

# 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
- URSIgram
  - Overview features
- SWx alerts
- Exercises

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- **SIDC/RWC**
- URSIgram
  - Overview features
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# The SIDC

- 1981
  - Sunspot Index Data Centre
    - Sunspot number
- 2000
  - Solar Indices Data analysis Centre
    - = OD « Solar Physics and Space Weather »
    - Incl. SWx services
      - SIDC/RWC
- 2013
  - SILSO
    - Sunspot Index and Long-term Solar Observations

SWIC - Collaboration between STCE, Koninklijke Luchtmacht, KNMI



# The SIDC / RWC

## Team of space weather forecasters

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



SWIC - Collaboration between STCE, Koninklijke Luchtmacht, KNMI

6

### International Space Environment Service

ISES (International Space Environment Services):  
international network

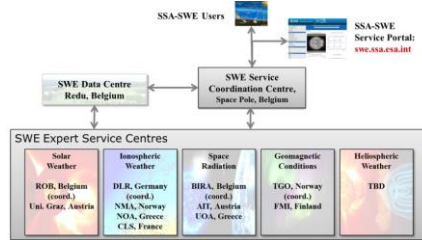
- ROB/SIDC is RWC (Regional Warning centre) since 2000
- endorsement by national government
- Services delivered to SWE network developed under ESA SSA (Space Situational Awareness) program (cfr. presentation by MK). Expert Group coordinating the Expert Service Centre “Solar Weather”

ICAO: International Civil Aviation Organization

PECASUS: Pan European Consortium for Aviation Space weather User Services

# The SIDC / RWC Regional Warning Centre Brussels

- International context
  - ISES
    - International Space Environment Service
  - ESA / SSCC
    - Services and expertise
  - WMO / ICTSW
  - ICAO / PECASUS



International Space Environment Service  
<http://www.spaceweather.org/>

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WMO: WMO: ICTWS: 4-year → plan for consolidation of SWx services in WMO.

ICTSW: Interprogramme Coordination Team on Space Weather

WMO: World Meteorological Organization

# SWx effects covered by aviation advisories

Effect	Sub-effect	Parameter used	Moderate	Severe
GNSS	Amplitude Scintillation	S4 (dimensionless)	0.5	0.8
GNSS	Phase Scintillation	Sigma-phi (radians)	0.4	0.7
GNSS	Vertical Total Electron Content (TEC)	TEC units	125	175
RADIATION		Effective dose (micro-Sieverts/hour)*	30	80
HF COM	Auroral Absorption (AA)	Kp	8	9
HF COM	Polar Cap Absorption (PCA)	dB from 30MHz riometer data	2	5
HF COM	Shortwave Fadeout (SWF)	Solar X-rays (0.1-0.8 nm) (W-m <sup>-2</sup> )	1x10 <sup>-4</sup> (X1)	1x10 <sup>-3</sup> (X10)
HF COM	Post-Storm Depression	MUF**	30%	50%
SATCOM***	N/A	N/A	N/A	N/A

[Manual] §3.6 and table 3-1

\* MOD advisories will only be issued when the MOD threshold is reached at FL460 and below. SEV advisories will be issued when the SEV threshold is reached at any flight level. [Manual], §3.6, table 3-1

\*\* As compared to a 30-day running median of the critical frequency of the F2 layer (foF2). At least one interval with Kp≥6 over the last 5 days. [Manual], §3.6, table 3-1

\*\*\* Currently, there are no thresholds for SATCOM effects [SWAG] §1.2, table 1

SWIC - Collabora





# Weekly SIDC SWx briefing



*From the TV5 documentary: "La météo de l'espace: l'émergence d'une nouvelle science"*  
<https://www.dailymotion.com/video/x39iwaj>

SWIC - Collaboration between STCE, Koninklijke Luchtmacht, KNMI



# 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 539 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 23 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 0600 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.sidc.be/newsletters/>  
 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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1. STCE Workshop "Geomagnetic storms and solar eruptions: from Sun to Earth"	2
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3. PROBA2 Observations (23 Jan 2017 - 29 Jan 2017)	6
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7. Review of ionospheric activity (23 Jan 2017 - 29 Jan 2017)	14



Solar Influences  
 Space weather Centre  
[www.sidc.be](http://www.sidc.be)

Royal Observatory  
 of Belgium

The space weather briefing as a pdf: <http://www.sidc.be/newsletters/SIDCbriefing2017-01-30.pdf>

# SIDC products – Free online

The screenshot shows the SIDC - Solar Influences Data Analysis Center website. The page title is "SIDC - Solar Influences Data Analysis Center" and the URL is "www.sidc.be/registration/registration\_main.php". The page features a navigation menu on the left with categories like "Home", "General info", "Jobs and Students", "Projects", "Publications", "Sunspots (SILSO)", "Software", "user guide", "Local Solar Observations", "Space Weather services", "Real Time Data", "Seminars", and "LEGAL NOTICES". There are also logos for "SWW" and "Classroom".

The main content area displays a table of products with the following columns: Mail header, SIDC code, Description, format, Frequency, and Source. A link "Click here to (un)subscribe to products" is located above the table.

Mail header	SIDC code	Description	format	Frequency	Source
Boumeuss	bms	Sunspot data.	Encoded data (ISES)	daily	SEC (RWC-Boulder,US)
COMESep 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	COMESep 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. <small>This message is of the fast</small>	Plain text	ASAP, when a flare >M5 has been detected	SIDC (RWC-Belgium)

At the bottom of the browser window, the Windows taskbar is visible, showing the search bar "Ask me anything" and the system tray with the date and time "10:51 AM 3/21/2017".

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# URSIgram

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

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☆☆☆☆

## SIDC - Solar Influences Data Analysis Center

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

Home

- Ground-based images (UBET)
- Human Solar Radioastronomy
- Sunspots (SILSO)
- Space Weather services
- Image Processing
- Hardware characterisation
- Space instruments
- Visualisation
- Dissemination
- General info
- LEGAL NOTICES

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.

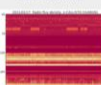
Over the past 24 hours the solar wind speed remained slow between 320 km/s and 375 km/s, the total magnetic field slowly increased up 10 nT and the Bz component ranged between -8.8 nT and 7.8 nT being mostly negative since February 16 at 02:00 UTC. The solar wind parameters indicate that the solar wind is slightly compressed ahead of the expected high-speed stream 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.

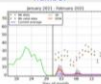
The geomagnetic conditions over the past 24 hours were active in response to the enhanced interplanetary magnetic field and the prolonged period of southward directed Bz component. Unsettled conditions are expected for the next 24 hours with possible active periods due to the enhancement of the solar 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**

SWIC - Collaboration between STCE, Koninklijke Luchtmacht, KNMI

13 

:Issued: 2014 Apr 17 1325 UTC  
 :Product: documentation at <http://www.sidc.be/products/tot>  
 #-----#  
 # DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from the SIDC #  
 #-----#  
 SIDC URSIGRAM 40417  
 SIDC SOLAR BULLETIN 17 Apr 2014, 1304UT



SIDC FORECAST (valid from 1230UT, 17 Apr 2014 until 19 Apr 2014)  
 SOLAR FLARES : Active (M-class flares expected, probability >=50%)  
 GEOMAGNETISM : Quiet (A<20 and K<4)  
 SOLAR PROTONS : Quiet

PREDICTIONS FOR 17 Apr 2014 10CM FLUX: 180 / AP: 013  
 PREDICTIONS FOR 18 Apr 2014 10CM FLUX: 184 / AP: 007  
 PREDICTIONS FOR 19 Apr 2014 10CM FLUX: 188 / AP: 005

COMMENT: Eleven sunspot groups were reported by NOAA today. NOAA ARs 2035, 2036, and 2037 (Catania numbers 24, 25, and 26 respectively) maintain the beta-gamma configuration of the photospheric magnetic field. The strongest flare of the past 24 hours was the M1.0 flare peaking at 19:59 UT yesterday in the NOAA AR 2035 (Catania number 24). The flare was associated with an EIT wave and a weak coronal dimming, but the associated CME was narrow and is not expected to arrive at the Earth.

We expect further flaring activity on the C-level, especially in the NOAA ARs 2035 and 2037 (Catania numbers 24 and 26 respectively) as well as in the NOAA AR 2042 (no Catania number yet) that yesterday appeared from behind the east solar limb, with a good chance for an M-class event.

Since yesterday evening the Earth is situated inside a solar wind structure with an elevated interplanetary magnetic field magnitude (occasionally up to 10 nT). It may be a weak ICME or the compression region on the flank of an ICME that missed the Earth. The solar origin of this structure is not clear. The north-south magnetic field component Bz was not strong, so no significant geomagnetic disturbance resulted (K index stayed below 4). Currently the solar wind speed is around 380 km/s and the IMF magnitude is around 8 nT.

We expect quiet to unsettled (K index up to 3) geomagnetic conditions, with active geomagnetic conditions (K = 4) possible, but unlikely.

TODAY'S ESTIMATED ISN : 145, BASED ON 17 STATIONS.  
 99999

SOLAR INDICES FOR 16 Apr 2014  
 WOLF NUMBER CATANIA : ///  
 10CM SOLAR FLUX : 184  
 AK CHAMBON LA FORET : 012  
 AK WINGST : 004  
 ESTIMATED AP : 004  
 ESTIMATED ISN : 139, BASED ON 29 STATIONS.

## Satellites and instruments

NOTICEABLE EVENTS SUMMARY  
 DAY BEGIN MAX END LOC XRAY OP 10CM Catania/NOAA RADIO\_BURST\_TYPES  
 16 1954 1959 2004 S14E09 M1.0 1N 24/2035 II/2  
 END

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## Catania regions

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## Suns spot numbers

**ESTIMATED AP : 004**  
**ESTIMATED ISN : 139, BASED ON 29 STATIONS.**

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 16 1954 1959 2004 S14E09 M1.0 1N **24** 2035 II/2  
 END

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## Flare classification

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END							



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*Flare features*

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*Radio bursts*

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 PREDICTIONS FOR 19 Apr 2014 10CM FLUX: 188 / AP: 005

COMMENT: Eleven sunspot groups were reported by NOAA today. NOAA ARs 2035, 2036, and 2037 (Catania numbers 24, 25, and 26 respectively) maintain the beta-gamma configuration of the photospheric magnetic field. The strongest flare of the past 24 hours was the M1.0 flare peaking at 19:59 UT yesterday in the NOAA AR 2035 (Catania number 24). The flare was associated with an EIT wave and a weak coronal dimming, but the associated CME was narrow and is not expected to arrive at the Earth.

We expect further flaring activity on the C-level, especially in the NOAA ARs 2035 and 2037 (Catania numbers 24 and 26 respectively) as well as in the NOAA AR 2042 (no Catania number yet) that yesterday appeared from behind the east solar limb, with a good chance for an M-class event.

Since yesterday evening the Earth is situated inside a solar wind structure with an elevated interplanetary magnetic field magnitude (occasionally up to 10 nT). It may be a weak ICME or the compression region on the flank of an ICME that missed the Earth. The solar origin of this structure is not clear. The north-south magnetic field component Bz was not strong, so no significant geomagnetic disturbance resulted (K index stayed below 4). Currently the solar wind speed is around 380 km/s and the IMF magnitude is around 8 nT.

We expect quiet to unsettled (K index up to 3) geomagnetic conditions, with active geomagnetic conditions (K = 4) possible, but unlikely.

TODAY'S ESTIMATED ISN : 145, BASED ON 17 STATIONS.  
 99999

SOLAR INDICES FOR 16 Apr 2014  
 WOLF NUMBER CATANIA : ///  
 10CM SOLAR FLUX : 184  
 AK CHAMBON LA FORET : 012  
 AK WINGST : 004  
 ESTIMATED AP : 004  
 ESTIMATED ISN : 139, BASED ON 29 STATIONS.

*Active region classification  
 & filaments / prominences*

*Flare prediction*

NOTICEABLE EVENTS SUMMARY  
 DAY BEGIN MAX END LOC XRAY OP 10CM Catania/NOAA RADIO\_BURST\_TYPES  
 16 1954 1959 2004 S14E09 M1.0 1N 24/2035 II/2  
 END

:Issued: 2014 Apr 17 1325 UTC  
:Product: documentation at <http://www.sidc.be/products/tot>  
#-----#  
# DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from the SIDC #  
#-----#  
SIDC URSIGRAM 40417  
SIDC SOLAR BULLETIN 17 Apr 2014, 1304UT



SIDC FORECAST (valid from 1230UT, 17 Apr 2014 until 19 Apr 2014)  
SOLAR FLARES : Active (M-class flares expected, probability >=50%)  
GEOMAGNETISM : Quiet (A<20 and K<4)  
SOLAR PROTONS : Quiet

PREDICTIONS FOR 17 Apr 2014 10CM FLUX: 180 / AP: 013  
PREDICTIONS FOR 18 Apr 2014 10CM FLUX: 184 / AP: 007  
PREDICTIONS FOR 19 Apr 2014 10CM FLUX: 188 / AP: 005

COMMENT: Eleven sunspot groups were reported by NOAA today. NOAA ARs 2035, 2036, and 2037 (Catania numbers 24, 25, and 26 respectively) maintain the beta-gamma configuration of the photospheric magnetic field. The strongest flare of the past 24 hours was the M1.0 flare peaking at 19:59 UT yesterday in the NOAA AR 2035 (Catania number 24). The flare was associated with an EIT wave and a weak coronal dimming, but the associated CME was narrow and is not expected to arrive at the Earth.

We expect further flaring activity on the C-level, especially in the NOAA ARs 2035 and 2037 (Catania numbers 24 and 26 respectively) as well as in the NOAA AR 2042 (no Catania number yet) that yesterday appeared from behind the east solar limb, with a good chance for an M-class event.

Since yesterday evening the Earth is situated inside a solar wind structure with an elevated interplanetary magnetic field magnitude (occasionally up to 10 nT). It may be a weak ICME or the compression region on the flank of an ICME that missed the Earth. The solar origin of this structure is not clear. The north-south magnetic field component Bz was not strong, so no significant geomagnetic disturbance resulted (K index stayed below 4). Currently the solar wind speed is around 380 km/s and the IMF magnitude is around 8 nT.

We expect quiet to unsettled (K index up to 3) geomagnetic conditions, with active geomagnetic conditions (K = 4) possible, but unlikely.

TODAY'S ESTIMATED ISN : 145, BASED ON 17 STATIONS.  
99999

SOLAR INDICES FOR 16 Apr 2014  
WOLE NUMBER CATANIA : ///  
10CM SOLAR FLUX : 184

**10.7 cm Radio flux**

AK CHAMBON LA FORET : 012  
AK WINGST : 004  
ESTIMATED AP : 004  
ESTIMATED ISN : 139, BASED ON 29 STATIONS.

NOTICEABLE EVENTS SUMMARY  
DAY BEGIN MAX END LOC XRAY OP 10CM Catania/NOAA RADIO\_BURST\_TYPES  
16 1954 1959 2004 S14E09 M1.0 1N 24/2035 II/2  
END

:Issued: 2014 Apr 17 1325 UTC  
 :Product: documentation at <http://www.sidc.be/products/tot>  
 #-----#  
 # DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from the SIDC #  
 #-----#  
 SIDC URSIGRAM 40417  
 SIDC SOLAR BULLETIN 17 Apr 2014, 1304UT



SIDC FORECAST (valid from 1230UT, 17 Apr 2014 until 19 Apr 2014)  
 SOLAR FLARES : Active (M-class flares expected, probability >=50%)  
 GEOMAGNETISM : Quiet (A<20 and K<4)  
 SOLAR PROTONS : Quiet

PREDICTIONS FOR 17 Apr 2014 10CM FLUX: 180 / AP: 013  
 PREDICTIONS FOR 18 Apr 2014 10CM FLUX: 184 / AP: 007  
 PREDICTIONS FOR 19 Apr 2014 10CM FLUX: 188 / AP: 005

COMMENT: Eleven sunspot groups were reported by NOAA today. NOAA ARs 2035, 2036, and 2037 (Catania numbers 24, 25, and 26 respectively) maintain the beta-gamma configuration of the photospheric magnetic field. The strongest flare of the past 24 hours was the M1.0 flare peaking at 19:59 UT yesterday in the NOAA AR 2035 (Catania number 24). The flare was associated with an EIT wave and a weak coronal dimming, but the associated CME was narrow and is not expected to arrive at the Earth.

We expect further flaring activity on the C-level, especially in the NOAA ARs 2035 and 2037 (Catania numbers 24 and 26 respectively) as well as in the NOAA AR 2042 (no Catania number yet) that yesterday appeared from behind the east solar limb, with a good chance for an M-class event.

Since yesterday evening the Earth is situated inside a solar wind structure with an elevated interplanetary magnetic field magnitude (occasionally up to 10 nT). It may be a weak ICME or the compression region on the flank of an ICME that missed the Earth. The solar origin of this structure is not clear. The north-south magnetic field component Bz was not strong, so no significant geomagnetic disturbance resulted (K index stayed below 4). Currently the solar wind speed is around 380 km/s and the IMF magnitude is around 8 nT.

We expect quiet to unsettled (K index up to 3) geomagnetic conditions, with active geomagnetic conditions (K = 4) possible, but unlikely.

TODAY'S ESTIMATED ISN : 145, BASED ON 17 STATIONS.  
 99999

## Proton flux / events

SOLAR INDICES FOR 16 Apr 2014  
 WOLF NUMBER CATANIA : ///  
 10CM SOLAR FLUX : 184  
 AK CHAMBON LA FORET : 012  
 AK WINGST : 004  
 ESTIMATED AP : 004  
 ESTIMATED ISN : 139, BASED ON 29 STATIONS.

NOTICEABLE EVENTS SUMMARY  

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	Catania/NOAA	RADIO_BURST_TYPES
16	1954	1959	2004	S14E09	M1.0	1N	24/2035		II/2
END									

:Issued: 2014 Apr 17 1325 UTC  
 :Product: documentation at <http://www.sidc.be/products/tot>  
 #-----#  
 # DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from the SIDC #  
 #-----#  
 SIDC URSIGRAM 40417  
 SIDC SOLAR BULLETIN 17 Apr 2014, 1304UT



SIDC FORECAST (valid from 1230UT, 17 Apr 2014 until 19 Apr 2014)  
 SOLAR FLARES : Active (M-class flares expected, probability >=50%)  
 GEOMAGNETISM : Quiet (A<20 and K<4)  
 SOLAR PROTONS : Quiet

PREDICTIONS FOR 17 Apr 2014 10CM FLUX: 180 / AP: 013  
 PREDICTIONS FOR 18 Apr 2014 10CM FLUX: 184 / AP: 007  
 PREDICTIONS FOR 19 Apr 2014 10CM FLUX: 188 / AP: 005

COMMENT: Eleven sunspot groups were reported by NOAA today. NOAA ARs 2035, 2036, and 2037 (Catania numbers 24, 25, and 26 respectively) maintain the beta-gamma configuration of the photospheric magnetic field. The strongest flare of the past 24 hours was the M1.0 flare peaking at 19:59 UT yesterday in the NOAA AR 2035 (Catania number 24). The flare was associated with an EIT wave and a weak coronal dimming, but the associated CME was narrow and is not expected to arrive at the Earth.

We expect further flaring activity on the C-level, especially in the NOAA ARs 2035 and 2037 (Catania numbers 24 and 26 respectively) as well as in the NOAA AR 2042 (no Catania number yet) that yesterday appeared from behind the east solar limb, with a good chance for an M-class event.

Since yesterday evening the Earth is situated inside a solar wind structure with an elevated interplanetary magnetic field magnitude (occasionally up to 10 nT). It may be a weak ICME or the compression region on the flank of an ICME that missed the Earth. The solar origin of this structure is not clear. The north-south magnetic field component Bz was not strong, so no significant geomagnetic disturbance resulted (K index stayed below 4). Currently the solar wind speed is around 380 km/s and the IMF magnitude is around 8 nT.  
 We expect quiet to unsettled (K index up to 3) geomagnetic conditions, with active geomagnetic conditions (K = 4) possible, but unlikely.

TODAY'S ESTIMATED ISN : 145, BASED ON 17 STATIONS.  
 99999

**CME & ICME**

SOLAR INDICES FOR 16 Apr 2014  
 WOLF NUMBER CATANIA : ///  
 10CM SOLAR FLUX : 184  
 AK CHAMBON LA FORET : 012  
 AK WINGST : 004  
 ESTIMATED AP : 004  
 ESTIMATED ISN : 139, BASED ON 29 STATIONS.

NOTICEABLE EVENTS SUMMARY  
 DAY BEGIN MAX END LOC XRAY OP 10CM Catania/NOAA RADIO\_BURST\_TYPES  
 16 1954 1959 2004 S14E09 M1.0 1N 24/2035 II/2  
 END

:Issued: 2014 Apr 17 1325 UTC  
:Product: documentation at <http://www.sidc.be/products/tot>  
#-----#  
# DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from the SIDC #  
#-----#  
SIDC URSIGRAM 40417  
SIDC SOLAR BULLETIN 17 Apr 2014, 1304UT

SIDC FORECAST (valid from 1230UT, 17 Apr 2014 until 19 Apr 2014)  
SOLAR FLARES : Active (M-class flares expected, probability >=50%)  
GEOMAGNETISM : Quiet (A<20 and K<4)  
SOLAR PROTONS : Quiet

PREDICTIONS FOR 17 Apr 2014 10CM FLUX: 180 / AP: 013  
PREDICTIONS FOR 18 Apr 2014 10CM FLUX: 184 / AP: 007  
PREDICTIONS FOR 19 Apr 2014 10CM FLUX: 188 / AP: 005

COMMENT: Eleven sunspot groups were reported by NOAA today. NOAA ARs 2035, 2036, and 2037 (Catania numbers 24, 25, and 26 respectively) maintain the beta-gamma configuration of the photospheric magnetic field. The strongest flare of the past 24 hours was the M1.0 flare peaking at 19:59 UT yesterday in the NOAA AR 2035 (Catania number 24). The flare was associated with an EIT wave and a weak coronal dimming, but the associated CME was narrow and is not expected to arrive at the Earth.

We expect further flaring activity on the C-level, especially in the NOAA ARs 2035 and 2037 (Catania numbers 24 and 26 respectively) as well as in the NOAA AR 2042 (no Catania number yet) that yesterday appeared from behind the east solar limb, with a good chance for an M-class event.

Since yesterday evening the Earth is situated inside a solar wind structure with an elevated interplanetary magnetic field magnitude (occasionally up to 10 nT). It may be a weak ICME or the compression region on the flank of an ICME that missed the Earth. The solar origin of this structure is not clear. The north-south magnetic field component Bz was not strong, so no significant geomagnetic disturbance resulted (K index stayed below 4). Currently the solar wind speed is around 380 km/s and the IMF magnitude is around 8 nT.

We expect quiet to unsettled (K index up to 3) geomagnetic conditions, with active geomagnetic conditions (K = 4) possible, but unlikely.

TODAY'S ESTIMATED ISN : 145, BASED ON 17 STATIONS.  
99999

SOLAR INDICES FOR 16 Apr 2014  
WOLF NUMBER CATANIA : ///  
10CM SOLAR FLUX : 184  
AK CHAMBON LA FORET : 012  
AK WINGST : 004  
ESTIMATED AP : 004  
ESTIMATED ISN : 139, BASED ON 29 STATIONS.

NOTICEABLE EVENTS SUMMARY  
DAY BEGIN MAX END LOC XRAY OP 10CM Catania/NOAA RADIO\_BURST\_TYPES  
16 1954 1959 2004 S14E09 M1.0 1N 24/2035 II/2  
END



## Geomagnetic activity

:Issued: 2021 Feb 08 1231 UTC  
:Product: documentation at <http://www.sidc.be/products/tot>  
#-----#  
# DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from the SIDC #  
#-----#



SIDC URSIGRAM 10208  
SIDC SOLAR BULLETIN 08 Feb 2021, 1230UT  
SIDC FORECAST (valid from 1230UT, 08 Feb 2021 until 10 Feb 2021)  
SOLAR FLARES : Quiet conditions (<50% probability of C-class flares)  
GEOMAGNETISM : Quiet (A<20 and K<4)

SOLAR PROTONS : Quiet  
PREDICTIONS FOR 08 Feb 2021 10CM FLUX: 074 / AP: 005  
PREDICTIONS FOR 09 Feb 2021 10CM FLUX: 074 / AP: 004  
PREDICTIONS FOR 10 Feb 2021 10CM FLUX: 075 / AP: 004  
COMMENT: Solar activity was at very low levels. No numbered sun spots were observed on the solar disc. No significant flares were detected in the last 24 hours and none are expected in the next 24 hours. No Earth-directed coronal mass ejections (CMEs) were detected 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 2 MeV electron flux remained under the 1000 pfu threshold and is expected to remain so in the next 24 hours. The 24h electron fluence was at nominal levels and is expected to remain so, although slight increase is possible due to the influence of the HSS currently affecting the Earth.

Over the past 24 hours the solar wind conditions (ACE and DSCOVR) started to recover from the HSS which arrived to the Earth on Feb 6th. The total magnetic field varied between 0.8 nT and 6 nT and its Bz component weakly oscillated between -4 nT and 4 nT. The phi angle was predominantly positive reflecting the polarity of the coronal hole affecting the Earth. The solar wind speed showed a gradual decrease from 550 km/s to 410 km/s as the effect of the HSS starts to wane.

The geomagnetic conditions over the past 24 hours were predominantly quiet with several unsettled periods and two isolated locally active conditions with Kp indices equal to 4. Mostly quiet conditions are expected in the next 24 hours as the influence of the HSS continues to wane. Isolated unsettled to active periods remain possible.

TODAY'S ESTIMATED ISN : 000, BASED ON 09 STATIONS.  
99999

SOLAR INDICES FOR 07 Feb 2021  
WOLF NUMBER CATANIA : ///  
10CM SOLAR FLUX : 073  
AK CHAMBON LA FORET : 016  
AK WINGST : ///  
ESTIMATED AP : 022  
ESTIMATED ISN : 000, BASED ON 08 STATIONS.

*≥ 2 MeV flux & fluence*

NOTICEABLE EVENTS SUMMARY  
DAY BEGIN MAX END LOC XRAYOP 10CM Catania/NOAA RADIO\_BURST\_TYPES  
NONE  
END



# SIDC/RWC & URSIgram - Contents

- SIDC/RWC
- URSIgram
  - Overview features
- **SWx alerts**
- Exercises

# Fast alerts: automatic detection by S IDC software

## Flare > M5

*S IDC in GOES X-ray*

```
:Issued: 2016 Jul 24 0516 UTC
:Product: documentation at http://www.sidc.be/products/flaremail
#-----#
# Large flare alerts from the S IDC (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@pd.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 S IDC (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 | 328| 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
minv: lowest velocity detected within the CME
maxv: highest velocity detected within the CME
This message is sent whenever a CME wider than 150 degrees is detected by
cactus.
#-----#
```



# PRESTO alert: 1. Criteria

**Presto alert**

L1 positive  
 www  
 mail

**Send presto alert**

**When to send a presto immediately?**

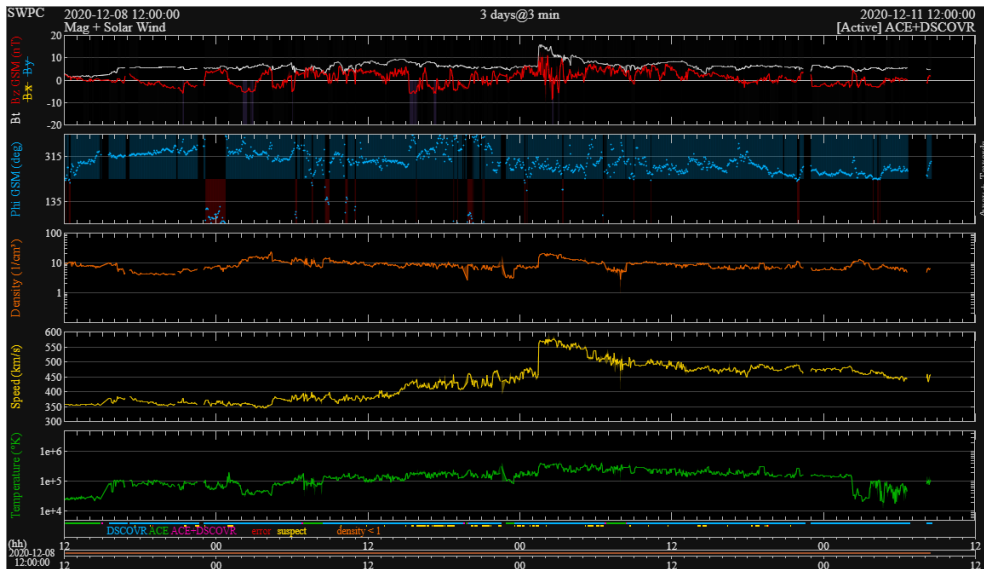
- During or just after an **X-flare** occurred.
- In case of a **proton event**.
- When **K > 5**.
- When a **halo CME** or a strong Westward directed CME occurred. Try to find out whether the halo CME is front-sided or not. Therefore look at the EIT images to find a related flare.
- In case you observe 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**.

A shock is considered to have the following criteria, calculated using a 10 min average before and after the shock:

- A 20+ % increase in B, N (density), and T
- A 20+ km/s increase in V (speed)

From: Interplanetary shock database (S. Nikbakhsh, PhD thesis)  
<https://hel-da.helsinki.fi/bitstream/handle/10138/45227/Thesis.pdf>

# PRESTO alert: 2. Detection



SWIC - Collaboration between STCE, Koninklijke Luchtmacht, KNMI

# 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
# 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 #

SWIC - Collaboration between STCE, Koninklijke Luchtmacht, KNMI

## 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: #



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This message is of the fast alert type. It is sent when quiet Space Weather conditions are expected 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.

All quiet alerts are sent by the SWx forecaster, both to begin and to end the period.

The all quiet period is seldomly sent during the solar cycle maximum, as new groups may quickly develop on disk or may round the east limb, or there may be filaments on disk that may result in flare/proton events.

The all quiet alert is also seldomly sent during the ascending and declining phase as in view of the persistent high speed streams from coronal holes, as well as transients in the solar wind.

The criteria for the all quiet alerts are under debate.

# Exercise: URSIgram

- Which of the following topics is usually not mentioned in the daily URSIgram?
  - ✓ Visibility of the aurora
  - ✗ The flux of high energetic ( $\geq 2$  MeV) electrons
  - ✓ Ionospheric scintillation

## Latest issue

```
:Issued: 2021 Feb 16 1230 UTC
:Product: documentation at http://www.sidc.be/products/mwu
#-----#
# DAILY BULLETIN ON SOLAR AND GEOMAGNETIC ACTIVITY from the SIDC #
# (RMC Belgium) #
#-----#
SIDC URSIGRAM 10216
SIDC SOLAR BULLETIN 16 Feb 2021, 1230UT
SIDC FORECAST (valid from 1230UT, 16 Feb 2021 until 18 Feb 2021)
SOLAR FLARES : Quiet conditions (<50% probability of C-class flares)
GEOMAGNETISM : Active conditions expected (A=20 or F=4)
SOLAR PROTONS : Quiet
PREDICTIONS FOR 16 Feb 2021 10CM FLUX: 070 / AP: 014
PREDICTIONS FOR 17 Feb 2021 10CM FLUX: 070 / AP: 012
PREDICTIONS FOR 18 Feb 2021 10CM FLUX: 070 / AP: 012
COMMENT: 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 -4.8 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.

TODAY'S ESTIMATED ISN : 000, BASED ON 17 STATIONS.

SOLAR INDICES FOR 15 Feb 2021
WOLF NUMBER CATANIA : 000
10CM SOLAR FLUX : 070
AK CHAMON LA FORET : 017
AK WIMST : ///
ESTIMATED AP : 008
ESTIMATED ISN : 000, BASED ON 16 STATIONS.

NOTICEABLE EVENTS SUMMARY
DAY BEGIN MAX END LOC XRAY OP 10CM Catania/NOAA RADIO_BURST_TYPES
NONE
END
```

SWIC - Collaboration between STCE, Koninklijke Luchtmacht, KNNM





## Space Weather into practice – URSIgram exercises

Jan Janssens

SWIC - Collaboration between STCE, Koninklijke Luchtmacht, KNMI

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SIDC URSIGRAM 30515  
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 >=50%)  
GEOMAGNETISM : Active conditions expected (A>=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 >=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

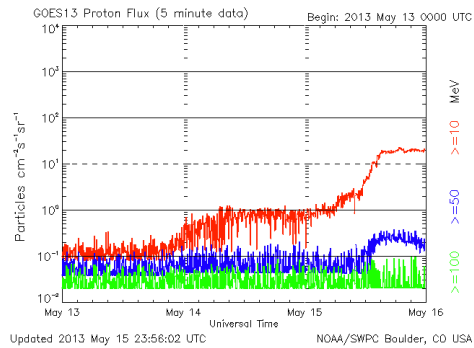
- **Setting**
  - You have received the above URSIgram. It is now 18:00UT on 15 May 2013. You have to brief the SWx operational personnel.
- **Questions – Part 1 of 2: Reading-Comprehension questions**
  - Was the X1.2 flare: a) a strong flare (which class)? b) a long duration event (LDE)?
  - What kind 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 the SWx operational personnel.
- **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 fregate 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	<p><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.</p> <p><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.</p> <p><b>Other systems:</b> Blackout of HF radio communications through the polar regions and increased navigation errors over several days are likely.</p>
S 3	Strong	<p><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.</p> <p><b>Satellite operations:</b> Single-event upsets, noise in imaging systems, and slight reduction of efficiency in solar panel are likely.</p> <p><b>Other systems:</b> Degraded HF radio propagation through the polar regions and navigation position errors likely.</p>
S 2	Moderate	<p><b>Biological:</b> Passengers and crew in high-flying aircraft at high latitudes may be exposed to elevated radiation risk.</p> <p><b>Satellite operations:</b> Infrequent single-event upsets possible.</p> <p><b>Other systems:</b> Small effects on HF propagation through the polar regions and navigation at polar cap locations possibly affected.</p>
S 1	Minor	<p><b>Biological:</b> None.</p> <p><b>Satellite operations:</b> None.</p> <p><b>Other systems:</b> Minor impacts on HF radio in the polar regions.</p>

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Real-time: <https://www.swpc.noaa.gov/products/goes-proton-flux>

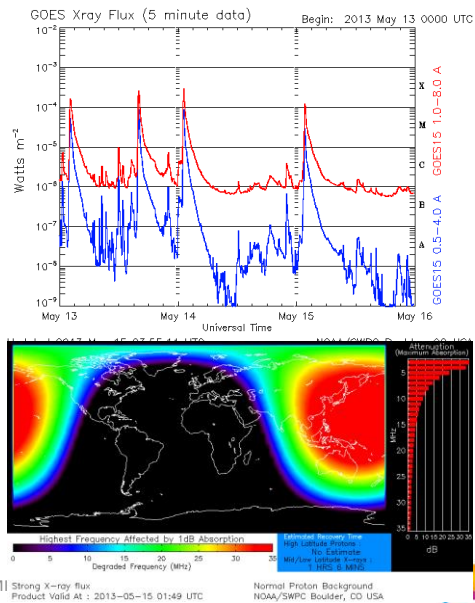
Nowcast e.g. COMESEP: <http://www.comesep.eu/alert/>

Nowcast e.g. D-RAP: <https://www.swpc.noaa.gov/products/d-region-absorption-predictions-d-rap>

Archive at <ftp://ftp.swpc.noaa.gov/pub/warehouse/>

# 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?



SWIC - Collaboration between STCE, Koninklijke Luchtmacht, KNMI  
Strong X-ray flux  
Product Valid At : 2013-05-15 01:49 UTC

Normal Proton Background  
NOAA/SWPC Boulder, CO USA

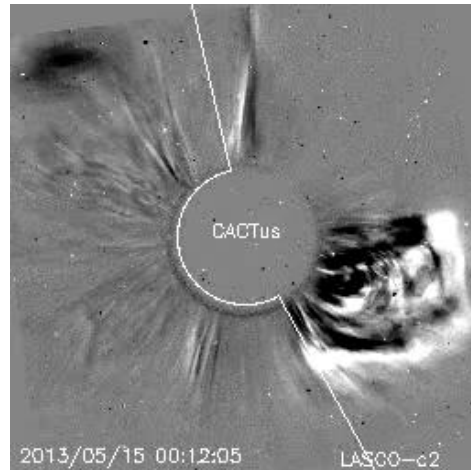
Real-time: <https://www.swpc.noaa.gov/products/goes-x-ray-flux>

Nowcast e.g. D-RAP: <https://www.swpc.noaa.gov/products/d-region-absorption-predictions-d-rap>

Archive at <ftp://ftp.swpc.noaa.gov/pub/warehouse/>

# 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)?



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Real-time data at <http://www.sidc.oma.be/cactus/out/latestCMEs.html>

Archive at <http://sidc.oma.be/cactus/catalog.php>

Movie of this event at

[http://sidc.oma.be/cactus/catalog/LASCO/2\\_5\\_0/2013/05/CME0079/CME.html](http://sidc.oma.be/cactus/catalog/LASCO/2_5_0/2013/05/CME0079/CME.html)

# 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  ESU  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
1535Z, reached a peak flux of 23 pfu, and was ongoing as of the
writing of this summary.
    
```

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Real-time at <https://www.swpc.noaa.gov/products/solar-and-geophysical-event-reports>

Summary at <https://www.swpc.noaa.gov/products/solar-and-geophysical-activity-summary>

Archive at <ftp://ftp.swpc.noaa.gov/pub/warehouse/>

The daily values for the 10.7cm radio flux can be found at

Penticton: <http://www.spaceweather.ca/solarflux/sx-4a-en.php>

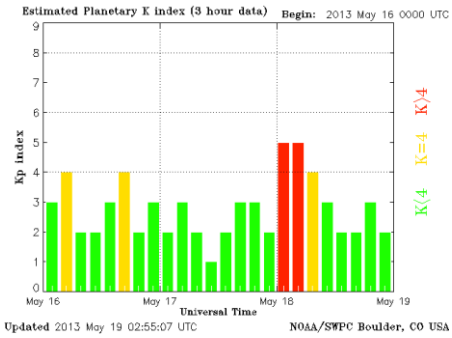
SWPC/NOAA: <ftp://ftp.swpc.noaa.gov/pub/lists/radio/rad.txt>

For 14 & 15 May, the Penticton values were as follows:

Date	Time	Julian day	Carr. Rot.	Observed Flux	Adjusted Flux	URSI Flux
2013-05-14	17:00:00	2456427.197	2136.996	<b>148.1</b>	151.4	136.2
2013-05-14	20:00:00	2456427.322	2137.001	<b>147.9</b>	151.1	136.0
2013-05-14	23:00:00	2456427.447	2137.005	<b>147.8</b>	151.0	135.9
2013-05-15	17:00:00	2456428.197	2137.033	<b>141.8</b>	144.9	130.4
2013-05-15	20:00:00	2456428.322	2137.037	<b>145.6</b>	148.8	133.9
2013-05-15	23:00:00	2456428.447	2137.042	<b>148.7</b>	152.0	136.8

# URSIgram – Exercise 1

- Question 5:
  - « ... possible isolated minor storm periods. »
  - Do you expect important satellite communications problems?



G 3	<b>Strong</b>	<p><b>Power systems:</b> Voltage corrections may be required, false alarms triggered on some protection devices.</p> <p><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.</p> <p><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.).</p>
G 2	<b>Moderate</b>	<p><b>Power systems:</b> High-latitude power systems may experience voltage alarms, long-duration storms may cause transformer damage.</p> <p><b>Spacecraft operations:</b> Corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions.</p> <p><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.).</p>
G 1	<b>Minor</b>	<p><b>Power systems:</b> Weak power grid fluctuations can occur.</p> <p><b>Spacecraft operations:</b> Minor impact on satellite operations possible.</p> <p><b>Other systems:</b> Migratory animals are affected at this and higher levels; aurora is commonly visible at high latitudes (northern Michigan and Maine).</p>

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Real-time:

NOAA Kp: <https://www.swpc.noaa.gov/products/planetary-k-index>

Dourbes K: [http://ionosphere.meteo.be/geomagnetism/ground\\_K\\_dourbes](http://ionosphere.meteo.be/geomagnetism/ground_K_dourbes)

Dst: [http://wdc.kugi.kyoto-u.ac.jp/dst\\_realtime/presentmonth/index.html](http://wdc.kugi.kyoto-u.ac.jp/dst_realtime/presentmonth/index.html)

DSCOVR: <https://www.swpc.noaa.gov/products/real-time-solar-wind>

TEC: <http://swaciweb.dlr.de/data-and-products/public/tec/tec-eu/?L=1>

Archive at <ftp://ftp.swpc.noaa.gov/pub/warehouse/>



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 the SWx operational personnel.

- **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,...)?

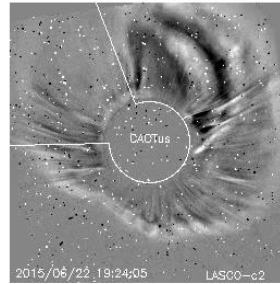
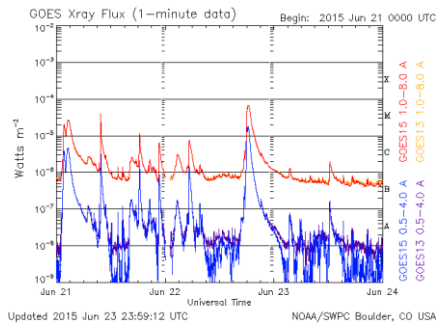


# URSIgram – Exercise 2

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



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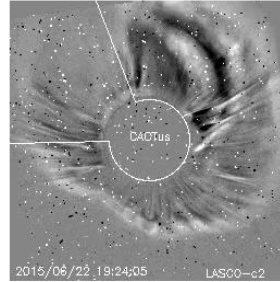
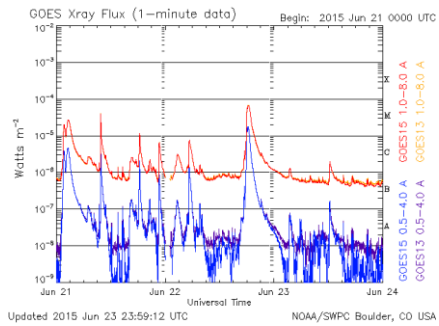


# URSIgram – Exercise 2

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



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# 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 : 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

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

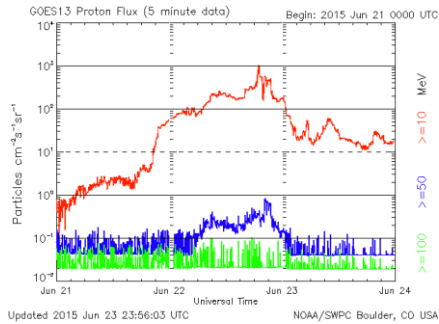
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45

# URSIgram – Exercise 2

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

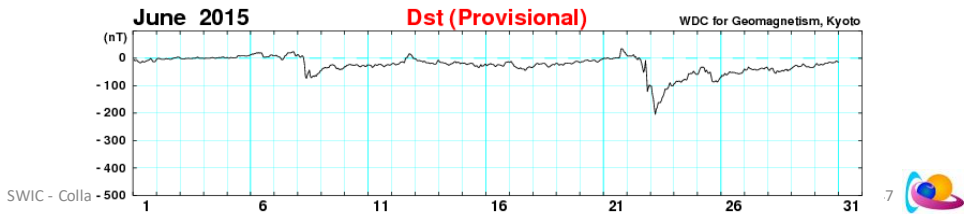
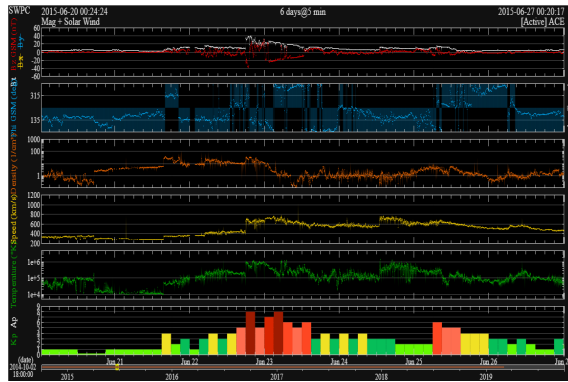


S 4	<b>Severe</b>	<p><b>Biological:</b> Unavoidable radiation hazard to astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.</p> <p><b>Satellite operations:</b> May experience memory device problems and noise on imaging systems; star-tracker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

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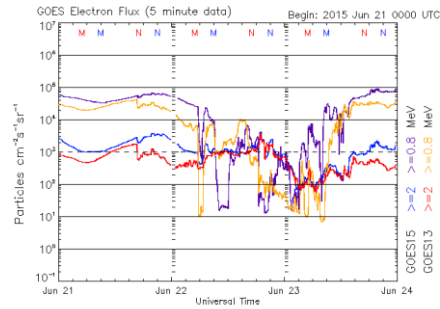
# URSIgram – Exercise 2

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

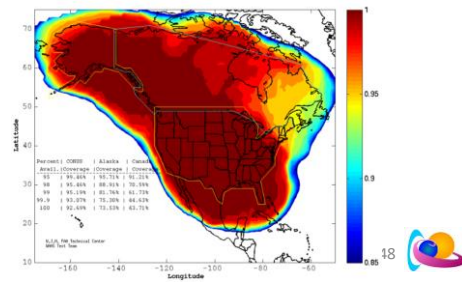


# URSIgram – Exercise 2

- 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,...)?



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

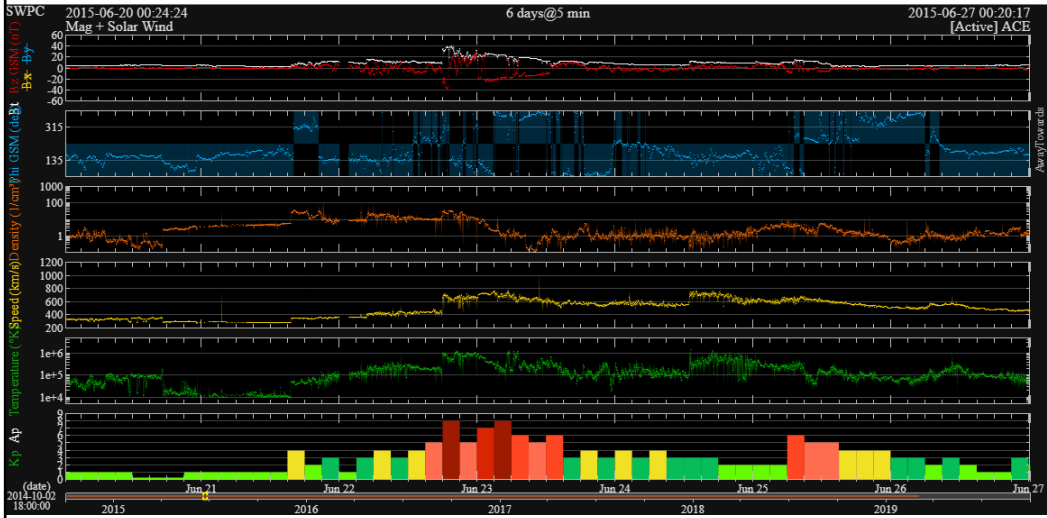


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<https://www.sciencedirect.com/topics/engineering/augmentation-system>



# URSIgram – Exercise 2



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# SIDC/RWC & URSIgram - Summary

- SIDC/RWC
- Overview contents of the URSIgram
- SWx alerts issued by the SIDC
- Exercises