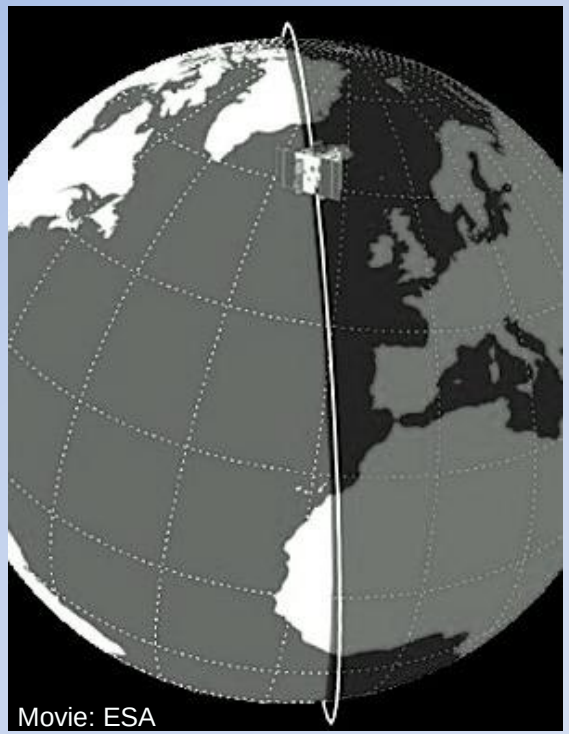
PROBA2 a Space Weather Monitor

Matthew J West

ESWW10 - Nov 2013

PROBA2



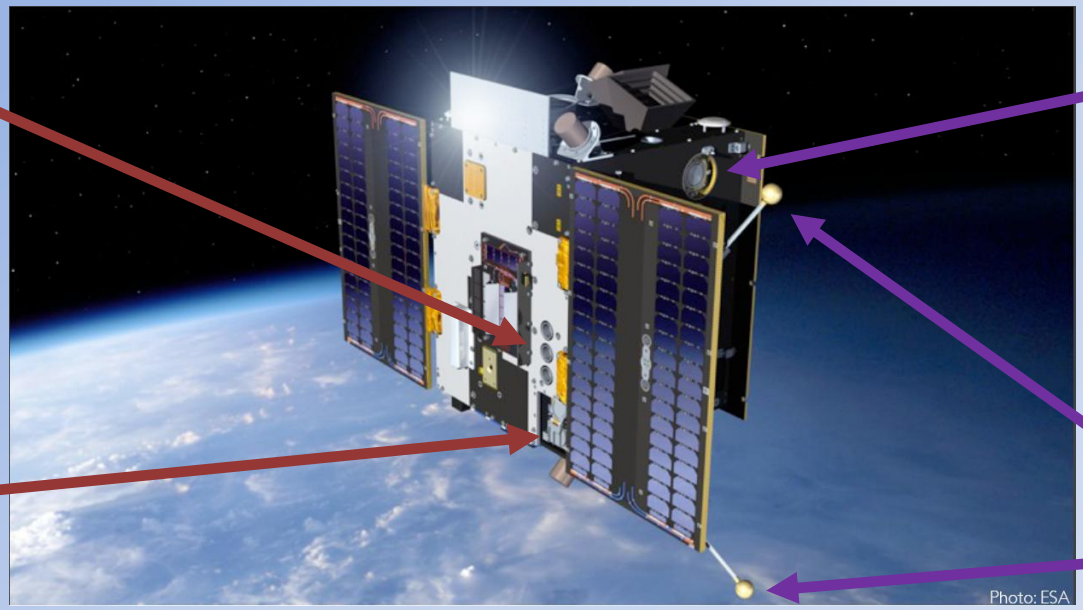
- Microsatellite in sun-synchronous orbit
- Launched on November 2, 2009
- 725 km altitude ☀ Period: ≈100 min
- Commanding and data processing at P2SC (ROB, Brussels).
- Funded by ESA / SSA

PROBA2 - 4 innovative instruments

PROBA2 originally an ESA technology mission.
Currently a scientific instrument and space weather tool.

Large Yield Radiometer (**LYRA**)

Sun Watcher using APS & Image Processing (**SWAP**, an EUV imager)



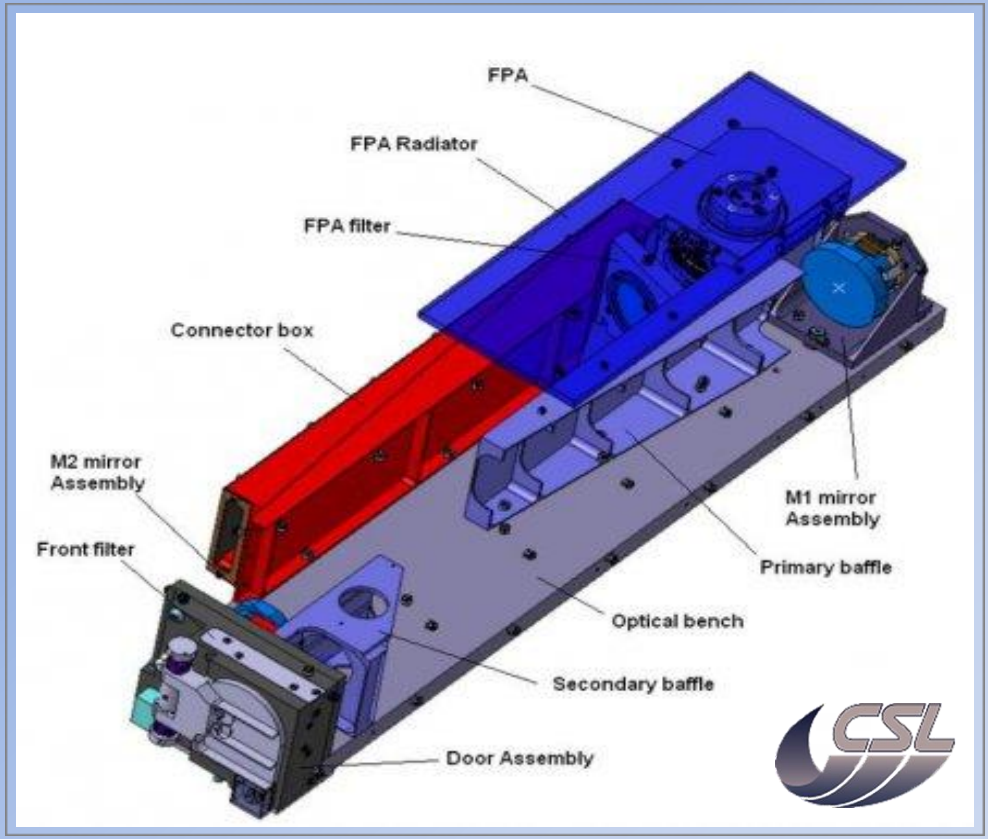
Thermal Plasma Measurement Unit (**TPMU**)

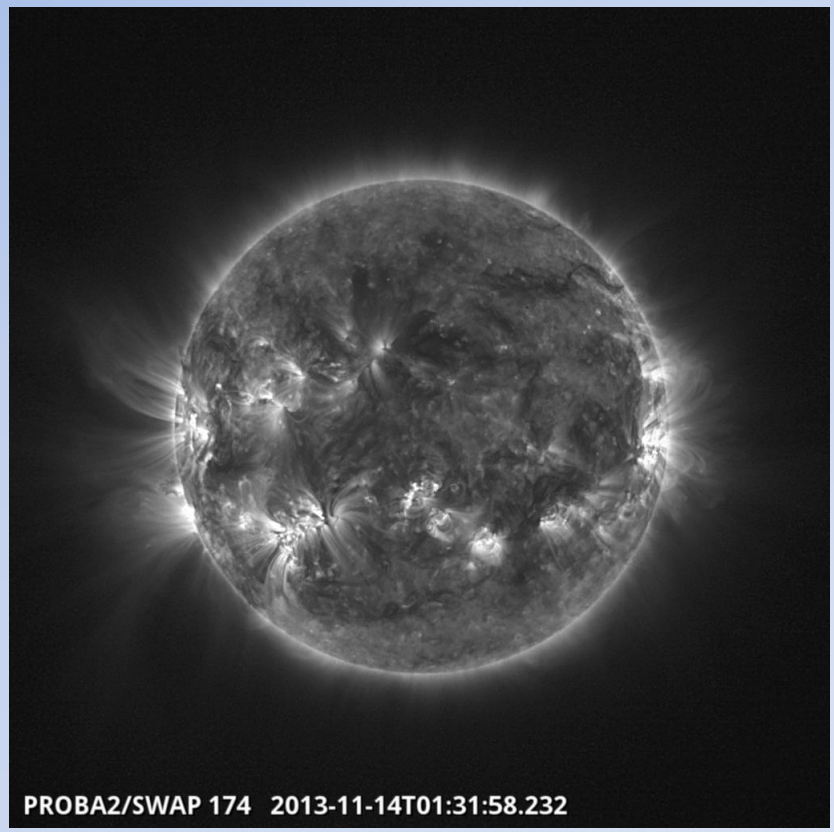
The Dual segmented Langmuir probe (**DSLP**)

Two particle detectors to monitor the plasma environment of the spacecraft.

Two instruments to monitor solar activity – operated from P2SC Belgium

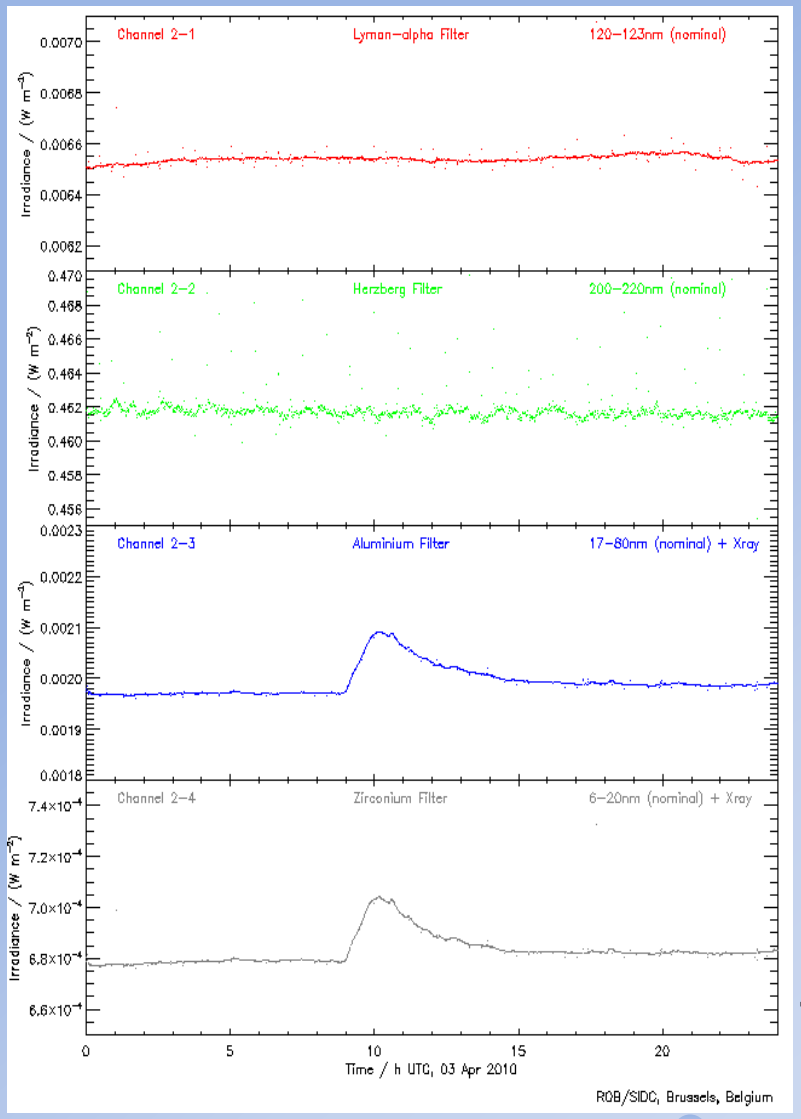
SWAP – EUV Imager





- Exercise in miniaturization: off-axis Ritchey-Chrétien scheme.
- Observes the 1 million degree corona in EUV light

LYRA – Large Yield Radiometer



LYRA monitors the solar irradiance in four UV pass-bands.

Chosen for their relevance to solar physics, aeronomy and Space Weather:

- **Lyman-α** channel (120-123 nm)
- **Herzberg continuum** channel (190-222 nm)
- **Aluminium filter** channel (17-80 nm + a contribution below 5 nm), including strong He II at 30.4 nm
- **Zirconium filter** channel (6-20 nm + a contribution below 2 nm), rejecting He II.

Providing time series of solar irradiance with a very high sampling cadence (up to 100 Hz).

The wavelengths are complimentary to GOES/EUVS, SDO/EVE, SOHO/SEM etc.

PROBA2 as a Space Weather Monitor

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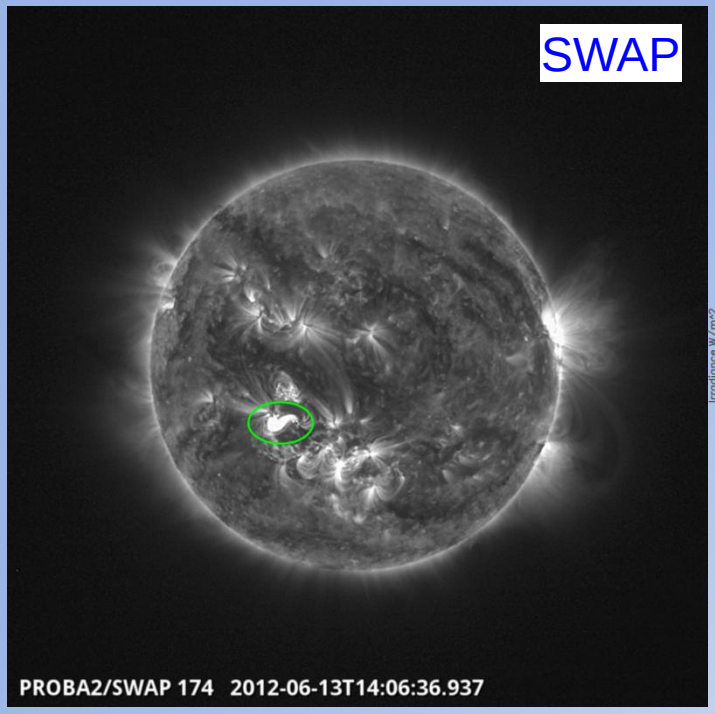
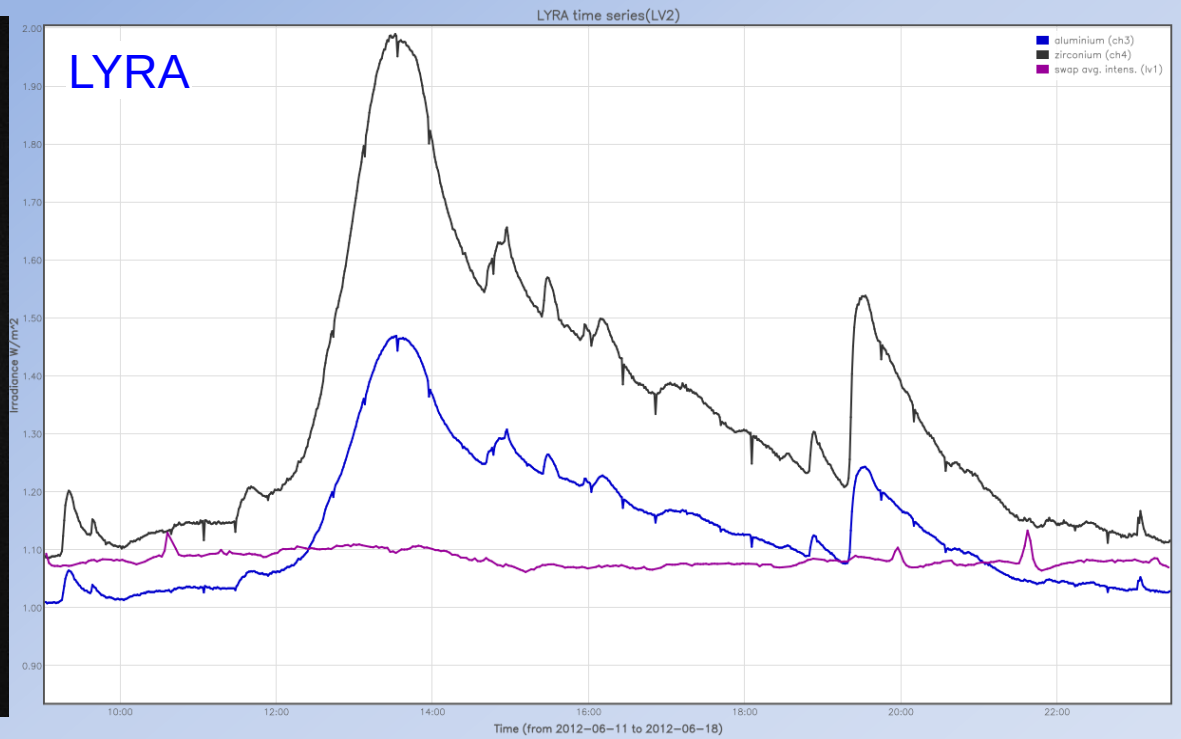
Observing the sources of Space Weather

Observing Flares I

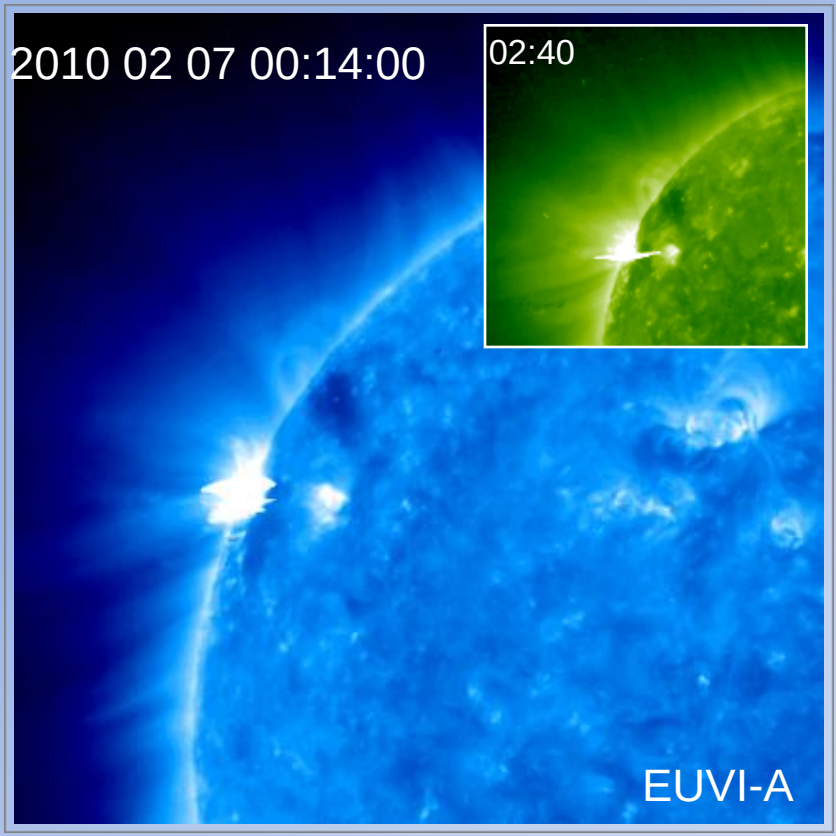


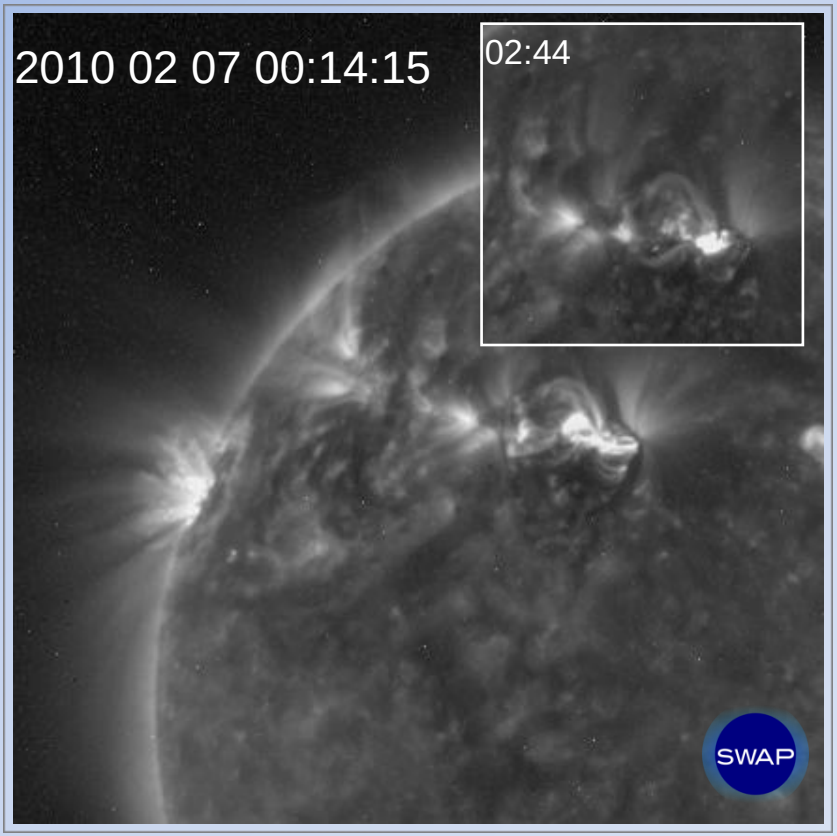


13th Jun 2012, at 11:29 UT, an M1.2 flare occurred in AR11504

Useful for observing the sources of space weather.

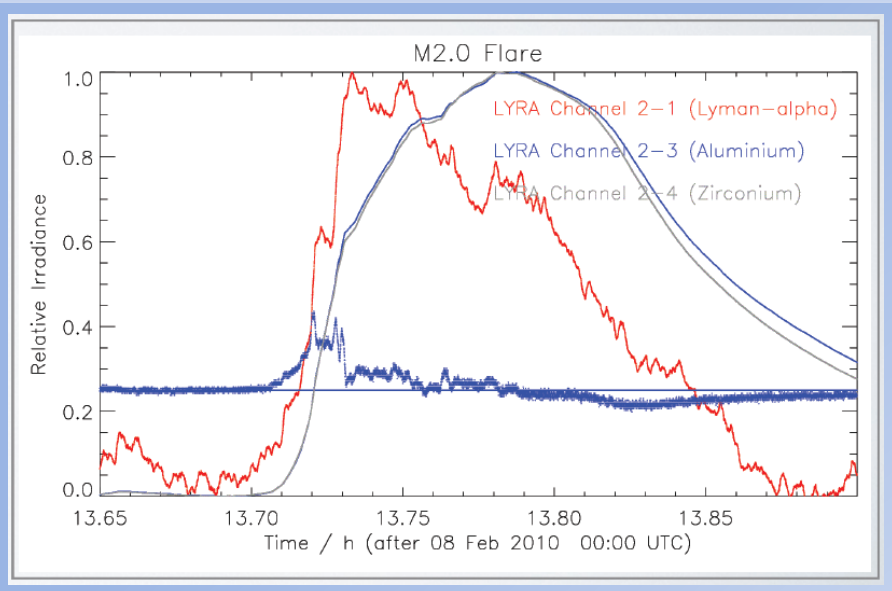
Observing Flares II – SWAP Limited Blooming





- Limited blooming due to CMOS detector
- Nominal cadence of ~2 min
- Max cadence ~18 sec

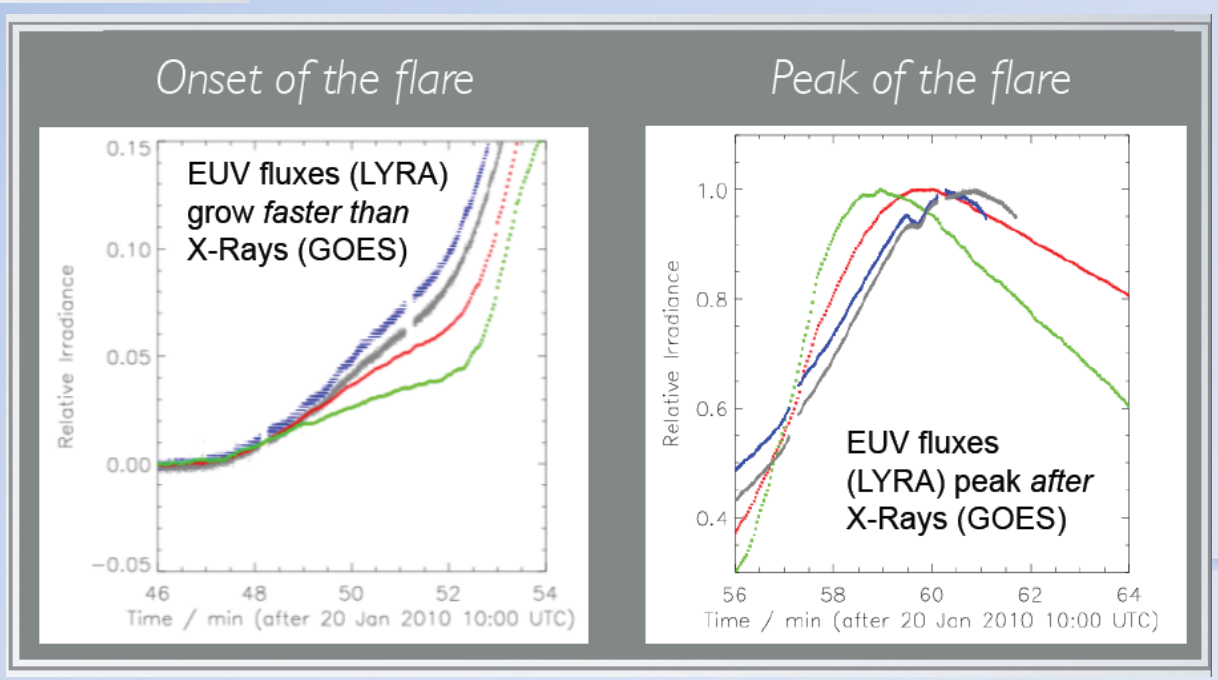
Observing Flares III – LYRA High Resolution



Nominal temporal resolution of 20 Hz

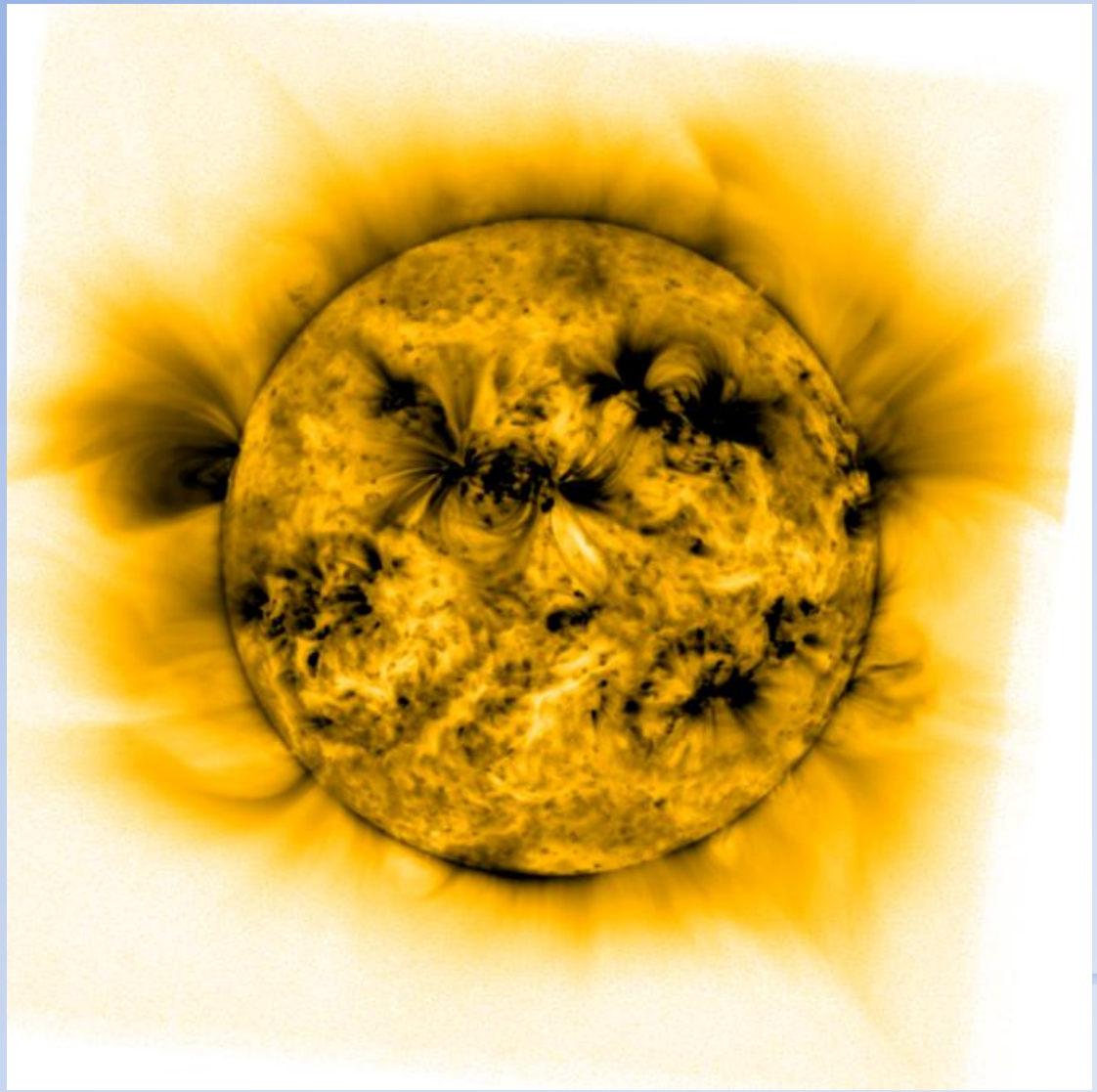
Maximum temporal resolution of 100 Hz

M-flare 20 Jan 10

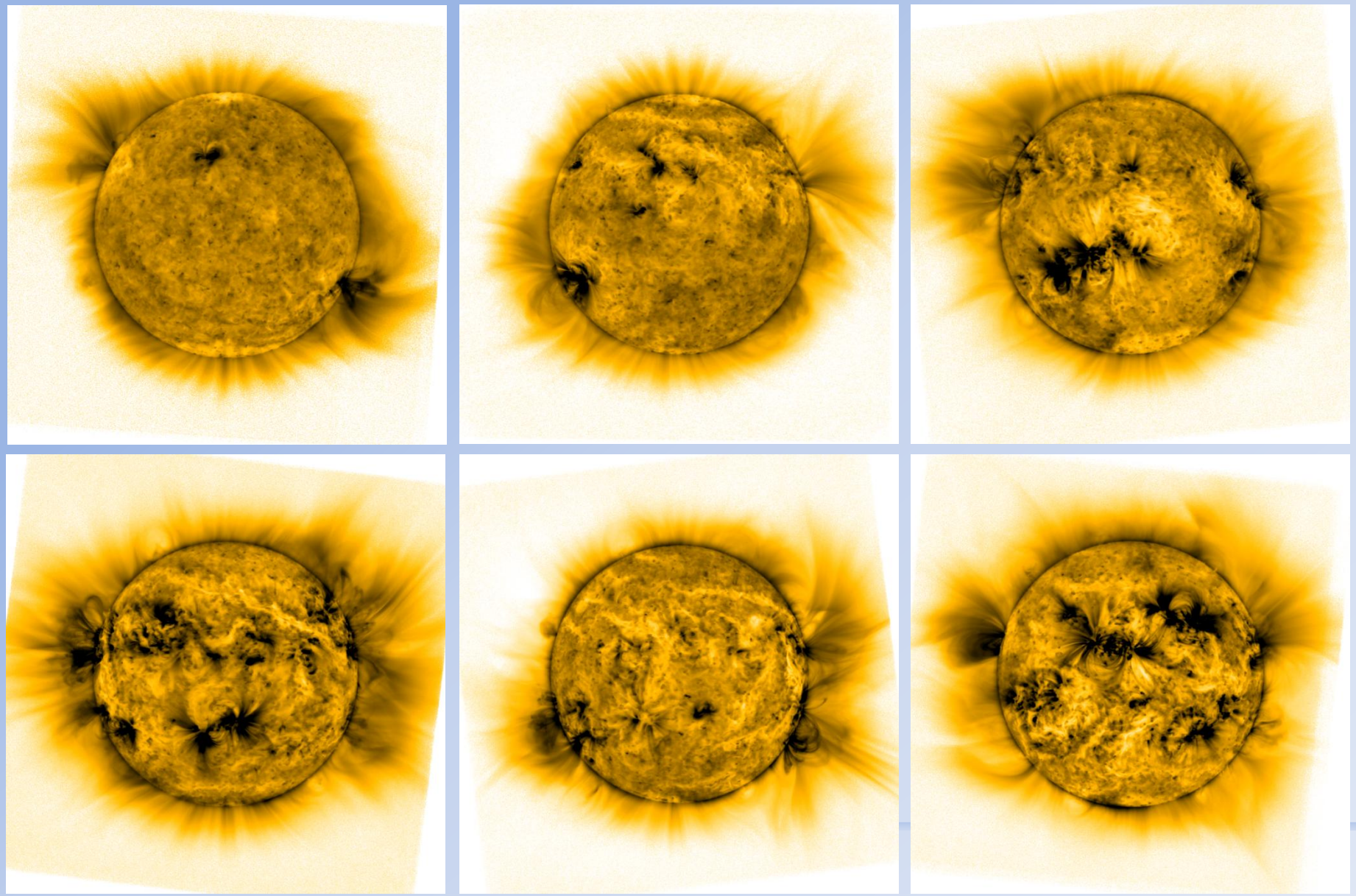


Solar Activity

We can observe various forms of solar activity:
Flares
CMEs
Prominence eruptions
EIT Waves



Active Regions (Inverted colours)



Discussion I

PROBA2 is an effective Space Weather monitor.

Provides:

High cadence, Large view, EUV imaging (SWAP)

- Prominence eruptions / CMEs
- EUV Jets
- Flares
- ARs

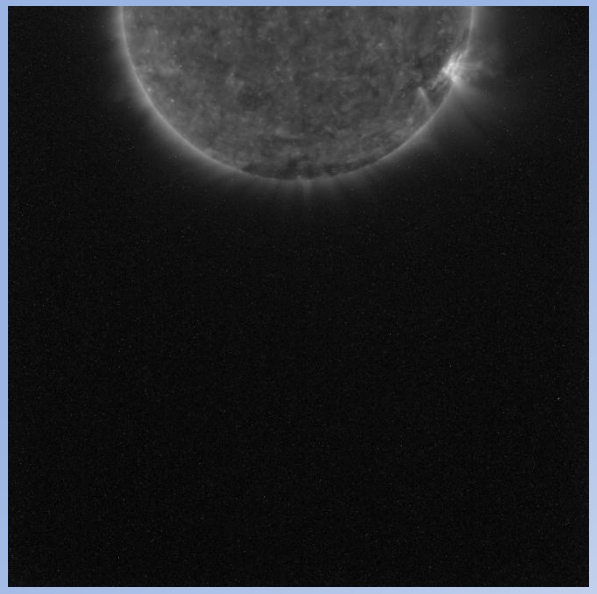
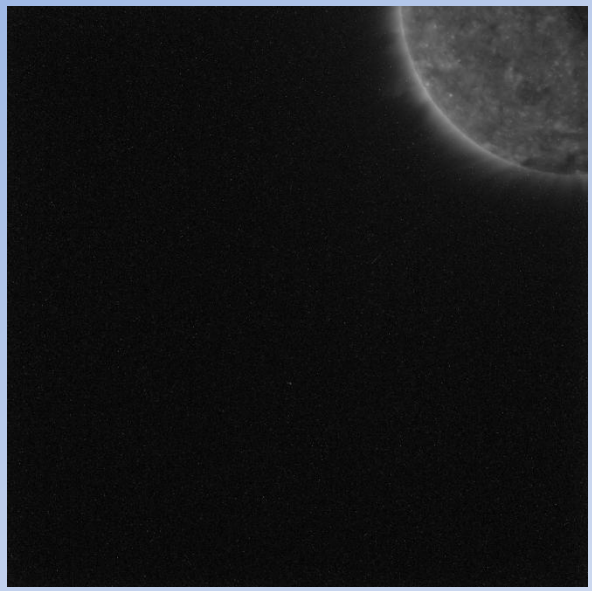
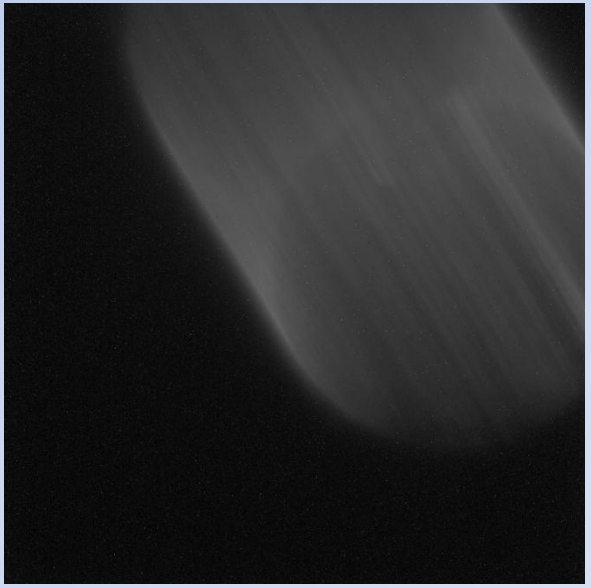
High cadence Solar irradiance observations (LYRA)

- Flares
- Eruptions

Discussion II

Advantages of a small mission:

- We can easily undertake special off pointing campaigns.

- Useful for prominence, CME and comet tracking.
- We can control the satellite from anywhere with an internet connection.

Discussion III

PROBA2 has two downlink stations:

REDU (Belgium) & Svalbard.

We receive data every 2-3 hours.

Once the data reaches the ground -> ~30 minutes to prep and output.

However, due to the low altitude polar sun sync orbit:

•We have eclipse seasons which interrupt signals and potentially miss events.

•Experience interference from SAA

Note, we attempt to use both events to study the atmosphere.

www. http://proba2.oma.be/

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Welcome to the PROBA2 Science Center

About PROBA2

- Mission
- Spacecraft
- Launch and Orbit
- Operations Calendar
- Science Payload

Science

- Guest Investigator Program
- Publications

Data

- LYRA Data
- SWAP Data
- Data analysis software
- Spacecraft Ancillary Data
- Terms of use
- Timeline

Community

- Scientific community involvement
- Meetings
- Outreach

About the PROBA2 Science Center

Fri, 06/15/2012 - 10:37 — Koen Stegen

The PROBA2 Science Center, located at the Royal Observatory of Belgium in Brussels, oversees scientific operations and data processing for ESA's PROBA2 spacecraft. The P2SC is the primary archive and distribution center for data from SWAP and LYRA, as well as the primary maintainer of calibration tools, data analysis software, and additional instrument data. The P2SC is also home to the science operations center, where instrument observing plans are devised and, with the help of ESA's Spacecraft Operations Center in Redu, Belgium, loaded onto the spacecraft. Finally, the P2SC serves as the main site for coordination of the PROBA2 Science Working Team, coordinating special scientific campaigns, supporting science data users and guest investigators, and organizing PROBA2 outreach efforts.

PROBA2 is a small ESA satellite with a scientific mission to explore the active Sun and its effect on the near-earth environment and a broader mission to provide a test platform for new instrument and platform technology. The mission overview page provides additional information about PROBA2 and its on board instrumentation and advanced platform technology.

If you require special assistance, you can contact the instrument teams directly using the contact page on this site.

News

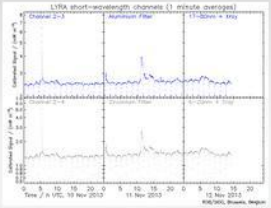
SWAP observes three partial solar eclipses

Tue, 11/05/2013 - 11:44 — Matthew West

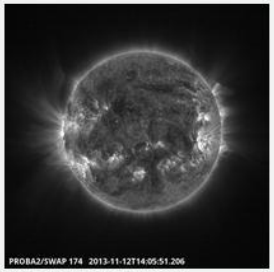
Three partial solar eclipses were observed by PROBA-2 as it moved in and out of the Moon's shadow during the 03-Nov-2013 'hybrid' solar eclipse.

A hybrid eclipse is comprised of a total solar eclipse and an 'annular eclipse', depending on an observer's viewing location on

LYRA Latest



SWAP Latest



Theme

Garland

Switch

For more information and to discuss the potential of PROBA2:

Visit the **PROBA2 stand** at the ESWW Fair on *Wednesday 16:30*

The **PROBA2 Splinter** Session on *Thursday 17:15-18:45*