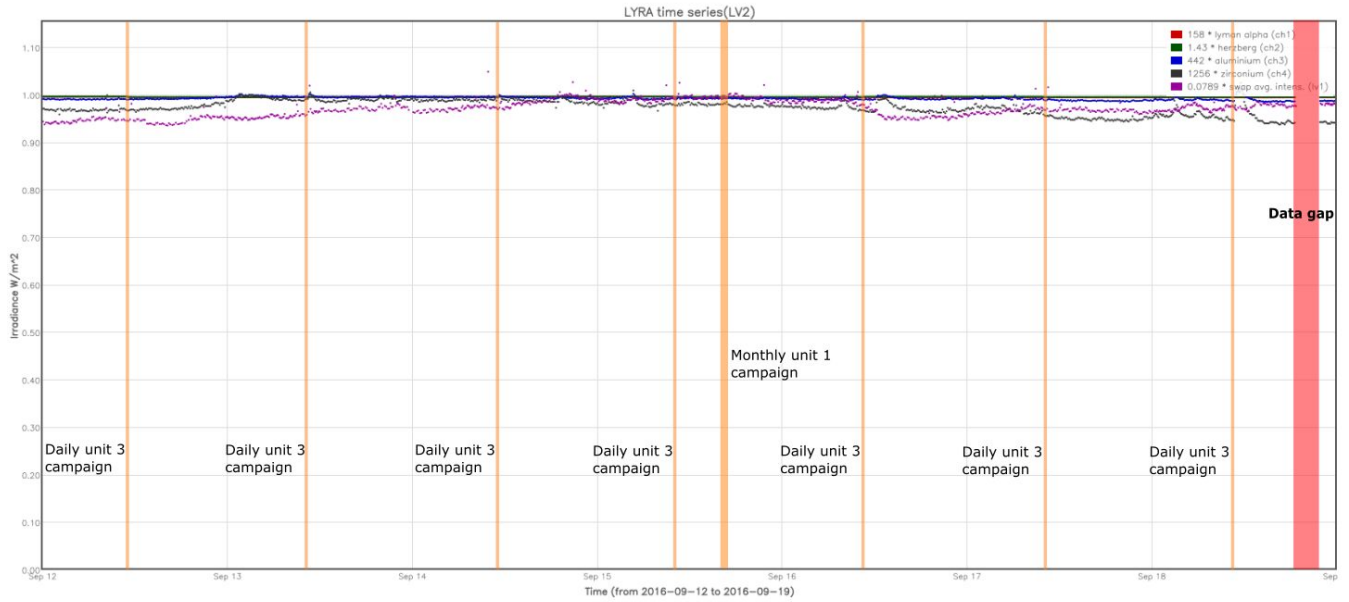
A B6.8 flare originated from AR 2592 located in the Eastern Hemisphere. The peak time was 11:00 UT.

Find a movie of the events [here](#) (SWAP 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, 2016-Sep-12
- Daily Unit 3 campaign, 2016-Sep-13
- Daily Unit 3 campaign, 2016-Sep-14
- Daily Unit 3 campaign, 2016-Sep-15
- Monthly Unit 1 campaign, 2016-Sep-15
- Daily Unit 3 campaign, 2016-Sep-16
- Daily Unit 3 campaign, 2016-Sep-17
- Daily Unit 3 campaign, 2016-Sep-18

The red shaded period corresponds to:

- Missing pass 21808: No data received between 2016-09-18 at 18:34:05 UT and 2016-09-18 at 21:42:10 UT.

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>).

Two papers were published recently:

Cid et al. published an article using SWAP observations in the Astrophysical Journal titled: "Redefining the boundaries of interplanetary coronal mass ejections from observations at the ecliptic plane". In this work Cid et al. studied an interplanetary coronal mass ejection (ICME) observed in-situ on 2015 Jan 6-7 and compared it to its associated CME component observed in AIA, LASCO and PROBA2 - SWAP observations. In particular they studied the boundary between an ICME and ambient solar wind. SWAP helped provide the kinematic study of the CME close to the Sun. Cid et al. found that compositional signatures are precise diagnostic tools for the boundaries of ICMEs, especially the Oxygen ratio which indicates how well the stream interface has been conserved between plasmas of different composition during the transit from the Sun to 1 AU.

Hayes et al published a paper titled "Quasi-periodic Pulsations during the Impulsive and Decay phases of an X-class Flare". In this work Hayes focus on the character of the fine structure pulsations evident in the soft X-ray (SXR) time derivatives and compare this variability with the structure across multiple wavelengths including hard X-ray and microwave emission. Hayes et al. used LYRA and GOES observations to study the nature of the QPPs together with RHESSI observations in the X1.0 flare of 2013 October 28, where they detected and analyzed pulsations observed at multiple wavelengths. Throughout the impulsive phase of the flare, highly correlated common features are observed at HXR, SXR, and microwave wavelengths with minimal time delay between peaks. After the highly correlated impulsive phase, they find that emission in the non-thermal channels is no longer present. It is not known what controls the timescale of the observed pulsations. The timescale of the QPPs is consistent with expected characteristic timescales of MHD modes in the corona.

Guest Investigator Program

- None

2. LYRA instrument status

Calibration

No Calibration campaign during this week.

IOS & operations

| Monday 12 Sep | Tuesday 13 Sep | Wednesday 14 Sep | Thursday 15 Sep | Friday 16 Sep | Saturday 17 Sep | Sunday 18 Sep |
|--------------------------------|--------------------------------|--------------------------------|---|--------------------------------|--------------------------------|--------------------------------|
| Nominal acquisition + daily U3 | Nominal acquisition + daily U3 | Nominal acquisition + daily U3 | Nominal acquisition + daily U3 + Monthly U1 | Nominal acquisition + daily U3 | Nominal acquisition + daily U3 | Nominal acquisition + daily U3 |
| LYIOS00578 | LYIOS00578 | LYIOS00578 | LYIOS00578 | LYIOS00579 | LYIOS00579 | LYIOS00579 |

The following science campaigns were performed by LYRA:

- daily U3 observations campaign
- Monthly U1 campaign

LYRA detector temperature

LYRA detector 2 temperature globally varied between 48.56776 49.96848 °C.

3. SWAP instrument status

Calibration

No Calibration campaign during this week.

MCPM errors

The number of MCPM recoverable errors increased from 3663 to 3701 .

The number of MCPM unrecoverable errors remained at 0.

IOS & operations

| Monday 12 Sep | Tuesday 13 Sep | Wednesday 14 Sep | Thursday 15 Sep | Friday 16 Sep | Saturday 17 Sep | Sunday 18 Sep |
|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Nominal acquisition | Nominal acquisition | Nominal acquisition | Nominal acquisition | Nominal acquisition | Nominal acquisition | Nominal acquisition |
| IOS00659 571 images | IOS00659 590 images | IOS00659 612 images | IOS00659 672 images | IOS00660 647 images | IOS00660 692 images | IOS00660 513 images |

Special operations for SWAP, this week:

- None

SWAP detector temperature

The SWAP Cold Finger Temperature globally varied between -0.72999 to 0.230005 °C.

4. PROBA2 Science Center Status

The main operator is Robbe Vansintjan.

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 21739 to 21808) was nominal, except for:

- Pass 21808

Data coverage HK

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

- Receive twice for Pass 21808. Pass 21808 has been lost.

Data coverage SWAP

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

- Pass 21808 has been lost.

Total number of images between 2016 Sep 12 0UT and 2016 Sep 19 0UT: 4277

Highest cadence in this period: 110 seconds

Average cadence in this period: 141.38 seconds

Number of image gaps larger than 300 seconds: 202

Largest data gap: 139.33 minutes

Data coverage LYRA

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

- Pass 21808 has been lost.

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)