


P2SC-ROB-WR-104- 20120319 Weekly report #104	P2SC Weekly report	
Period covered: Date: Written by: Approved by:	Mon Mar 19 to Sun Mar 25, 2012 28 Mar 2012 Erik Pylyser David Berghmans	Royal Observatory of Belgium PROBA2 Science Center
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1. Science

Solar & Space weather events

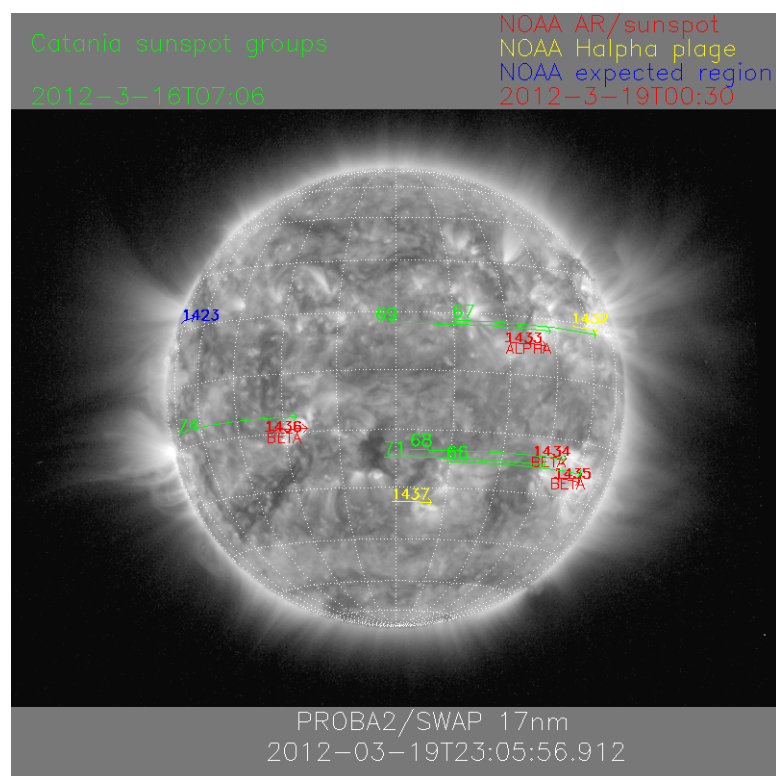
Overview

The level of solar activity this week¹ and associated M- and X-flares (if any):

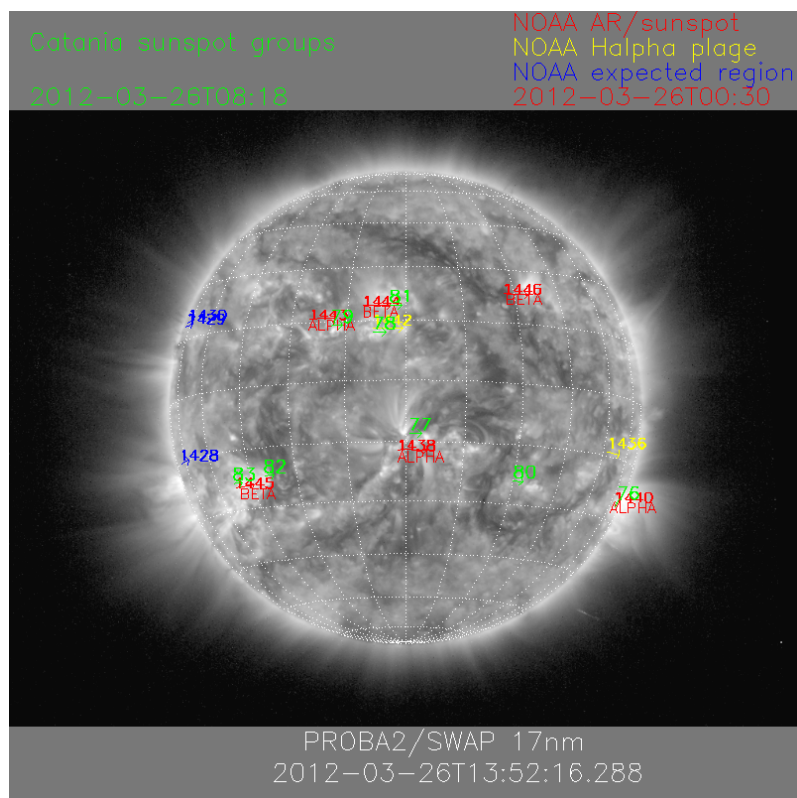
	Monday 19 Mar	Tuesday 20 Mar	Wednesday 21 Mar	Thursday 22 Mar	Friday 23 Mar	Saturday 24 Mar	Sunday 25 Mar
Activity	low	low	low	low	moderate	low	low
Flares	-	-	-	-	M1.0 at 19:34	-	-

¹ See appendix.

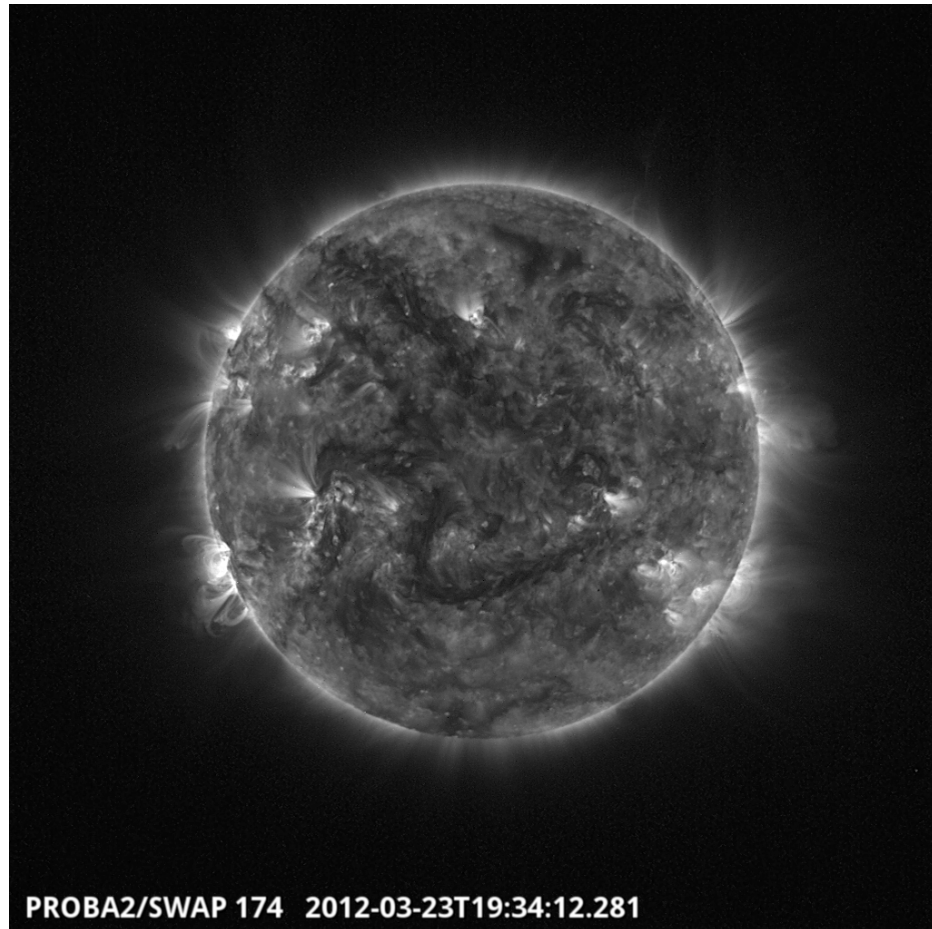
The SWAP images of Mar 19 and Mar 26 (00:30) are shown below, with annotated active regions.



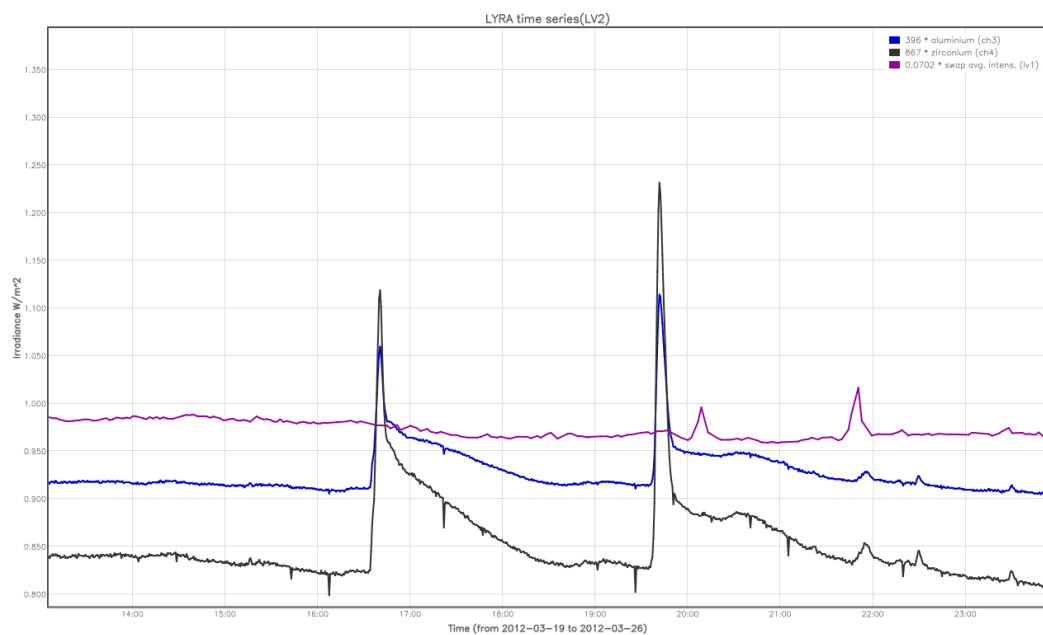
<http://sidc.be/html/CmapPage.html>



On this page is presented the SWAP image and LYRA curve related to the most energetic flares of this week, i.e.



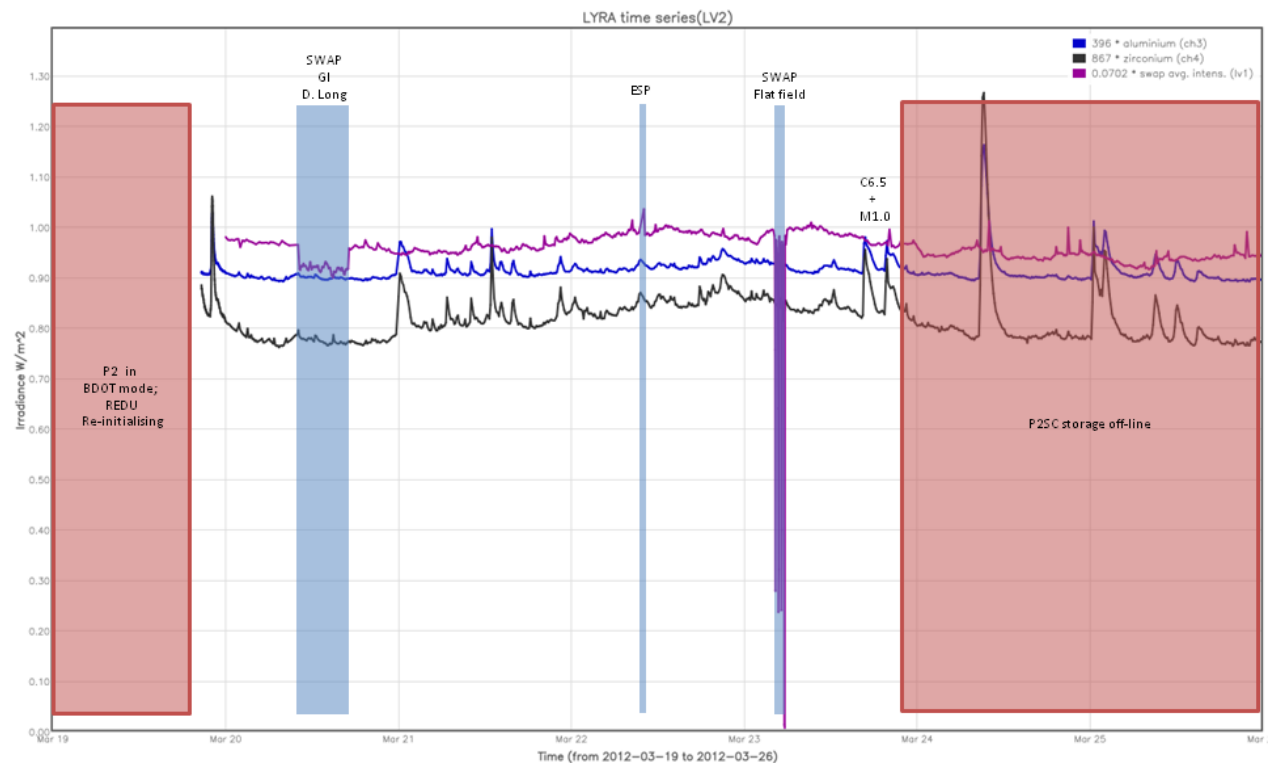
M1.0 Flare (preceded by a C6.5) on Fri March 23; 19:34 (AR 11445; South-East, limb)



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 (solar intensity derived from 'integrated' SWAP images)



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

- the 7hr special GI (D. Long) campaign on Tuesday,
- an ESP campaign on Thursday
- the SWAP flat field campaign on Friday.

The 4 'down' peaks visible during the flat field campaign are due to the Sun exiting the SWAP field of view. That was unexpected. Analysis is under way to find out why this happened. In any case, this campaign will have to be repeated at a later stage.

The red shaded periods correspond, from left to right, with:

- the period when PROBA2 was in BDOT mode, following the PROBA2 satellite reboot in the previous week-end.
- the period during which P2SC storage server went off-line, due to a malfunctioning hard drive.

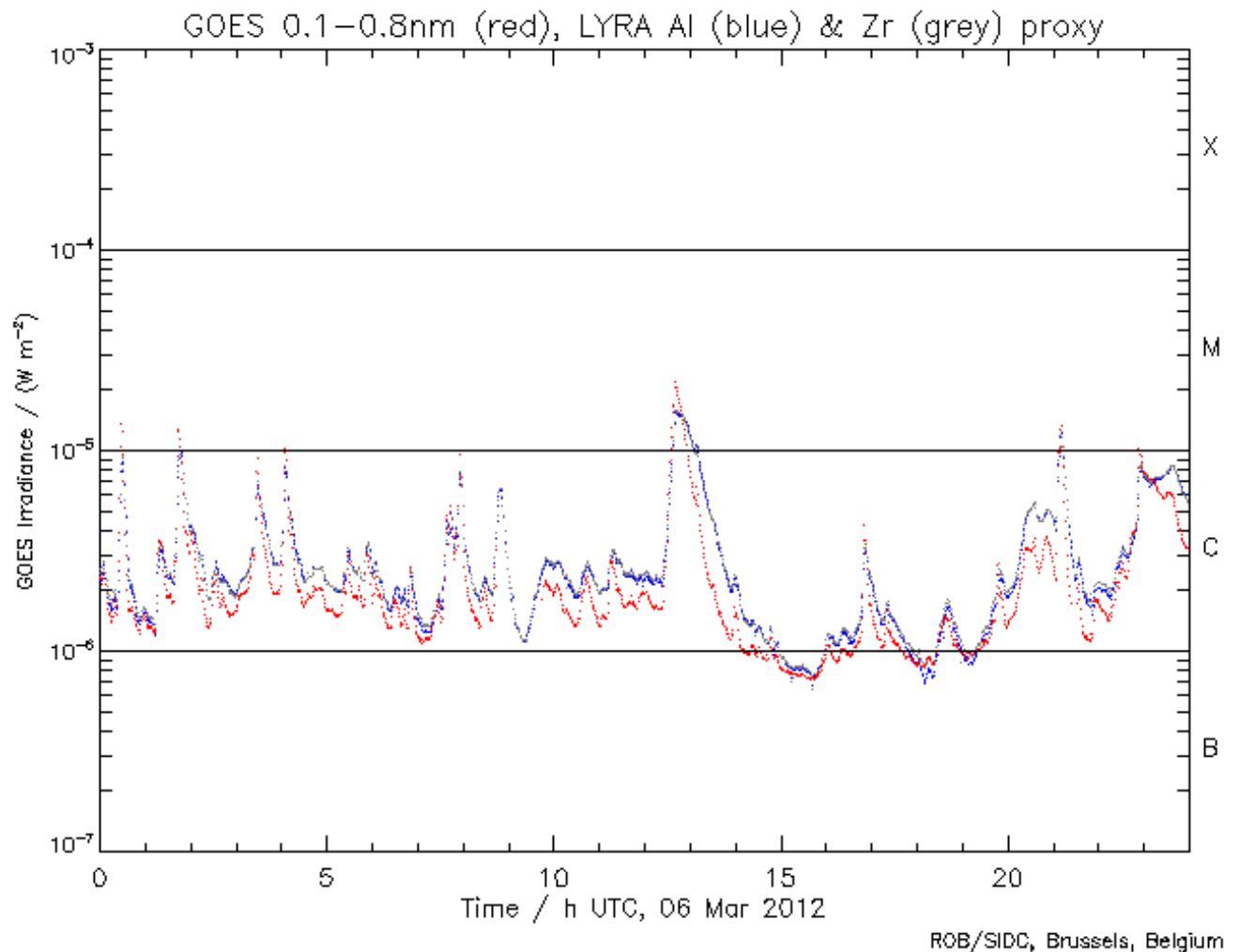
GOES and LYRA

This week, GOES-15 went out of order from Mar 21 (end of day) till Mar 23, 16:00 UT.

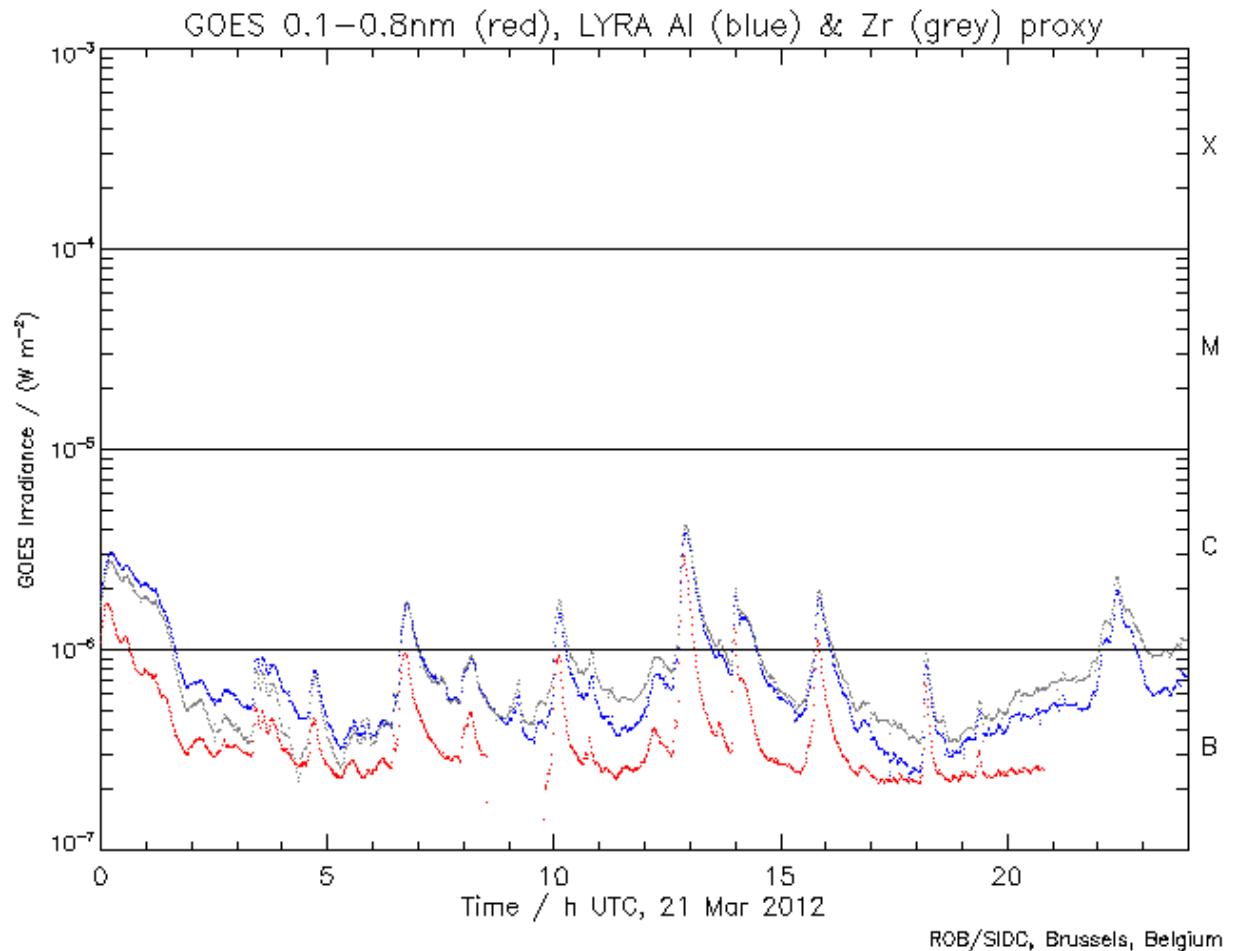
To deal with those (fortunately rare) situations, the LYRA team has set-up an alternative for the GOES flare monitoring service, using the PROBA2/LYRA radiometer as a GOES proxy. More precisely, the two shorter wavelength channels of LYRA, namely the 'aluminium' and 'zirconium' channels, are used. Those channels cover respectively the $<5\text{nm} + 17\text{-}80\text{ nm}$ range and the $<2\text{nm} + 6\text{-}20\text{nm}$ range, meaning that they both include a soft X-ray and an EUV contribution. GOES flare scale, on the other hand, is computed from a channel observing in the $0.1\text{-}0.8\text{nm}$ and doesn't see the EUV.

To be able to use LYRA data as a proxy for GOES, we first have to remove the long-term EUV trend, which is done by subtracting the pre-flare level. Then, the aluminium and zirconium channels are respectively multiplied by 0.015 and 0.018, before to be added to the pre-flare value in GOES.

The result is illustrated here, for Mar 06 2012:



For Mar 21, when GOES went off-line:



Both channels of LYRA produce similar results. The remaining differences between GOES and LYRA curves are still explained by the presence of EUV signal in LYRA channels. Because of this EUV contribution, the LYRA flare profiles usually peak slightly after GOES and the flares decay much slower. Nevertheless, the flare intensities deduced from LYRA data match quite well the ones of GOES.

Those curves are produced daily and currently available on:

<http://solwww.oma.be/users/dammasch/GoesVsLyra.html>

An email, sent to the international space weather forecaster community (see outreach section below), announcing the availability/existence of this LYRA service, was welcomed by the [ISES](#) forecaster services from e.g. Australia, Canada and the USA.

Scientific campaigns

The following LYRA and SWAP specific scientific campaigns have been performed this week:

- SWAP special campaign for Guest Investigator D. Long (in parallel with Hinode observation time) on Tue 20, between 10:00 and 17:00 (TBC). This campaign is a (shorter) repeat from the campaign

on Mar 12.

- SWAP flat field campaign: on Fri 23.

Flat field measurements are used to identify and correct anisotropy in sensitivity of telescopic images. Typically this is achieved by capturing an image of a flat, well-illuminated light source, so that the only variation in image brightness comes from the optical setup or camera itself.

However, since there are no flat, EUV sources for SWAP to use for this purpose, we are attempting to use the method of Kuhn et al. (1991, PASP, 103, 1097). By making a series of carefully selected offpoints and performing a cross-correlation of the brightness of features on the sun as they appear in different locations in the images, it is theoretically possible to reconstruct the flat field using image data. To minimize variation during the routine, we limit the duration of the campaign and attempt to do it at a time when solar activity is minimal.

Given limitations on telemetry, duration, and spacecraft pointing, we used four different pointings for each Large Angle orientation within a single orbit, making a total of 16 different off-pointing positions. The data are obtained at high cadence with minimal processing to ensure high quality. The team intends to use software on the ground to combine the roughly 100 usable images they obtained into a flat field measurement. It is likely this campaign will require additional refinement, so we expect to run this campaign periodically during the coming weeks until we can obtain a good flat field measurement.

- Daily LYRA campaign with Unit 3, opening the cover for 15 minutes.

Outreach, papers, presentations, etc.

- Email to international solar community, dated 20/03/2012, to announce:

1) submission for the Topical Issue on PROBA2 in the journal Solar Physics are welcome up till Friday April 20 2012.

2) Organisation of PROBA2 Science Days on 2012-05-03 and 04

- Thursday May 3 will be dedicated to on orbit degradation problem of solar instruments.

- Friday May 4 will be dedicated to science analysis of PROBA2 data.

3) More news will appear on:

<http://proba2.sidc.be/index.html/community/calendar/article/proba2-science-meeting-may-2012?menu=26>

- Email to international solar community, dated 22/03/2012; 'Alternative flare monitoring services'. D. Berghmans

- Space Weather Euro News, 16, 3: 'LYRA, an alternative flare monitoring service', Marie Dominique, Ingolf Dammasch, David Berghmans.

- 'PROBA2 en Ruimteweer'. Presentations given to students from 5th & 6th year of secondary school, by Petra Vanlommel and Elke D'huys, in the context of 'Junior College' from the Katholieke Universiteit Leuven (KUL). First presentation given on Mar 20 in Kortrijk (KULAK) and second on Mar 22 in Heverlee (KUL). See also http://www.kuleuven.be/onderwijs/juniorcollege/jcwiskunde/wiskunde#De_thema_s (in Dutch).

- Koen Stegen provided a P2SC demo to a visiting student (secondary school) on Thu 22.

2. LYRA instrument status

Calibration

No calibration this week.

IOS & operations

Monday 19 Mar	Tuesday 20 Mar	Wednesday 21 Mar	Thursday 22 Mar	Friday 23 Mar	Saturday 24 Mar	Sunday 25 Mar
P2 re-initialisation + nominal acquisition, from 20:30 none->LYIOS00233	Nominal acquisition + daily U3 LYIOS00233	Nominal acquisition + daily U3 LYIOS00233	Nominal acquisition + daily U3 LYIOS00233	Nominal acquisition + daily U3 LYIOS00233	Nominal acquisition + daily U3 LYIOS00233	Nominal acquisition + daily U3 LYIOS00233

On Monday 19th, PROBA2 was still in BDOT mode, after its reboot on Sun 18 (see report #103). During the day, REDU re-initialised the spacecraft. It was back into SUN pointing mode at 18:11. During pass 7358, LYRA IOS 233 was implemented and data re-acquired from 20:38 on. From then on, LYRA science data were available again.

No LYRA data were received for all passes from 7342 until 7358 included.

LYRA detector temperature

LYRA detector 2 temperature fluctuated between 47.2 and 47.9 under nominal circumstances. First temperature data after PROBA2 came out of BDOT mode (Mon 19, evening) indicates that LYRA temperature was 45.6 degrees.

To be explored

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3. SWAP instrument status

Calibration

No calibration this week.

MCPM errors

The number of MCPM recoverable errors increased from 2371 (until Mar 18, 23:10:49) to 0 (on Mar 19, 03:50:08) to 26 (on Mar 25:59:59).

The number of MCPM unrecoverable errors is still 0.

IOS & operations

Monday 19 Mar	Tuesday 20 Mar	Wednesday 21 Mar	Thursday 22 Mar	Friday 23 Mar	Saturday 24 Mar	Sunday 25 Mar
P2 re-initialisation + nominal acquisition 130s cadence, from 20:30	Nominal acquisition + D. Long campaign (10:00-17:00)	Nominal acquisition	Nominal acquisition + ESP	Nominal acquisition + flat field campaign	Nominal acquisition	Nominal acquisition
none -> IOS00377 90 images	IOS00377 1086 images	IOS00377 665 images	IOS00377 649 images	IOS00378 696 images	IOS00378 639 images	IOS00378 583 images

On Monday 19, PROBA2 was still in BDOT mode, after its reboot on Sun 18 (see report #103). During the day, REDU re-initialised the spacecraft. It was back into SUN pointing mode at 18:11. During pass 7358, SWAP IOS 377 was implemented and data re-acquired from 20:38 on. From then on, SWAP science data were available again.

On Tuesday 20, an off-pointing campaign was executed for Guest Investigator D. Long (see section 1 for details)

On Friday 23 a flat-field campaign was executed (see section 1 for details)

No SWAP data were received for all passes from 7342 until 7358 included.

SWAP detector temperature

The SWAP Cold Finger Temperature fluctuated between -0.2 and -0.8 degrees Celsius, under nominal operations.

After the return to nominal operations after the PROBA2 BDOT mode on Mon 19, temperature climbed up to 2.7 degrees C, until the LAR delay patch of 7 minutes was executed on Tue 20, around 09:00 - temperature then dropped down to -0.5 degrees.

To be explored

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4. PROBA2 Science Center Status

The main operator is Koen Stegen; Erik Pylyser provides support, when needed.

The weekly 'P2SC Operations meeting' was held on 21/03/2012.

During the evening of Mar 23, P2SC experienced a problem with a hard drive. A hot back-up (RAID system) was initiated automatically, but this did not seem to succeed in keeping P2SC operational. P2SC was off-line until Mon Mar 26 when recovery actions were initiated by the P2SC team. These efforts resulted in having P2SC back on-line on Wed Mar 28. A formal Anomaly Report will be provided, in the Weekly report #105, next week.

5. Data reception & discussions with MOC

Passes

The delivery of the following passes for this week (passes 7351 to 7413) was nominal, except for:
- 7351 until 7358 included: no BIN_LYRA/SWAP science files were received (PROBA2 in BDOT mode on Mar 19, following its reboot on Mar 18)

Data coverage HK

No HK data *files* were missing this week. But, SWAP/LYRA specific HK data, in those files, became effectively available only after PROBA2 came out of BDOT mode, Mon 19, in the evening.

Data coverage SWAP

SWAP data are missing from Sun 18 00:43 until Mon 19 20:30 (PROBA2 reboot and subsequently in BDOT mode)

Total number of images between 2012 Mar 19 00:00 and 2012 Mar 26 00:00: 4408

Highest cadence in this period: 0 seconds

Average cadence in this period: 120.26 seconds

Number of image gaps larger than 300 seconds: 8

Largest data gap: 34.33 minutes

Data coverage LYRA

LYRA data are missing from Sun 18 00:43 till Mon 19 20:30 (PROBA2 reboot and in BDOT mode)

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
DSLP	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
SEU	Single Event Upset
SOHO	Solar and Heliospheric Observatory
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 UTC UV	Telecommand Coordinated Universal Time Ultraviolet
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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)
- (+ extreme?)