

# SPACE WEATHER INTRODUCTORY COURSE



Collaboration of



**Solar-Terrestrial Centre of Excellence**



**Koninklijke luchtmacht**



**Koninklijk Nederlands  
Meteorologisch Instituut**  
*Ministerie van Infrastructuur en Milieu*



## **Space Weather into practice – SIDC/RWC & URSIgram**

Jan Janssens

# SIDC/RWC & URSIgram - Contents

- SIDC/RWC
- SWx alerts
- Exercises

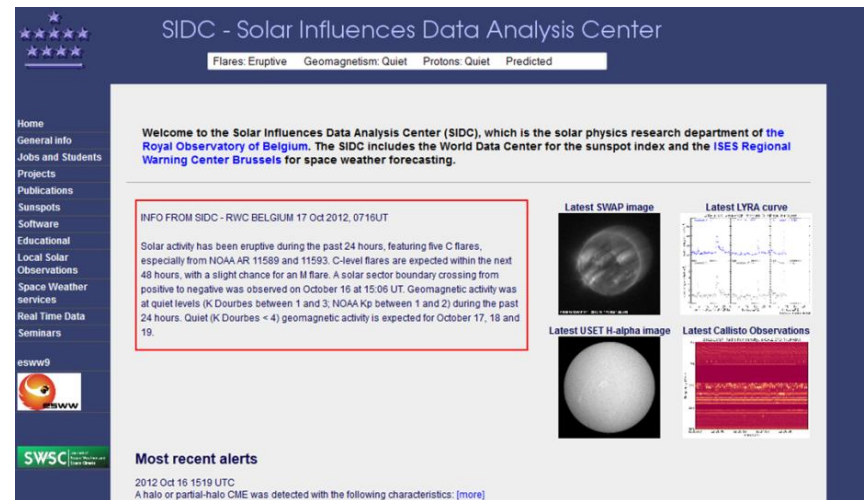
# SIDC/RWC & URSIgram - Contents

- **SIDC/RWC**
- SWx alerts
- Exercises

# The SIDC / RWC

## Regional Warning Centre Brussels

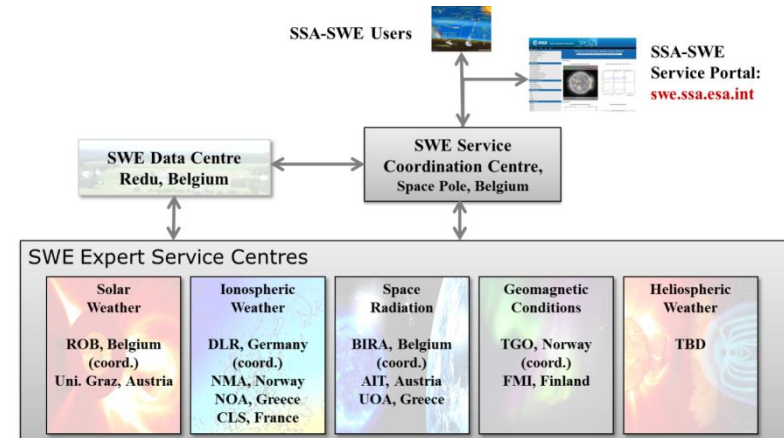
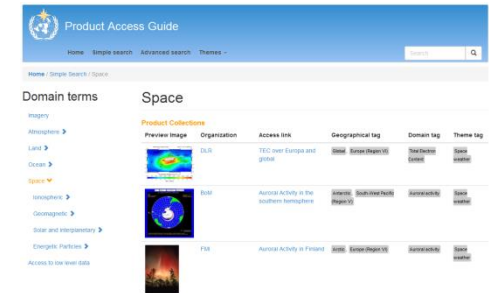
- Team of +/- 8 SWx forecasters
  - Scientists
    - Cumul job
    - Experts
  - Weekly tour of duty
    - 7/7, 14/24
    - Back-up by automated services and tools
  - IT supported
    - Previweb
      - Interface
    - Web page
    - Mailing service
  - Regular meetings
  - ICAO support: PECASUS
    - HF, radiation, GNSS



# The SIDC / RWC

## Regional Warning Centre Brussels

- International context
  - ISES
    - International Space Environment Service
  - ESA / SSCC
    - SSA Space Weather Coordination Centre
    - Services and expertise
  - World Meteorological Org.
  - ICAO / PECASUS
    - International Civil Aviation Organization



SSA: Space Situational Awareness





# URSIgram

<http://www.sidc.be/>

## SIDC - Solar Influences Data Analysis Center

Predicted Ap index: 14 visit us at <http://www.sidc.be>

The SIDC is part of [the Royal Observatory of Belgium](#) and a partner in the Solar Terrestrial Center of Excellence ([STCE](#)).

### INFO FROM SIDC - RWC BELGIUM 2021 Feb 16 12:30UTC

The solar activity has been quiet over the past 24 hours. The visible solar disc is spotless and the X-ray flux is below B-level. The solar activity is expected to remain at low levels over the next 24 hours.

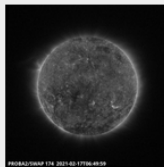
No Earth-directed coronal mass ejections (CMEs) was observed in the available coronagraph imagery.

The greater than 10 MeV proton flux was at nominal levels in the past 24 hours and is expected to remain so in the next 24 hours. The greater than 2MeV electron flux remained under the 1000 pfu threshold and is expected to remain so in the next 24 hours.

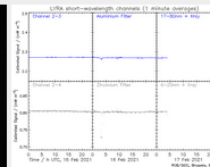
Over the past 24 hours the solar wind speed remained slow between 320 km/s and 375 km/s, the total magnetic field slowly increased up 10 nT and the Bz component ranged between -8.8 nT and 7.8 nT being mostly negative since February 16 at 02:00 UTC. The solar wind parameters indicate that the solar wind is slightly compressed ahead of the expected high-speed streams associated with the extension of the northern polar coronal hole (positive polarity, and facing Earth on February 13). The enhancements of the solar wind conditions are expected to persist with the speed increasing.

The geomagnetic conditions over the past 24 hours were active in response to the enhanced interplanetary magnetic field and the prolonged period of southward directed Bz component. Unsettled conditions are expected for the next 24 hours with possible active periods due to the enhancement of the solar wind parameters as long as Earth remains under the influence of the coronal hole wind speed.

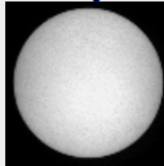
### Latest SWAP image



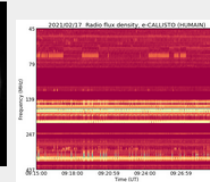
### Latest LYRA curve



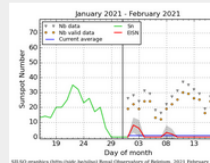
### Latest USET H-alpha image



### Latest Callisto Observations



### Daily estimated sunspot number



### Most recent alerts



# The weekly bulletin

:Issued: 2017 Jan 30 1406 UTC  
:Product: documentation at <http://www.sidc.be/products/bul>

-----#  
# SIDC Weekly bulletin on Solar and Geomagnetic activity #  
-----#

WEEK 839 from 2017 Jan 23  
SOLAR ACTIVITY

-----  
Solar activity was very low to low, with a single C-class flare produced by spotless active region NOAA 2627 near the west limb on 28 January (C2 flare peaking at 21:09UT). A new region, NOAA 2629, developed quickly on 24 January and was responsible for most of the B-class flaring on 24-26 January. The other regions were mostly quiet and decaying. No earth-directed coronal mass ejections (CMEs) were observed in available coronagraphic imagery. The greater than 10MeV proton flux was at nominal levels. A small positive equatorial coronal hole (CH) started its transit of the central meridian on 23 January, and a negative trans-equatorial CH was transiting the central meridian (CM) by the end of the period.

## GEOMAGNETIC ACTIVITY

-----  
Solar wind conditions near Earth were determined by the high speed stream (HSS) from the small positive coronal hole (CH). The co-rotating interaction region (CIR) that preceded it, drove a small shock on 26 January at 07:12UT. The proper HSS arrived a few hours later around 13:45UT of the same day, with solar wind speed gradually increasing from an initial 375 km/s up to values near 670 km/s around 06UT on 27 January. Bz oscillated wildly between -12 nT and +13 nT, preventing the development of a strong geomagnetic disturbance. As a result, only active geomagnetic conditions were observed on 26 and 27 January, while the rest of the week was at quiet levels with an occasional unsettled episode.

## DAILY INDICES

DATE	RC	EISN	10CM	Ak	BKG	M	X
2017 Jan 23	///	057	084	006	B1.0	0	0
2017 Jan 24	053	042	082	003	B1.0	0	0
2017 Jan 25	064	046	085	005	B1.4	0	0
2017 Jan 26	053	039	083	012	B1.1	0	0
2017 Jan 27	033	028	080	021	A9.1	0	0
2017 Jan 28	///	029	079	010	A8.5	0	0
2017 Jan 29	///	032	077	007	A8.2	0	0

-----  
# RC : Sunspot index (Wolf Number) from Catania Observatory (Italy)  
# EISN : Estimated International Sunspot Number  
# 10cm : 10.7 cm radioflux (DRAO, Canada)  
# Ak : Ak Index Wingst (Germany)  
# BKG : Background GOES X-ray level (NOAA, USA)  
# M,X : Number of X-ray flares in M and X class, see below (NOAA, USA)  
-----

## NOTICEABLE EVENTS SUMMARY

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	Catania/NOAA	RADIO_BURST_TYPES
NONE									

## STCE Newsletter

23 Jan 2017 - 29 Jan 2017



Published by the STCE - this issue : 3 Feb 2017. Available online at <http://www.stce.be/newsletter/>.

The Solar-Terrestrial Centre of Excellence (STCE) is a collaborative network of the Belgian Institute for Space Aeronomy, the Royal Observatory of Belgium and the Royal Meteorological Institute of Belgium.

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## SIDC Space Weather briefing

23 January – 29 January 2017

Jan Janssens  
&  
SIDC forecaster team

Solar Influences  
Data analysis Centre  
[www.sidc.be](http://www.sidc.be)

★★★★★ Royal Observatory  
of Belgium



# SIDC products – Free online

Space Weather Now! SIDC - Solar Influences Data Analysis Center

visit us at <http://www.sidc.be> SIDC/RWC-Belgium forecast of

[Click here to \(un\)subscribe to products](#)

Mail header	SIDC code	Description	format	Frequency	Source
Boumeuss	bms	Sunspot data.	Encoded data (ISES)	daily	SEC (RWC-Boulder,US)
COMESSEP SEP forecast	comesep_sep	Automated Solar Energetic Particle (SEP) radiation storm forecast for >10 MeV protons when a medium or stronger SEP storm risk is expected following detection of a >=M1 flare or a Ground Level Enhancement (GLE)	Plain text	ASAP, for expected medium or stronger SEP radiation risk	COMESSEP Consortium (PI: BIRA-IASB)
Geoalert RWC-Belgium	xut	Forecast, solar events, daily solar and geomagnetic indices, solar regions: data and flare forecast.	Encoded data (ISES)	daily	SIDC (RWC-Belgium)
Geoalert RWC-Boulder	geo	Forecast, solar events, daily solar and geomagnetic indices, solar regions: data and flare forecast.	Encoded data (ISES)	daily	SEC (RWC-Boulder,US)
GOES X-ray flare detection alert	flaremail	This message is of the fast alert type. It is sent out when SIDC software detects in the GOES data a flare with an X-ray radiation flux stronger than M5.	Plain text	ASAP, when a flare >M5 has been detected	SIDC (RWC-Belgium)

fast Highlight All Match Case Whole Words 5 of 5 matches

10:51 AM 3/21/2017

# SIDC/RWC & URSIgram - Contents

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- SWx alerts
- Exercises



# Fast alerts: automatic detection by SDC software

## Flare > M5

*SIDC in GOES X-ray*

```
:Issued: 2016 Jul 24 0516 UTC
:Product: documentation at http://www.sidc.be/products/flaremail
#-----#
# Large flare alerts from the SIDC (RWC-Belgium), detected in GOES #
# X-ray data #
#-----#
A class M5.5 solar X-ray flare occurred on 2016/07/23 with peak time 05:31UT
#-----#
# Solar Influences Data analysis Center - RWC Belgium #
# Royal Observatory of Belgium #
# Fax : 32 (0) 2 373 0 224 #
# Tel.: 32 (0) 2 373 0 491 #
#
# For more information, see http://www.sidc.be. Please do not reply #
# directly to this message, but send comments and suggestions to #
# 'sidctech@oma.be'. If you are unable to use that address, use #
# 'rvdlinden@spid.aas.org' instead. #
# To unsubscribe, visit http://sidc.be/registration/unsub.php #
#
# Legal notices: #
# - Intellectual Property Rights: #
# http://www.astro.oma.be/common/internet/en/data-policy-en.pdf #
# - Liability Disclaimer: #
# http://www.astro.oma.be/common/internet/en/disclaimer-en.pdf #
# - Use and processing of your personal information: #
# http://www.astro.oma.be/common/internet/en/privacy-policy-en.pdf #
#-----#
```

## Halo CME (width > 150°)

*CACTus in SOHO/LASCO*

```
:Issued: 2016 Nov 05 1349 UTC
:Product: documentation at http://www.sidc.be/products/cactus
#-----#
# HALO CME ALERTS from the SIDC (RWC-Belgium), generated by CACTUS #
#-----#
A halo or partial-halo CME was detected with the following
characteristics:

      t0      | dt0 | pa | da | v | dv | minv | maxv |
005|2016/11/05 04:24| 03 | 338| 178| 0297| 0048| 0200| 0452

Details can be found here:
http://www.sidc.oma.be/cactus/out/latestCMEs.html

      t0: onset time, earliest indication of liftoff
      dt0: duration of liftoff (hours)
      pa: principal angle, counterclockwise from North (degrees)
      da: angular width of the CME (degrees),
      v: median velocity (km/s)
      dv: variation (1 sigma) of velocity over the width of the CME
      mindv: lowest velocity detected within the CME
      maxdv: highest velocity detected within the CME

This message is sent whenever a CME wider than 150 degrees is detected by
cactus.
#-----#
```

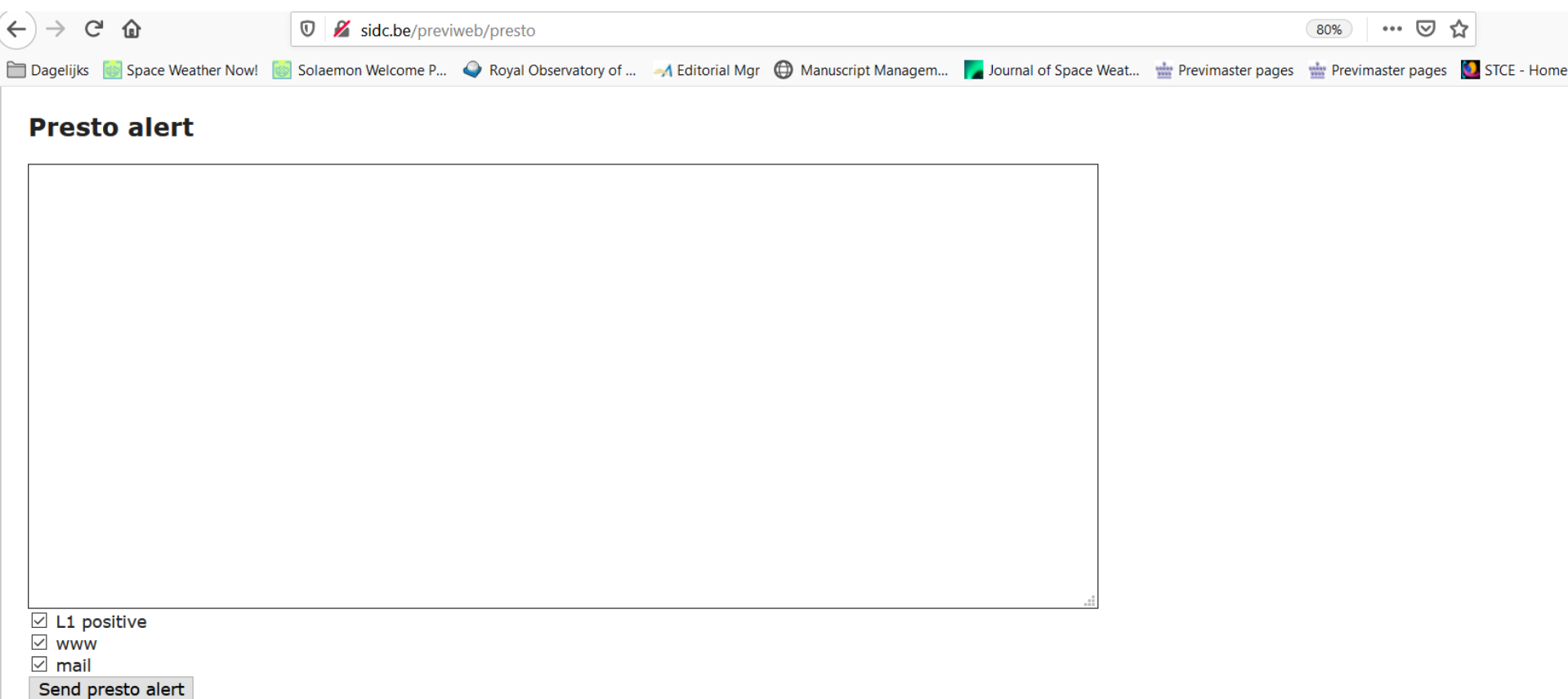
SOHO: Solar and Heliospheric Observatory

CACTus: Computer Aided CME Tracking

LASCO: Large Angle and Spectrometric Coronagraph



# PRESTO alert: 1. Criteria



The screenshot shows a web browser window with the address bar displaying 'sidc.be/previweb/presto'. The page title is 'Presto alert'. Below the title is a large, empty rectangular box for text input. At the bottom left of the page, there are three checked checkboxes: 'L1 positive', 'www', and 'mail'. To the right of these checkboxes is a button labeled 'Send presto alert'.

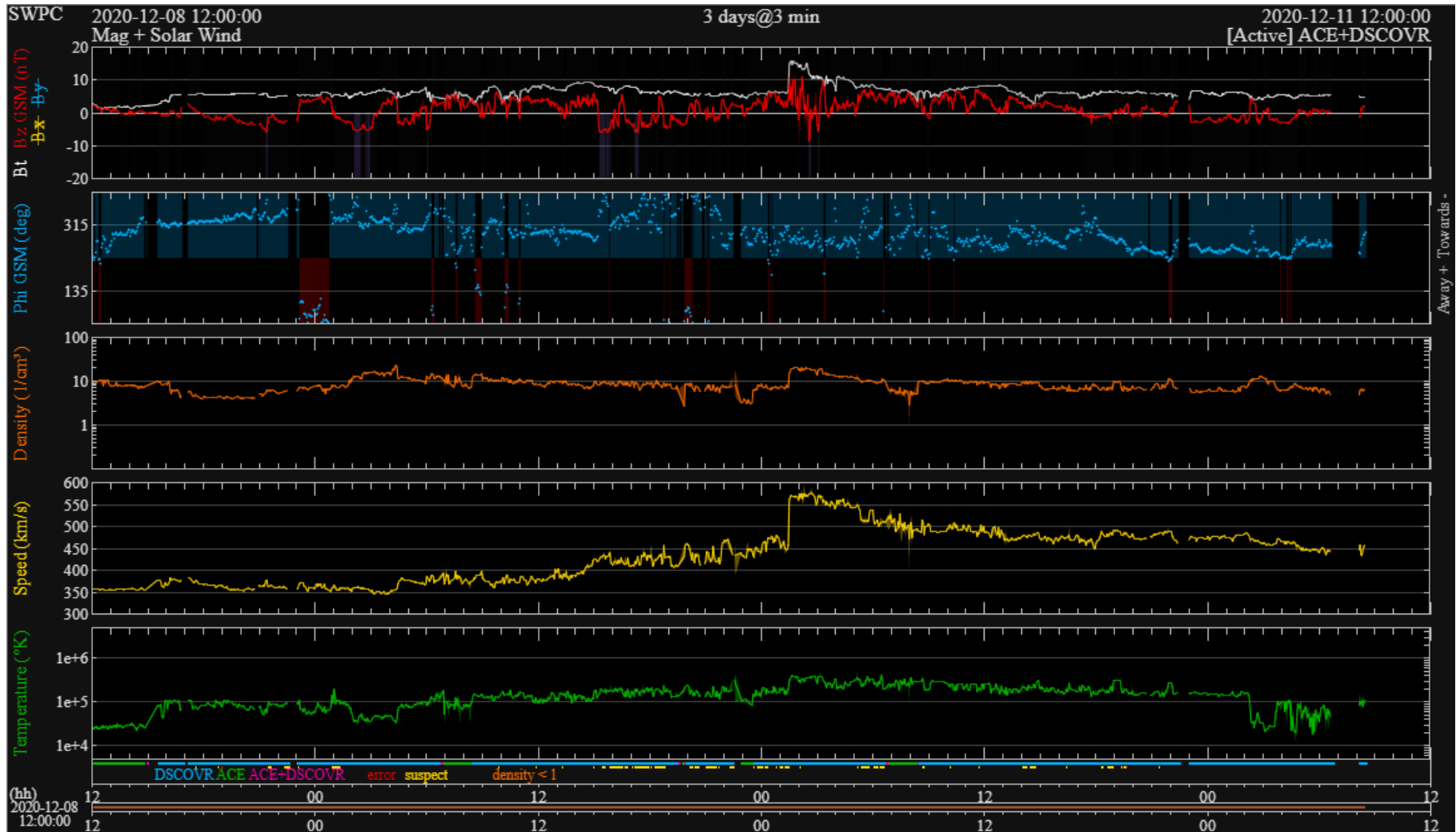
**Presto alert**

☒ L1 positive  
☒ www  
☒ mail

## When to send a presto immediately?

- During or just after an **X-flare** occurred.
- In case of a **proton event**.
- When **K > 5**.
- When a **halo CME** or a strong Westward directed CME occurred. Try to find out whether the halo CME is front-sided or not. Therefore look at the EIT images to find a related flare.
- In case you observe a **fast forward shock** in the solar wind speed.
- In case you observe enhanced solar wind conditions which will likely lead to geomagnetic storm conditions **K > 5**.

# PRESTO alert: 2. Detection



# PRESTO alert: 3. Send

## PRESTO ALERT

Message 14 of 1168



From **Solar Influences Data analysis Center**   
To **jan.janssens@oma.be**   
Reply-To **no-reply-sidc@oma.be**   
Date **10.12.2020 08:30**



:Issued: 2020 Dec 10 0727 UTC  
:Product: documentation at <http://www.sidc.be/products/presto>  
#-----#  
# FAST WARNING 'PRESTO' MESSAGE from the SIDC (RWC-Belgium) #  
#-----#  
A shock was seen in the solar wind at 01:34 UT marking the arrival of the CME from 7 December. The speed jumped from 450 km/s to 560 km/s and the magnetic field from 6 nT to 16 nT. It did not have long lasting negative Bz embedded in it, therefore only unsettled conditions were seen locally (K Dourbes =3) and active at planetary levels (Kp = 4).  
#-----#  
# Solar Influences Data analysis Center - RWC Belgium #  
# Royal Observatory of Belgium #  
# #  
# Website <http://www.sidc.be>. #  
# E-mail [sidc-support@oma.be](mailto:sidc-support@oma.be) #  
# To unsubscribe <http://www.sidc.be/registration/unsub.php> #  
# #  
# Legal notices: #  
# - Intellectual Property Rights: #  
# <http://www.astro.oma.be/common/internet/en/data-policy-en.pdf> #  
# - Liability Disclaimer: #  
# <http://www.astro.oma.be/common/internet/en/disclaimer-en.pdf> #  
# - Use and processing of your personal information: #  
# <http://www.astro.oma.be/common/internet/en/privacy-policy-en.pdf> #  
#-----#





# All quiet alert

## Start/End of all quiet alert from the SIDC/RWC Belgium

Solar Influences Data analysis Center <sidc@oma.be>

Extra line breaks in this message were removed.

Sent: Mon 7/4/2016 1:33 PM

To: jan.janssens@oma.be

:Issued: 2016 Jul 04 1132 UTC

:Product: documentation at <http://www.sidc.be/products/quieta>

#-----#

# From the SIDC (RWC-Belgium): "ALL QUIET" ALERT #

#-----#

START OF ALL QUIET ALERT

.....

The SIDC - RWC Belgium expects quiet Space Weather conditions for the next 48 hours or until further notice.

This implies that:

- \* the solar X-ray output is expected to remain below C-class level,
- \* the K<sub>p</sub> index is expected to remain below 5,
- \* the high-energy proton fluxes are expected to remain below the event threshold.

#-----#

# Solar Influences Data analysis Center - RWC Belgium #

# Royal Observatory of Belgium #

# Fax : 32 (0) 2 373 0 224 #

# Tel.: 32 (0) 2 373 0 491 #

# #

# For more information, see <http://www.sidc.be>. Please do not reply #

## Start/End of all quiet alert from the SIDC/RWC Belgium

Solar Influences Data analysis Center <sidc@oma.be>

Sent: Wed 7/6/2016 12:11 AM

To: jan.janssens@oma.be

:Issued: 2016 Jul 05 2210 UTC

:Product: documentation at <http://www.sidc.be/products/quieta>

#-----#

# From the SIDC (RWC-Belgium): "ALL QUIET" ALERT #

#-----#

END OF ALL QUIET ALERT

.....

The SIDC - RWC Belgium expects solar or geomagnetic activity to increase. This may end quiet Space Weather conditions.

#-----#

# Solar Influences Data analysis Center - RWC Belgium #

# Royal Observatory of Belgium #

# Fax : 32 (0) 2 373 0 224 #

# Tel.: 32 (0) 2 373 0 491 #

# #

# For more information, see <http://www.sidc.be>. Please do not reply #

# directly to this message, but send comments and suggestions to #

# 'sidctech@oma.be'. If you are unable to use that address, use #

# 'rvdlinden@spd.aas.org' instead. #

# To unsubscribe, visit <http://sidc.be/registration/unsub.php> #

# #

# Legal notices: #





## **Space Weather into practice – URSIgram exercises**

Jan Janssens

SIDC SOLAR BULLETIN 15 May 2013, 1205UT

SIDC FORECAST (valid from 1230UT, 15 May 2013 until 17 May 2013)

SOLAR FLARES : Major flares expected (X-class flares expected, probability  $\geq 50\%$ )

GEOMAGNETISM : Active conditions expected ( $A \geq 20$  or  $K=4$ )

SOLAR PROTONS : Proton event expected (10 pfu at >10 MeV)

PREDICTIONS FOR 15 May 2013 10CM FLUX: 150 / AP: 017

PREDICTIONS FOR 16 May 2013 10CM FLUX: 152 / AP: 014

PREDICTIONS FOR 17 May 2013 10CM FLUX: 153 / AP: 011

COMMENT: A class X1.2 solar flare occurred today with peak time 01:48 UT, from NOAA AR 1748 which has a beta-gamma-delta magnetic configuration. It was associated with radio bursts and an increase of GOES proton flux levels, now at 5 protons/cm<sup>2</sup>-s-sr, the threshold of 10 protons/cm<sup>2</sup>-s-sr will likely be reached soon (at  $\geq 10$  MeV). The increases in proton flux likely come from the CME driven shock. If the strong flares from this AR continue, the proton increases will likely be more abrupt when the magnetic connection between the flare site and the Earth is better (i.e. when the AR is in the western hemisphere). A CME was associated with the event, a shock and glancing blow can probably be expected at the Earth late on May 16 (CME speed 1700 km/s in LASCO C2).

Geomagnetic conditions are quiet, but ACE data shows a disturbance starting this morning, with currently magnetic intensity close to 15 nT (northwards, so no geomagnetic effect). There is not enough data yet to discern clearly its cause, but it is likely related to the CME on May 12 (and possibly those from the two previous days related to X-flares from NOAA AR 1748). Geomagnetic conditions are expected to be unsettled to active, with possible isolated minor storm periods.

TODAY'S ESTIMATED ISN : 099, BASED ON 11 STATIONS.

## SOLAR INDICES FOR 14 May 2013

WOLF NUMBER CATANIA : 176

10CM SOLAR FLUX : 148

AK CHAMBON LA FORET : 012

AK WINGST : 009

ESTIMATED AP : 008

ESTIMATED ISN : 102, BASED ON 14 STATIONS.

## NOTICEABLE EVENTS SUMMARY

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO BURST TYPES	Catania NOAA NOTE
-----	-------	-----	-----	-----	------	----	------	-------------------	-------------------

15	0125	0148	0158	N12E64	X1.2	2N	IV/2II/1	1748
----	------	------	------	--------	------	----	----------	------

END

# URSIgram – Exercise 1

- **Setting**
  - You have received the above URSIgram. It is now 18:00UT on 15 May 2013. You have to brief your SWx colleagues.
- **Questions – Part 1 of 2: Reading-Comprehension questions**
  - Was the X1.2 flare: a) a strong flare (which class)? b) a long duration event (LDE)?
  - What kind of radio burst (SRB) is type «IV/2II/1 »?
  - ‘Active geomagnetic conditions’ correspond to which NOAA scale?
  - ‘ protons/cm<sup>2</sup>-s-sr ’ : This is the unit for which parameter? What is the short notation for this unit?
  - Despite the relatively strong magnetic field strength of 15 nT, no strong geomagnetic effects were recorded from this CME. Why?
  - ‘ Beta-Gamma-Delta ’: What’s the name of the corresponding active region classification scheme? What is the simplest type possible?
  - For the geomagnetic prediction of 15 May, why is  $A \geq 20$  while  $A_p=17$ ?
  - What is being evaluated under the column « OP »?



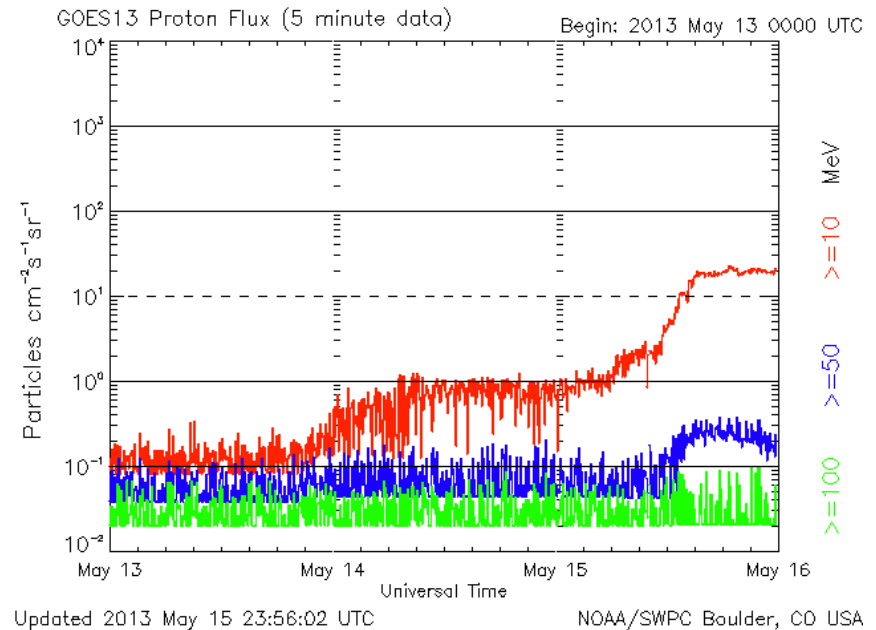
# URSIgram – Exercise 1

- **Setting**
  - You have received the above URSIgram. It is now 18:00UT on 15 May 2013. You have to brief your SWx colleagues.
- **Questions – Part 2 of 2: SWx impact questions**
  - Has the >10MeV proton event threshold been reached? If yes, what would be your communications advice concerning a Dutch frigate operating north of Iceland?
  - You received a report from Gilze-Rijen Air Base (The Netherlands) about HF radio communication problems around 01:45UT. Do you think they were related to the X1.2 flare?
  - With the LASCO/C2 data now fully available, do you agree (part of) the CME is headed for Earth? Why (not)?
  - Was the X1.2 event a Tenflare? Do you think the 10.7 cm radio flux of 20:00UT will be affected?
  - « ... possible isolated minor storm periods. » Do you expect important satellite communications problems?



# URSIgram – Exercise 1

- Question 1:
  - Has the >10MeV proton event threshold been reached? If yes, what would be your communications advice concerning a Dutch submarine operating north of Iceland?

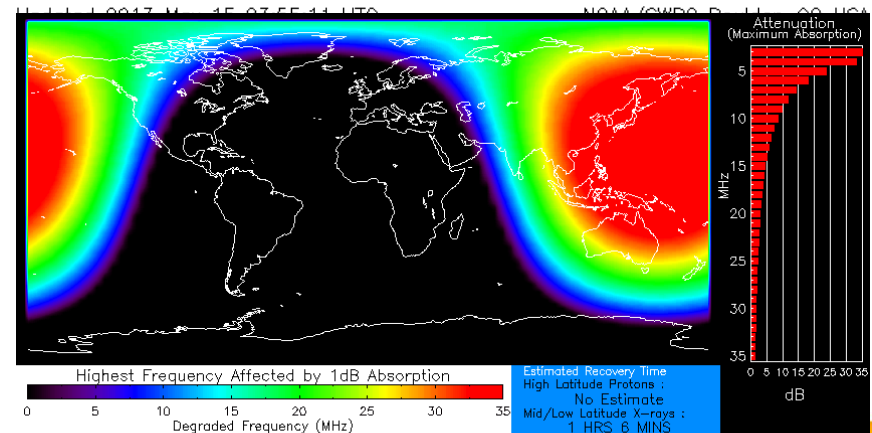
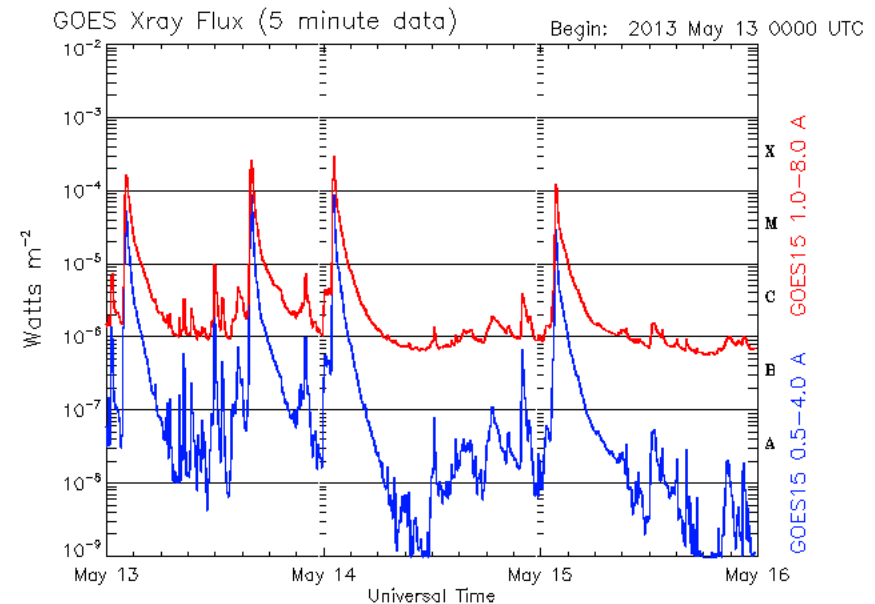


S 4	Severe	<b>Biological:</b> Unavoidable radiation hazard to astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk. <b>Satellite operations:</b> May experience memory device problems and noise on imaging systems; star-tracker problems may cause orientation problems, and solar panel efficiency can be degraded. <b>Other systems:</b> Blackout of HF radio communications through the polar regions and increased navigation errors over several days are likely.
S 3	Strong	<b>Biological:</b> Radiation hazard avoidance recommended for astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk. <b>Satellite operations:</b> Single-event upsets, noise in imaging systems, and slight reduction of efficiency in solar panel are likely. <b>Other systems:</b> Degraded HF radio propagation through the polar regions and navigation position errors likely.
S 2	Moderate	<b>Biological:</b> Passengers and crew in high-flying aircraft at high latitudes may be exposed to elevated radiation risk. <b>Satellite operations:</b> Infrequent single-event upsets possible. <b>Other systems:</b> Small effects on HF propagation through the polar regions and navigation at polar cap locations possibly affected.
S 1	Minor	<b>Biological:</b> None. <b>Satellite operations:</b> None. <b>Other systems:</b> Minor impacts on HF radio in the polar regions.



# URSIgram – Exercise 1

- Question 2:
  - You received a report from Gilze-Rijen Air Base (The Netherlands) about HF radio communication problems on 15 May around 01:45UT. Do you think they were related to the X1.2 flare?

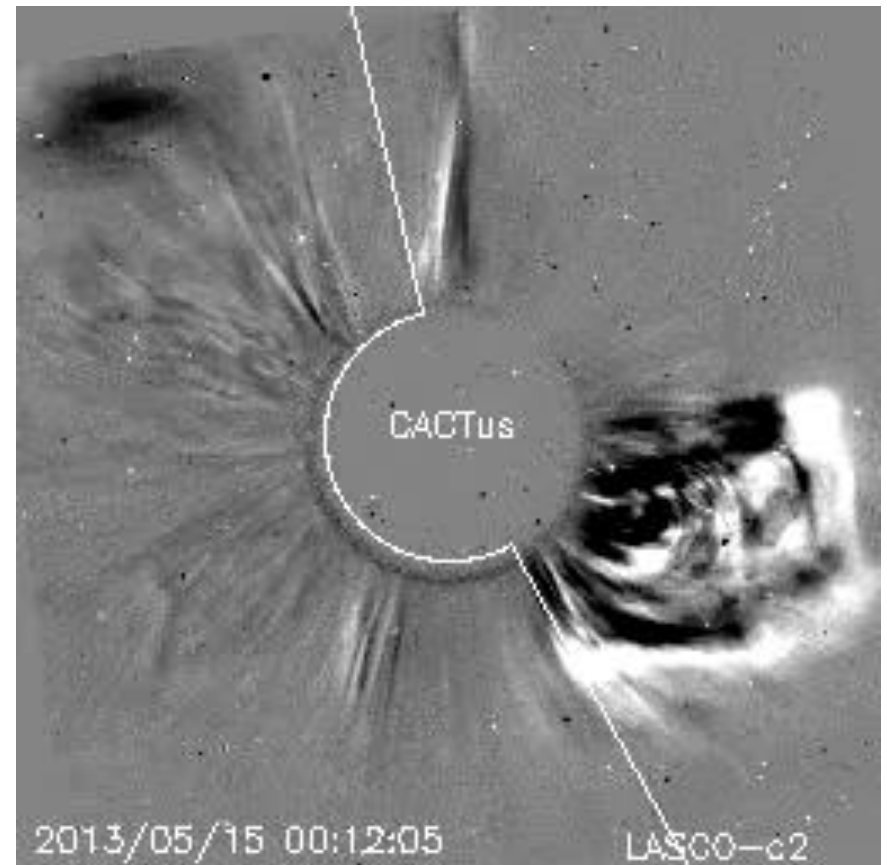


Strong X-ray flux  
Product Valid At : 2013-05-15 01:49 UTC

Normal Proton Background  
NOAA/SWPC Boulder, CO USA

# URSIgram – Exercise 1

- Question 3:
  - With the LASCO/C2 data now fully available, do you agree (part of) the CME is headed for Earth? Why (not)?



# URSIgram – Exercise 1

- Question 4:
  - Was the X1.2 event a Tenflare? Do you think the 10.7 cm radio flux of 20:00UT will be affected?

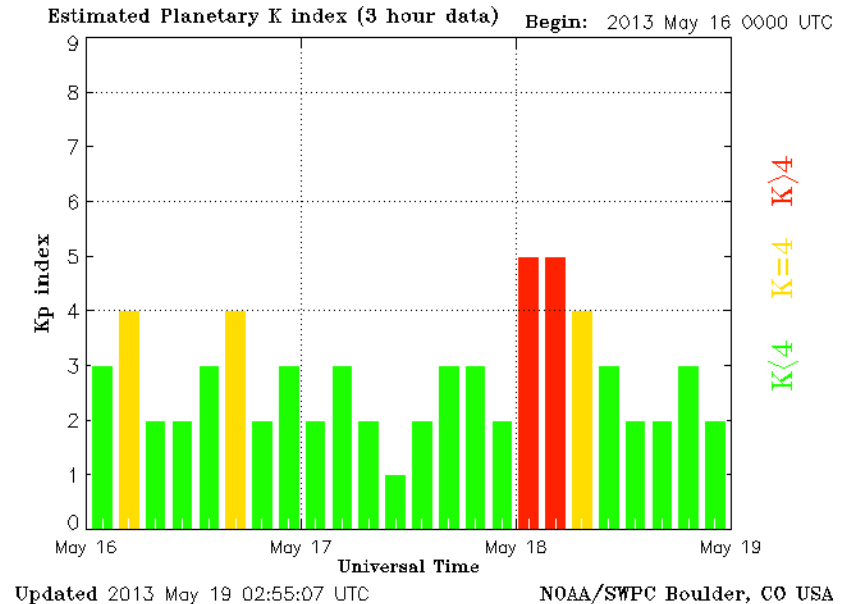
```
:Created: 2013 May 18 0332 UT
:Date: 2013 05 15
# Prepared by the U.S. Dept. of Commerce, NOAA, Space Weather Prediction Center
# Please send comments and suggestions to SWPC.Webmaster@noaa.gov
#
# Missing data: ////
# Updated every 30 minutes.
#
# Edited Events for 2013 May 15
#
#Event      Begin      Max      End  Obs  Q  Type  Loc/Frq  Particulars      Reg#
#-----
5160         0124      0140        0230  LEA  3   FLA  N12E64    2N      ERU          1748
5160         0125      0148        0158  G15  5   XRA  1-8A      X1.2    1.2E-01      1748
5160 +       0127      ////        0148  CUL  C   RSP  400-00*   IV/2          1748
5160 +       0127      0130        0142  LEA  G   RBR  410      240          1748
5160 +       0129      0134        0146  LEA  G   RBR  1415     300          1748
5160 +       0130      0136        0142  LEA  G   RBR  610      250          1748
5160 +       0133      0133        0146  LEA  G   RBR  245      430          1748
5160 +       0133      0142        0150  LEA  G   RBR  2695     440          1748
5160 +       0135      0141        0153  LEA  G   RBR  8800     1400         1748
5160 +       0136      0141        0154  LEA  G   RBR  15400     920          1748
5160 +       0136      0143        0151  LEA  G   RBR  4995     1000         1748
5160 +       0137      ////        0145  LEA  C   RSP  073-180   II/1    501          1748

:Product: 0516SGAS.txt
:Issued: 2013 May 16 0245 UTC
# Prepared jointly by the U.S. Dept. of Commerce, NOAA,
# Space Weather Prediction Center and the U.S. Air Force.
#
Joint USAF/NOAA Solar and Geophysical Activity Summary
SGAS Number 136 Issued at 0245Z on 16 May 2013
This report is compiled from data received at SWO on 15 May
A. Energetic Events
Begin Max End Rgn Loc Xray Op 245MHz 10cm Sweep
 0125 0148 0158 1748 N12E64 X1.2 2n 430 440 II/IV
B. Proton Events: A Greater than 10 MeV Proton event occurred at
15/1535Z, reached a peak flux of 23 pfu, and was ongoing as of the
writing of this summary.
```

# URSIgram – Exercise 1

- Question 5:
  - « ... possible isolated minor storm periods. »

Do you expect important satellite communications problems?



<b>G 3</b>	<b>Strong</b>	<b>Power systems:</b> Voltage corrections may be required, false alarms triggered on some protection devices. <b>Spacecraft operations:</b> Surface charging may occur on satellite components, drag may increase on low-Earth-orbit satellites, and corrections may be needed for orientation problems. <b>Other systems:</b> Intermittent satellite navigation and low-frequency radio navigation problems may occur, HF radio may be intermittent, and aurora has been seen as low as Illinois and Oregon (typically 50° geomagnetic lat.).
<b>G 2</b>	<b>Moderate</b>	<b>Power systems:</b> High-latitude power systems may experience voltage alarms, long-duration storms may cause transformer damage. <b>Spacecraft operations:</b> Corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions. <b>Other systems:</b> HF radio propagation can fade at higher latitudes, and aurora has been seen as low as New York and Idaho (typically 55° geomagnetic lat.).
<b>G 1</b>	<b>Minor</b>	<b>Power systems:</b> Weak power grid fluctuations can occur. <b>Spacecraft operations:</b> Minor impact on satellite operations possible. <b>Other systems:</b> Migratory animals are affected at this and higher levels; aurora is commonly visible at high latitudes (northern Michigan and Maine).

SIDC URSIGRAM 50623  
SIDC SOLAR BULLETIN 23 Jun 2015, 1242UT  
SIDC FORECAST (valid from 1230UT, 23 Jun 2015 until 25 Jun 2015)  
SOLAR FLARES : M-class flares expected (probability >=50%)  
GEOMAGNETISM : Major magstorm expected (A>=50 or K>=6)  
SOLAR PROTONS : Proton event in progress (>10 MeV)  
PREDICTIONS FOR 23 Jun 2015 10CM FLUX: 135 / AP: 038  
PREDICTIONS FOR 24 Jun 2015 10CM FLUX: 130 / AP: 038  
PREDICTIONS FOR 25 Jun 2015 10CM FLUX: 125 / AP: 018  
COMMENT: NOAA active region 2371 produced an M6.5 flare, peaking at 18:23 UT on June 22. An associated full halo CME erupted, with first measurement in LASCO C2 at 18:36 UT on June 22 and has a projected speed around 1000 km/s . A few filament eruptions were recorded in the Northwest quadrant, first a small one around 22:00 UT and then an extended one starting near 4:24 UT. Coronagraphic data indicate the occurrence of (mainly westward) CMEs, but incomplete data currently prohibit full analysis.

Proton levels have descended from the peak of 1070 pfu (19UT), despite some smaller peaks and are around 30 pfu at the moment. NOAA AR 2367 is now close to the West limb and could, in case of further eruptions, elevate the proton levels again. The proton levels might also be enhanced at the expected June 22 CME arrival. Flares at the M-level are expected, with some chance (15%) for a flare at the X-level.

A shock arrived to the ACE spacecraft at 18:01 UT on June 22, marking the expected arrival of the June 21 CME. The interplanetary magnetic field (IMF) magnitude jumped to 42 nT, with long periods of negative Bz down to -39 nT. Solar wind speeds reached values between 600 and 780 km/s. The IMF magnitude has declined to a current value of 12 nT.

Minor to severe geomagnetic conditions were recorded, with severe levels between 18 and 21 UT (on June 22) and between 3 and 6 UT (on June 23). The local K at Dourbes reached K=8 at 22 UT (on June 22). A decline to unsettled levels is expected for the coming hours. Further minor to major storm levels are expected, following the expected arrival of June 22 CME around 12:00 UT on June 24.

TODAY'S ESTIMATED ISN : 042, BASED ON 14 STATIONS.

SOLAR INDICES FOR 22 Jun 2015  
WOLF NUMBER CATANIA : 083  
10CM SOLAR FLUX : 135  
AK CHAMBON LA FORET : 108  
AK WINGST : ///  
ESTIMATED AP : 073  
ESTIMATED ISN : 047, BASED ON 23 STATIONS.

NOTICEABLE EVENTS SUMMARY  
DAY BEGIN MAX END LOC XRAY OP 10CM Catania/NOAA RADIO\_BURST\_TYPES  
22 1739 1823 1851 N12W08 M6.5 2B 1000 92/2371 II/1  
END

# URSIgram – Exercise 2

- **Setting**

- You have received the above URSIgram (23 June 2015 – 12:42UT). You have to brief your SWx colleagues.

- **Questions**

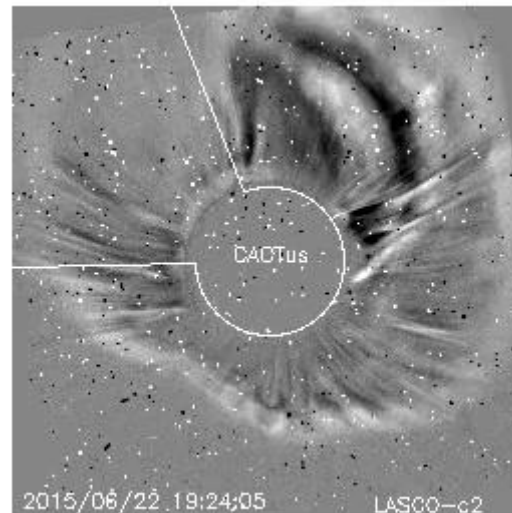
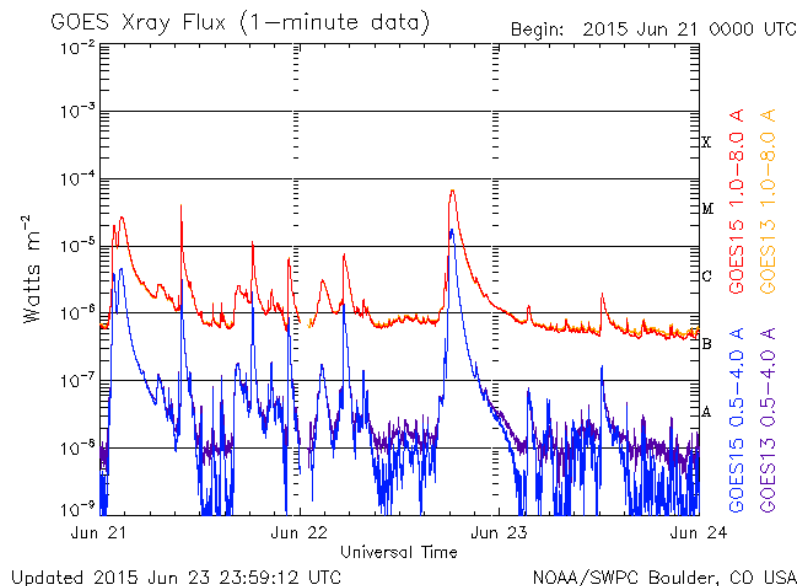
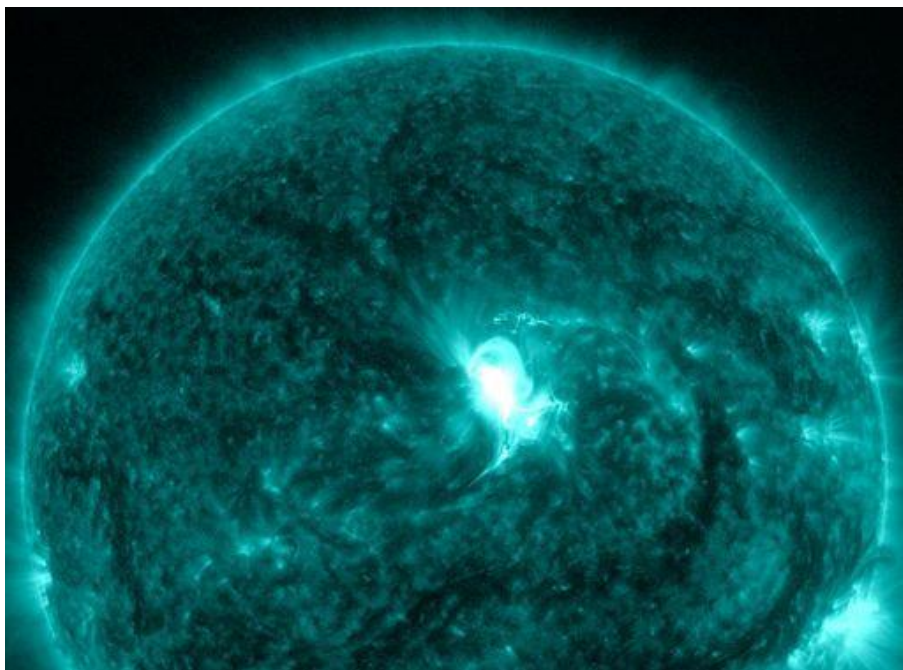
- Where on the solar surface did the M6 flare take place?
- How would you characterize the solar activity level (very low, ... , very high) over the last 24 hours?
- Did the M6 flare affect the daily 10.7cm radio flux of 22 June?
- A proton event is in progress.
  - Do you (still) expect a GLE?
  - What would you recommend concerning arctic polar flights?
- In terms of Dst, how strong would you expect this event to be (Quiet, ... , Extreme)?
- Based on the description of the geomagnetic storm:
  - Would you expect major satellite problems from deep di-electric charging?
  - Would you expect degradation of GNSS applications (WAAS,...)?





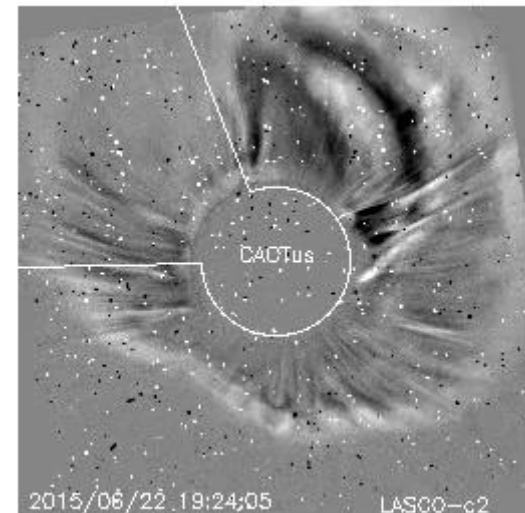
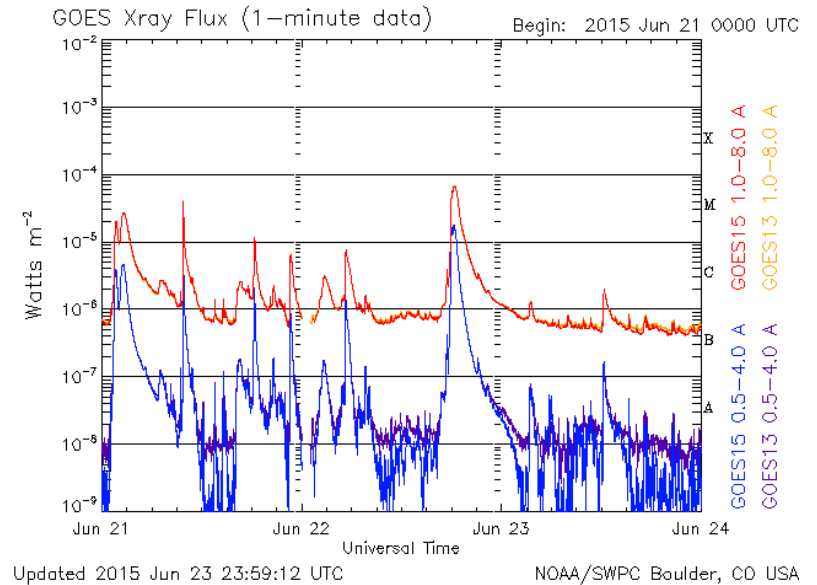
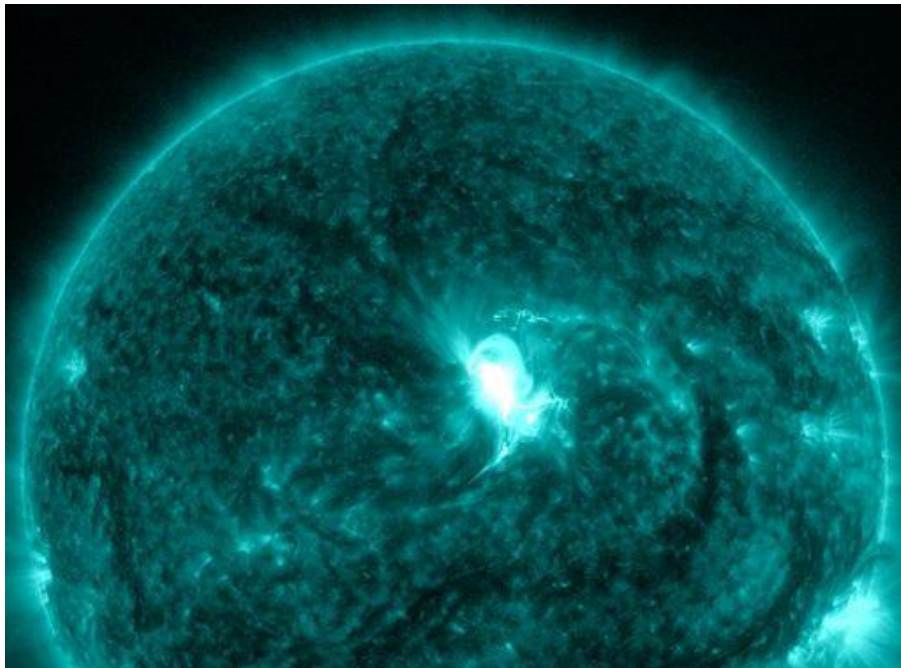
# URSIgram – Exercise 2

- Where on the solar surface did the M6 flare take place?



# URSIgram – Exercise 2

- How would you characterize the solar activity level (very low, ... , very high) over the last 24 hours?



# URSIgram – Exercise 2

- Did the M6 flare affect the daily 10.7cm radio flux of 22 June?

TODAY'S ESTIMATED ISN : 042, BASED ON 14 STATIONS.

SOLAR INDICES FOR 22 Jun 2015

WOLF NUMBER CATANIA : 083

10CM SOLAR FLUX :

AK CHAMBON LA FORET : 108

AK WINGST : ///

ESTIMATED AP : 073

ESTIMATED ISN : 047, BASED ON 23 STATIONS.

NOTICEABLE EVENTS SUMMARY

DAY BEGIN MAX END LOC XRAY OP 10CM Catania/NOAA RADIO\_BURST\_TYPES

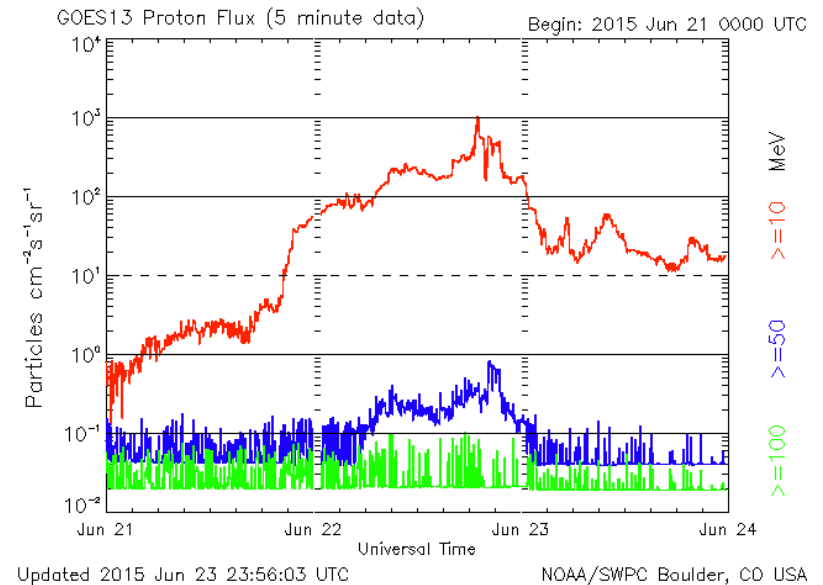
22 1739 1823 1851 N12W08 M6.5 2B 1000 92/2371 II/1

Date	Time	Julian day	Carrington rotation	Observed Flux	Adjusted Flux	URSI Flux
2015-06-20	17:00:00	2457194.197	2165.117	134.4	138.8	124.9
2015-06-20	20:00:00	2457194.322	2165.121	135.4	139.8	125.8
2015-06-20	23:00:00	2457194.447	2165.126	134.0	138.4	124.5
2015-06-21	17:00:00	2457195.197	2165.153	133.0	137.4	123.6
2015-06-21	20:00:00	2457195.322	2165.158	131.7	136.0	122.4
2015-06-21	23:00:00	2457195.447	2165.163	128.6	132.8	119.5
2015-06-22	17:00:00	2457196.197	2165.190	130.1	134.3	120.9
2015-06-22	20:00:00	2457196.322	2165.195	246.9	255.0	229.5
2015-06-22	23:00:00	2457196.447	2165.199	127.2	131.3	118.2
2015-06-23	17:00:00	2457197.197	2165.227	116.5	120.3	108.3
2015-06-23	20:00:00	2457197.322	2165.231	116.1	119.9	107.9
2015-06-23	23:00:00	2457197.447	2165.236	116.6	120.4	108.4



# URSIgram – Exercise 2

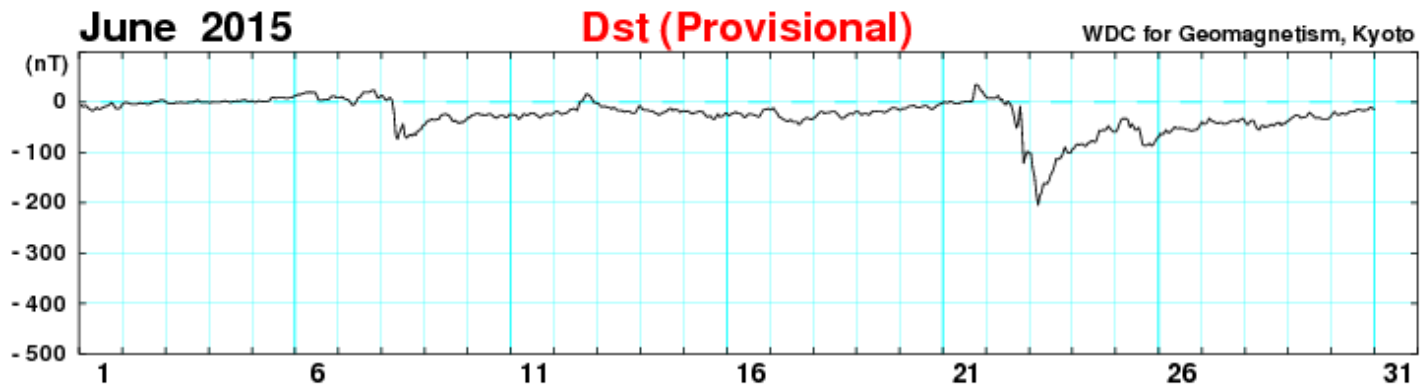
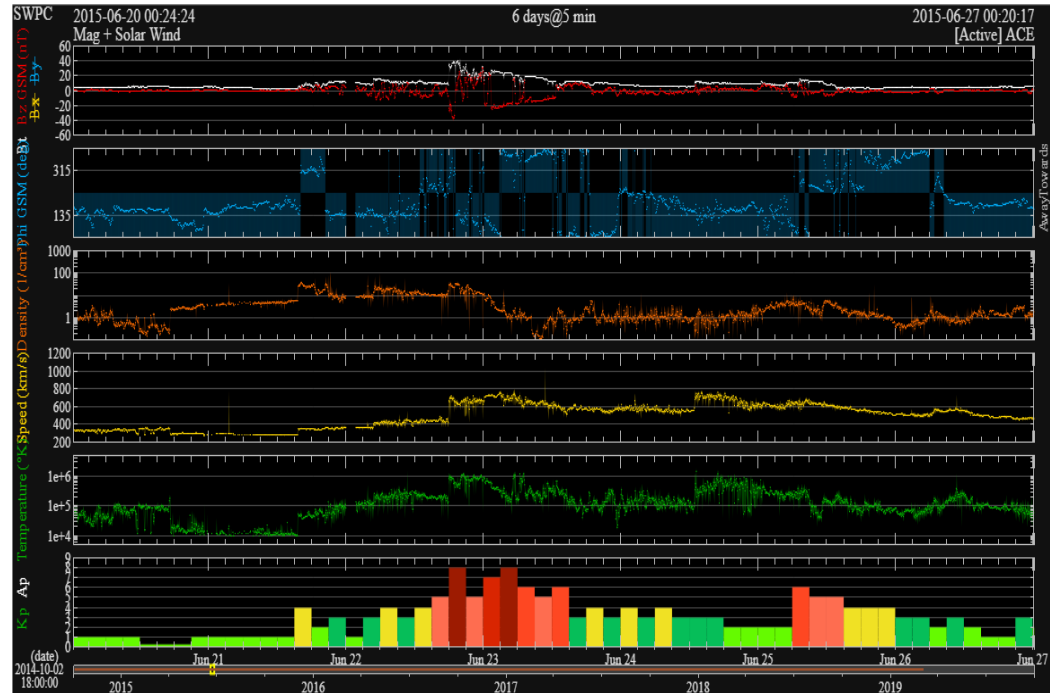
- A proton event is in progress.
  - Do you (still) expect a GLE?
  - What would you recommend concerning arctic polar flights?



S 4	Severe	<b>Biological:</b> Unavoidable radiation hazard to astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk. <b>Satellite operations:</b> May experience memory device problems and noise on imaging systems; star-tracker problems may cause orientation problems, and solar panel efficiency can be degraded. <b>Other systems:</b> Blackout of HF radio communications through the polar regions and increased navigation errors over several days are likely.
S 3	Strong	<b>Biological:</b> Radiation hazard avoidance recommended for astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk. <b>Satellite operations:</b> Single-event upsets, noise in imaging systems, and slight reduction of efficiency in solar panel are likely. <b>Other systems:</b> Degraded HF radio propagation through the polar regions and navigation position errors likely.
S 2	Moderate	<b>Biological:</b> Passengers and crew in high-flying aircraft at high latitudes may be exposed to elevated radiation risk. <b>Satellite operations:</b> Infrequent single-event upsets possible. <b>Other systems:</b> Small effects on HF propagation through the polar regions and navigation at polar cap locations possibly affected.
S 1	Minor	<b>Biological:</b> None. <b>Satellite operations:</b> None. <b>Other systems:</b> Minor impacts on HF radio in the polar regions.

# URSIgram – Exercise 2

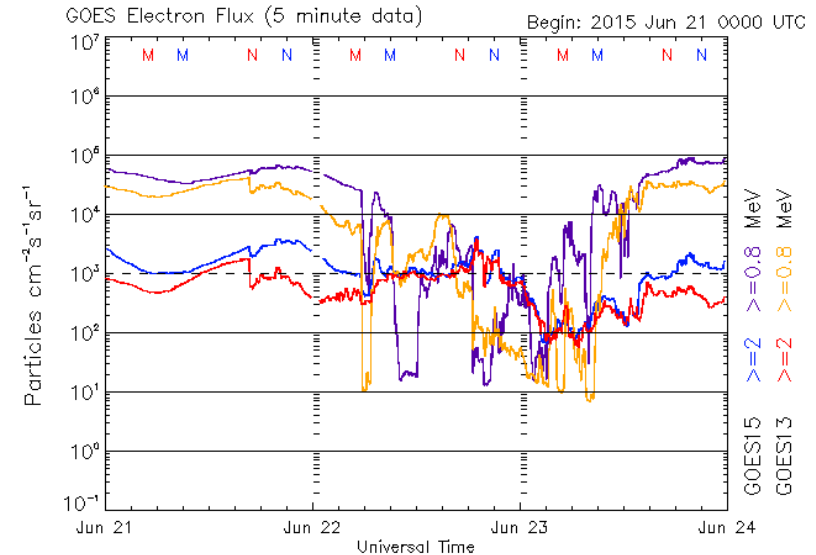
- In terms of Dst, how strong would you expect this event to be (Quiet, ... , Extreme)?



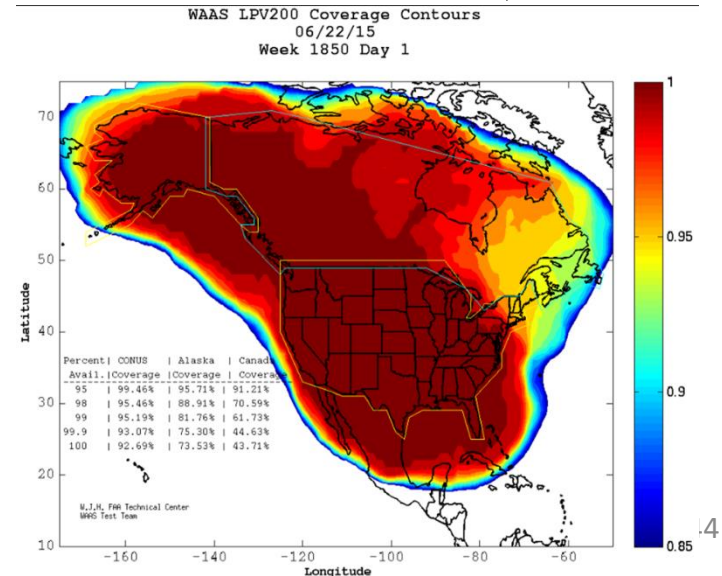


# URSIgram – Exercise 2

- Based on the description of the geomagnetic storm:
  - Would you expect major satellite problems from deep di-electric charging?
  - Would you expect degradation of GNSS applications (WAAS,...)?



Updated 2015 Jun 23 23:56:03 UTC NOAA/SWPC Boulder, CO USA





# SIDC/RWC & URSIgram - Summary

- SIDC/RWC
- SWx alerts issued by the SIDC
- Exercises

