

NATIONAL WEATHER SERVICE INSTRUCTION 10-1101

March 6, 2013

OPERATIONS AND SERVICES

Space Weather Services NWSPD 10-11

SPACE WEATHER PRODUCTS

NOTICE: This publication is available at: <http://www.nws.noaa.gov/directives/>.

OPR: W/OS (G. Fisher)

Certified by: W/OS (D.Caldwell)

Type of Issuance: Routine

SUMMARY OF REVISIONS: This instruction supersedes NWS Policy Instruction 10-1101, dated October 28, 2010 and subsequent recertification. OPR and names for certification and signature have changed. Numerous minor grammatical and context corrections throughout document. Updated information on specific products and services since last recertification, where needed. Other changes are noted below:

- Deleted “impacts table” comment from section 1, General;
- Relocated Space Weather Impacts table from section 6 to section 3;
- Added Geomagnetic Storms to Space Weather Impacts table in section 3;
- Deleted “enroute” descriptor under X-Ray Flux, HF Radio in the section 3, Space Weather Impacts table;
- Reference to the A index Watches was changed to reflect new K based Watches in section 4.a;
- Geomagnetic A index Watch was deleted and Geomagnetic K-index Watch was added to the table in section 4;
- The Weekly issue day of the week was changed from Tuesday to Monday in section 5.b;
- Deleted SWPC World Wide Web page from section 5;
- Added (WV.txt) identifier and changed K-Boulder observation to K-index (NOAA planetary average) in section 5.g;
- Deleted Special Advisories from section 5;
- Changed the issued day of the Space Weather Advisory Outlooks from Tuesday to Monday in section 5.h;
- Added NOAA 3-day Forecast to section 5.i. and Forecast Discussion to section 5.j;
- Deleted Space Weather Models section;
- Deleted the example of the Geomagnetic A index Watch in Appendix A.1.1;
- Added example of Geomagnetic K index Watch to Appendix A.1.c.1. Replaced all examples

in Appendix with 2012 examples;

- Added example of NOAA 3-Day Space Weather Forecast product to Appendix A.1.j;
- Added example of NOAA Space Weather Forecast Discussion to Appendix A.1.k;
- Added NOAA 3-Day Space Weather Forecast and NOAA Space Weather Forecast Discussion and renamed FXXX01 and FXXX04 in to Appendix A.2;
- Replaced A based Watches with K based (G scale) Watches in the Appendix table.

Signed _____

February 20, 2013 _____

David B. Caldwell

Date

Director, Office of Climate, Water, and Weather Services

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1. **General.** This instruction describes the space weather products provided by the Space Weather Prediction Center (SWPC) in Boulder, Colorado.

2. **Background.** SWPC, located in Boulder CO, is one of the nine National Centers for Environmental Prediction and is the nation's official source of space weather forecasts, watches, warnings, and alerts. SWPC provides a wide array of space weather products in two categories: Event-Driven and Regularly Scheduled Products.

3. **Space Weather Impacts.** The most significant impacts are noted in the following table:

Category	Effects
X-Ray Flux	<p>HF Radio: HF (high frequency) radio blackouts are possible on the entire sunlit side of the Earth. This results in degraded HF radio contact with mariners and aviators in the sunlit sector.</p> <p>Navigation: Low-frequency navigation signals used by maritime and general aviation systems experience outages on the sunlit side of the Earth, causing loss in positioning. Increased satellite navigation errors in positioning are possible on the sunlit side of Earth, which may spread into the night side.</p>
Radio Bursts	<p>Mobile communications: may disrupt cellular phone communications.</p> <p>Navigation: GPS system performance may be significantly degraded due to difficulty in signal acquisition. Radar surveillance systems are also affected.</p>
Energetic Electrons	<p>Spacecraft operations: may experience surface charging that can cause temporary or permanent damage to spacecraft systems.</p>

Energetic Protons	<p>Biological: exposure to elevated radiation hazards are possible to astronauts on EVA (extra-vehicular activity) and passengers and crew in high-flying aircraft at high latitudes.</p> <p>Satellite operations: satellites may be rendered useless, memory impacts can cause loss of control, may cause serious noise in image data, star-trackers may be unable to locate sources; permanent damage or reduction in efficiency to solar panels possible.</p> <p>Other systems: blackout of HF (high frequency) communications possible through the polar regions, and electronic navigation may be prone to errors.</p>
Geomagnetic Storms	<p>Power systems: impacts can range from weak power fluctuations to widespread voltage control problems with grid system collapse and transformer damage.</p> <p>Spacecraft operations: impacts can range from minor operations impacts to extensive surface charging, loss of orientation, uplink/downlink problems, and tracking problems.</p> <p>Other systems: HF (high frequency) radio propagation may be impossible in many areas for one to two days, low frequency radio navigation may be disrupted</p>

4. **Event-Driven Products.** Watches, Warnings, and Alerts are the primary event-driven products issued by SWPC. They can be issued any time when conditions meet, or activity is expected to exceed, specified thresholds.

a. Watch: Issued when the highest expected K index (G scale) value is forecast to be above specific thresholds – for up to three days in advance of expected activity.

b. Warning: Issued when exceeding thresholds for energetic protons or geomagnetic activity is considered to be imminent. The messages contain the warning’s valid period and the expected maximum level of activity. A high level of confidence is required before a warning is issued.

c. Alert: Issued when an event threshold is reached; contains information available at the time of issue. Alerts are issued for solar x-ray, radio, proton, and geomagnetic activity.

d. Summary: Issued after a solar x-ray, radio, or proton event ends; specifies the beginning, peak, and end of event times, along with the peak value of flux observed. Summary messages are also issued when geomagnetic activity ends subsequent to a sudden impulse.

Space weather notification messages are issued for these categories:

Category	Watch	Warning	Alert	Summary
X-Ray Flux			u	u
Radio Bursts			<input type="checkbox"/>	<input type="checkbox"/>
Geomagnetic Sudden Impulse		<input type="checkbox"/>		<input type="checkbox"/>
Geomagnetic K-index	u	<input type="checkbox"/>	<input type="checkbox"/>	
Electron Flux			<input type="checkbox"/>	
Proton 10 MeV and 100 MeV		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

These alerts are available at <http://www.swpc.noaa.gov/alerts/index.html>. Examples of some of these products can be found in Appendix A.

5. Regularly Scheduled Products. SWPC’s regularly scheduled products are issued at specified intervals.

a. Report and Forecast of Solar and Geophysical Activity (RSGA): A joint product of NOAA and the US Air Force (USAF) issued daily at 2200 Universal Time Coordinated (UTC) and is the daily report prepared by SWPC forecasters. It provides a summary and analysis of solar and geophysical activity during the previous 24 hours as well as the most recent solar indices. It also provides a forecast of solar and geomagnetic activity and indices for the following three (3) days.

b. Preliminary Report and Forecast of Solar Geophysical Data (commonly known as the Weekly): Compiled every Monday and made available on SWPC’s website. It contains space weather highlights from the previous week and an outlook for the following 27 days, including tables and plots of solar and geophysical indices, data, activity and reports of special events and missing data not included previously.

c. GEOALERT: A coded message issued daily at 0330 UTC. It contains a summary of sunspot characteristics, energetic solar-geophysical activity, and selected solar-geophysical indices for the previous day. It also contains a brief encoded forecast of solar-geophysical activity that may affect people and systems. This product is issued by SWPC in its capacity as the International Space Environment Service (ISES) World Warning Agency for the space environment.

d. Solar and Geophysical Activity Summary (SGAS): A joint product of NOAA and the USAF issued daily at 0245 UTC. It is a brief list of solar and geophysical events and indices for the previous UTC day, including energetic solar flares, proton events, and geomagnetic activity.

e. The Solar Cycle prediction charts and tables: Used to track solar cycle progression, are updated monthly by the SWPC using the latest International Space Environment Service (ISES) predictions.

f. The Solar Region Summary (SRS), a joint product of NOAA and the USAF issued daily at 0030 UTC, providing a detailed description of active regions currently visible on the solar disk. Active solar regions are sources of potential x-ray flares that may affect people and systems.

g. 3-hourly Space Weather Conditions and Forecast (WWV.txt): Issued every 3 hours. Provides 10.7 cm radio flux information (from Penticton, Canada); A index (NOAA-planetary average); and K index (NOAA-planetary average). The messages contain recent solar and geophysical indices, plus a summary of recent significant activity and a forecast of activity in the next 24 hours (based on NOAA Space Weather Scales).

h. Space Weather Advisory Outlooks: Issued every Monday, provide general descriptions of space weather conditions during the past week and an outlook for the next 7 days. Outlooks are based on the NOAA Space Weather Scales.

i. NOAA 3-Day Forecast: A plain language, single page forecast text product issued every 12 hours with both forecast and observed criterion now broken down for each of the three NOAA Scale categories. Each section includes a brief forecaster written rationale.

j. NOAA Space Weather Forecast Discussion: A free form, technical forecast discussion that details observed data, analysis, and forecast rationale. Issued every 12 hours. Forecast and observed (summary) criterion is broken down into 4 sections by phenomenon type and 2 sub-sections; Summary and Forecast.

Appendix A – Space Weather Product Data

This appendix contains Space Weather product examples and descriptions. The most current issue/version of each product in this appendix can be found at <http://www.swpc.noaa.gov/ftpmenu/latest.html> and <http://www.swpc.noaa.gov/Data/index.html>

1. Space Weather Product Examples.

a. X-ray Flux

- (1) Space Weather Message Code: ALTXMF
Serial Number: 180
Issue Time: 2012 Aug 18 0103 UTC

ALERT: X-Ray Flux exceeded M5
Threshold Reached: 2012 Aug 17 0100 UTC
NOAA Scale: R2 - Moderate

NOAA Space Weather Scale descriptions can be found at www.swpc.noaa.gov/NOAAscales

Potential Impacts: Area of impact centered on sub-solar point (high noon) on the sunlit side of Earth. Extent of blackout of HF (high frequency) radio communication dependent upon current X-ray Flux intensity. For real-time information on affected area and expected duration please see <http://www.swpc.noaa.gov/drap/index.html>.

- (2) Space Weather Message Code: SUMX10
Serial Number: 914
Issue Time: 2012 Sep 05 1901 UTC

SUMMARY: X-ray Event exceeded X10
Begin Time: 2012 Sep 05 1555 UTC
Maximum Time: 2012 Sep 05 1640 UTC
End Time: 2012 Sep 05 1858 UTC
X-ray Class: X17.0
Location: N20W44
NOAA Scale: R4 - Severe

NOAA Space Weather Scale descriptions can be found at www.swpc.noaa.gov/NOAAscales

Potential Impacts: Area of impact widespread on the sunlit side of Earth, strongest at the sub-solar point. Navigation - Minor disruptions of GPS satellite navigation possible due to loss-of-lock and increased range errors for some applications. Radio - Wide area black out of HF (high frequency) radio communication for one to two hours.

b. Radio Bursts

- (1) Space Weather Message Code: ALTTP2
Serial Number: 822
Issue Time: 2012 Sep 15 2344 UTC

ALERT: Type II Radio Emission
Begin Time: 2012 Sep 15 2259 UTC
Estimated Velocity: 681 km/s

NOAA Space Weather Scale descriptions can be found at
www.swpc.noaa.gov/NOAAscales

Description: Type II emissions occur in association with eruptions on the sun and typically indicate a coronal mass ejection is associated with a flare event.

- (2) Space Weather Message Code: SUM10R
Serial Number: 566
Issue Time: 2012 Aug 18 0341 UTC

SUMMARY: 10cm Radio Burst
Begin Time: 2012 Aug 18 0322 UTC
Maximum Time: 2012 Aug 18 0322 UTC
End Time: 2012 Aug 18 0322 UTC
Duration: 0 minutes
Peak Flux: 100 sfu
Latest Penticton Noon Flux: 95 sfu

NOAA Space Weather Scale descriptions can be found at
www.swpc.noaa.gov/NOAAscales

Description: A 10cm radio burst indicates that the electromagnetic burst associated with a solar flare at the 10cm wavelength was double or greater than the initial 10cm radio background. This can be indicative of significant radio noise in association with a solar flare. This noise is generally short-lived but can

cause interference for sensitive receivers including radar, GPS, and satellite communications.

c. Geomagnetic Sudden Impulse

- (1) Space Weather Message Code: WARSUD
Serial Number: 120
Issue Time: 2012 Oct 08 0440 UTC

WARNING: Geomagnetic Sudden Impulse expected
Valid From: 2012 Oct 08 0515 UTC
Valid To: 2012 Oct 08 0545 UTC
IP Shock Passage Observed: 2012 Oct 08 0430 UTC

NOAA Space Weather Scale descriptions can be found at
www.swpc.noaa.gov/NOAAscales

- (2) Space Weather Message Code: SUMSUD
Serial Number: 161
Issue Time: 2012 Oct 08 0527 UTC

SUMMARY: Geomagnetic Sudden Impulse
Observed: 2012 Oct 08 0515 UTC
Deviation: 21 nT
Station: BOU

NOAA Space Weather Scale descriptions can be found at
www.swpc.noaa.gov/NOAAscales

d. Geomagnetic K-index

- (1) Space Weather Message Code: WATA20
Serial Number: 501
Issue Time: 2012 Oct 13 1842 UTC

WATCH: Geomagnetic Storm Category G1 Predicted

Highest Storm Level Predicted by Day:
Oct 14: G1 (Minor) Oct 15: None (Below G1) Oct 16: None (Below G1)

THIS SUPERSEDES ANY/ALL PRIOR WATCHES IN EFFECT

- (2) Space Weather Message Code: WARK04
Serial Number: 2023
Issue Time: 2012 Nov 01 0725 UTC

WARNING: Geomagnetic K-index of 4 expected
Valid From: 2012 Nov 01 0730 UTC
Valid To: 2012 Nov 01 1900 UTC
Warning Condition: Onset

NOAA Space Weather Scale descriptions can be found at
www.swpc.noaa.gov/NOAAscales

Potential Impacts: Area of impact primarily poleward of 65 degrees Geomagnetic Latitude.
Induced Currents - Weak power grid fluctuations can occur.
Aurora - Aurora may be visible at high latitudes such as Canada and Alaska.

- (3) Space Weather Message Code: ALTK04
Serial Number: 1616
Issue Time: 2012 Nov 01 1024 UTC

ALERT: Geomagnetic K-index of 4
Threshold Reached: 2012 Nov 01 1024 UTC
Synoptic Period: 0900-1200 UTC

Active Warning: Yes

NOAA Space Weather Scale descriptions can be found at
www.swpc.noaa.gov/NOAAscales

Potential Impacts: Area of impact primarily poleward of 65 degrees Geomagnetic Latitude.
Induced Currents - Weak power grid fluctuations can occur.
Aurora - Aurora may be visible at high latitudes such as Canada and Alaska.

e. Electron Flux

- (1) Space Weather Message Code: ALTEF3
Serial Number: 1976
Issue Time: 2012 Oct 28 1436 UTC

ALERT: Electron 2MeV Integral Flux exceeded 1000pfu
Threshold Reached: 2012 Oct 28 1415 UTC
Station: GOES13

NOAA Space Weather Scale descriptions can be found at
www.swpc.noaa.gov/NOAAscales

Potential Impacts: Satellite systems may experience significant charging resulting in increased risk to satellite systems.

f. Proton Flux

- (1) Space Weather Message Code: WARPX1
Serial Number: 385
Issue Time: 2012 Sep 28 0147 UTC

WARNING: Proton 10MeV Integral Flux above 10pfu expected
Valid From: 2012 Sep 28 0200 UTC
Valid To: 2012 Sep 28 1400 UTC
Warning Condition: Onset
Predicted NOAA Scale: S1 - Minor

NOAA Space Weather Scale descriptions can be found at
www.swpc.noaa.gov/NOAAscales

Potential Impacts: Radio - Minor impacts on polar HF (high frequency) radio propagation resulting in fades at lower frequencies.

- (2) Space Weather Message Code: ALTPX1
Serial Number: 297
Issue Time: 2012 Sep 28 0315 UTC

ALERT: Proton Event 10MeV Integral Flux exceeded 10pfu
Begin Time: 2012 Sep 28 0300 UTC
NOAA Scale: S1 - Minor

NOAA Space Weather Scale descriptions can be found at
www.swpc.noaa.gov/NOAAscales

Potential Impacts: Radio - Minor impacts on polar HF (high frequency) radio propagation resulting in fades at lower frequencies.

- (3) Space Weather Message Code: SUMPX1
Serial Number: 64
Issue Time: 2012 Sep 28 1455 UTC

SUMMARY: Proton Event 10MeV Integral Flux exceeded 10pfu
Begin Time: 2012 Sep 28 0300 UTC
Maximum Time: 2012 Sep 28 0445 UTC
End Time: 2012 Sep 28 1040 UTC
Maximum 10MeV Flux: 28 pfu
NOAA Scale: S1 - Minor

NOAA Space Weather Scale descriptions can be found at
www.swpc.noaa.gov/NOAAscales

g. Report and Forecast of Solar and Geophysical Activity (RSGA)

:Product: Report of Solar-Geophysical Activity

:Issued: 2012 Oct 26 2200 UTC

Prepared jointly by the U.S. Dept. of Commerce, NOAA,

Space Weather Prediction Center and the U.S. Air Force.

#

Joint USAF/NOAA Report of Solar and Geophysical Activity

SDF Number 300 Issued at 2200Z on 26 Oct 2012

IA. Analysis of Solar Active Regions and Activity from 25/2100Z to 26/2100Z:
Solar activity has been low. Region 1598 (S12E04), a Dko/Beta-Delta spot group, remained the most magnetically complex region, yet only produced a C1/Sf flare at 26/1607Z.

The most active region was an area of enhanced plage near S27W87, formerly Region 1594, where three low-level C-class flares originated. Region 1596 (N08W35) showed signs of umbral separation, and new Region 1600 (N09W14) was numbered today.

IB. Solar Activity Forecast: Solar activity is expected to be low with a slight chance for M-class flares for the next three days (27-29 October).

IIA. Geophysical Activity Summary 25/2100Z to 26/2100Z:

The geomagnetic field has been quiet for the past 24 hours. Solar wind speed, as measured by the ACE spacecraft, remained relatively steady at 350 km/s. The Bz component of the interplanetary magnetic field remained mostly positive, with minor deflections of ± 4 nT, while the total field held steady at 4 nT. The greater than 2 MeV electron flux at geosynchronous orbit reached high levels during the period.

IIB. Geophysical Activity Forecast: The geomagnetic field is expected to be quiet for the next three days (27-29 October).

III. Event Probabilities 27 Oct-29 Oct

Class M 20/15/10

Class X 01/01/01

Proton 01/01/01

PCAF green

IV. Penticton 10.7 cm Flux

Observed 26 Oct 131

Predicted 27 Oct-29 Oct 135/130/115

90 Day Mean 26 Oct 122

V. Geomagnetic A Indices

Observed Afr/Ap 25 Oct 003/004

Estimated Afr/Ap 26 Oct 003/005

Predicted Afr/Ap 27 Oct-29 Oct 006/005-006/005-006/005

VI. Geomagnetic Activity Probabilities 27 Oct-29 Oct

A. Middle Latitudes

Active 05/05/05

Minor storm 01/01/01

Major-severe storm 01/01/01

B. High Latitudes

Active 15/15/15

Minor storm 10/10/10

Major-severe storm 05/05/05

h. Solar and Geophysical Activity Summary (SGAS)

:Product: Solar and Geophysical Activity Summary

:Issued: 2012 Oct 26 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 300 Issued at 0245Z on 26 Oct 2012

This report is compiled from data received at SWO on 25 Oct

A. Energetic Events

Begin Max End Rgn Loc Xray Op 245MHz 10cm Sweep

1846 1847 1849 110
 2333 2333 2333 100

- B. Proton Events: None
- C. Geomagnetic Activity Summary: The geomagnetic field has been at quiet levels for the past 24 hours.
- D. Stratwarm: Not Available
- E. Daily Indices: (real-time preliminary/estimated values)
 10 cm 130 SSN 058 Afr/Ap 003/004 X-ray Background B3.8
 Daily Proton Fluence (flux accumulation over 24 hrs)
 GT 1 MeV 3.1e+05 GT 10 MeV 1.1e+04 p/(cm2-ster-day)
 (GOES-13 satellite synchronous orbit W76 degrees)
 Daily Electron Fluence
 GT 2 MeV 9.40e+07 e/(cm2-ster-day)
 (GOES-13 satellite synchronous orbit W76 degrees)
 3 Hour K-indices:
 Boulder 1 1 2 1 2 2 1 1 Planetary 1 1 1 1 0 0 1 2
- F. Comments: None.

i. Solar Region Summary (SRS)

:Product: Solar Region Summary
 :Issued: 2012 Oct 27 0030 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 Region Summary
 SRS Number 301 Issued at 0030Z on 27 Oct 2012
 Report compiled from data received at SWO on 26 Oct
 I. Regions with Sunspots. Locations Valid at 26/2400Z
 Nmbr Location Lo Area Z LL NN Mag Type
 1596 N08W35 152 0230 Eao 11 09 Beta
 1598 S12E04 113 0340 Dko 07 17 Beta-Delta
 1599 S11E30 087 0120 Hsx 02 01 Alpha
 1600 N09W14 131 0040 Dso 04 04 Beta
 IA. H-alpha Plages without Spots. Locations Valid at 26/2400Z Oct
 Nmbr Location Lo
 1593 N15W77 194
 1594 S27W87 204
 II. Regions Due to Return 27 Oct to 29 Oct
 Nmbr Lat Lo
 1585 S19 025

j. Space Weather Advisory Outlook

SPACE WEATHER ADVISORY OUTLOOK #12-49
 2012 October 21 at 9:04 p.m. MDT (2012 October 22 0304 UTC)

**** SPACE WEATHER OUTLOOK ****

Summary For October 15-21

A Category R2 (Moderate) Radio Blackout occurred on 20 October and a Category R1 (Minor) Radio Blackout occurred on 21 October. Both Radio Blackouts were due to solar flares from a sunspot region near the southeast limb.

Outlook For October 22-28

Category R1 (Minor) Radio Blackouts are likely throughout the period.

Data used to provide space weather services are contributed by NOAA, USAF, NASA, NSF, USGS, the International Space Environment Services and other observatories, universities, and institutions. More information is available at SWPC's Web site <http://swpc.noaa.gov>

k. NOAA 3-Day Space Weather Forecast

Product: NOAA 3-day Forecasts
 Issued: 2012 Apr 30 0030 UTC
 Prepared by the U.S. Dept. of Commerce, NOAA, Space Weather Prediction Center

A. NOAA Geomagnetic Activity Observation and Forecast

The Greatest Observed 3 Hr Kp on 29 Apr 2012 was 5 (NOAA Scale G1).
 The Greatest Expected 3 Hr Kp for 30 Apr-02 May is 6 (NOAA Scale G2).

NOAA Kp index Breakdown 30 Apr - 02 May

	Apr 30	May 01	May 02
00-03UT	4	3	4
03-06UT	4	3	4
06-09UT	3	3	6 (G2)
09-12UT	2	2	6 (G2)
12-15UT	2	2	5 (G1)
15-18UT	2	2	5 (G1)
18-21UT	3	3	4

21-00UT 3 4 4

Rationale: NOAA Scale G2 conditions are forecast due to anticipated CME effects midday on 02 May.

B. NOAA Solar Radiation Activity Observation and Forecast

Solar Radiation as observed by NOAA GOES-13 was below S-Scale storm level Thresholds.

Solar Radiation Storm forecast for Apr 30 – 02 May

	Apr 30	May 01	May 02
S1 or greater	05%	05%	01%

Rationale: Less than a slight chance for Solar Radiation conditions exceeding NOAA Scale S1 is forecast due to a lack of solar regions with the observed potential to produce event level activity.

C. NOAA Radio Blackout Activity and Forecast

Radio blackouts reaching the R2 Levels were observed several times over the past 24hrs. The largest was at 1823Z on 29 Apr.

Radio Blackout forecast for Apr 30 – 02 May

	Apr 30	May 01	May 02
R1-R2	50%	50%	50%
R3 or greater	20%	20%	20%

Rationale: Radio blackouts of NOAA Scale R2 are likely and a chance for R3 conditions exist for the next 3 days due to the size, magnetic complexity, and historical activity of Regions 1499 and 1501.

I. NOAA Space Weather Forecast Discussion

Product: NOAA Space Weather Forecast Discussion

Issued: 2012 Apr 30 0000 UTC

Prepared by the U.S. Dept. of Commerce, NOAA, Space Weather Prediction Center

Solar Activity

24hr Summary...The solar disk is currently dominated by two very large sunspot regions, Region 1486 (S15E45, FKC/BGD with 2200 millionths), and Region 1484 (N04W28, DKC/BGD, with 1700 millionths). Region 1484 has been slightly more active, producing 4 C-class flares and 1 M-class flare during the past 24 hours. Region 1484 does not appear to be growing but continues to be very complex with two major inversion lines cutting through joined penumbral areas (multiple delta configurations). Region 1486 does not appear to be growing but like 1484 is also very complex magnetically with multiple strong delta configurations. Noteworthy flare events during the interval were a long duration C8 from 1486 which peaked at 1712 UTC (duration of 3 hours, 19 minutes) which was associated with a slow CME (about 380 km/s) off the southeast limb at 24/1654 UTC. Region 1486 was also responsible for the largest event of the period, an M1/2n at 0446 UTC. Updated imagery from SOHO/LASCO provided new information about the fast CME associated with yesterday's M4/1f flare from Region 1486: current estimated of the plane of sky speed is around 1233 km/s. The CME does not appear to be earthward directed. There is a moderate-sized coronal hole in the northern hemisphere which is just approaching central meridian at this time.

Forecast...Solar activity is expected to be high. Additional major flare activity is expected from both Region 1484 and Region 1486, although Region 1486 appears to be the most likely source at this time.

Energetic Particle

24hr Summary...A weak enhancement of 10 MeV protons began around 24/0415 UTC and appeared to reach maximum of 2 pfu at about 24/1115 UTC. The most likely source was the fast CME associated with yesterday's M7 flare (24/0254 UTC) from Region 486.

Forecast...There is a chance for moderate or even larger proton events, especially if major flare activity should be realized in Region 1484 which is now in a more favorable location for particle transport to Earth. In the longer term, Region 1486 should also be considered to be a threat for proton events as it rotates to more westerly longitudes over the next few days.

Solar Wind

24hr Summary...per previous discussions, observations at the ACE spacecraft clearly indicate the continued passage of a fairly strong interplanetary CME. Solar

wind speed continues to be elevated around 550 km/s and the total magnetic field Bt is still elevated around 10 nT. At this time the strongest part of the ICME appears to have passed, and the orientation of the z-component of the interplanetary magnetic field has been generally northwards during the past 10 hours, which has moderated the geoeffectiveness of this transient.

Forecast...Since there are not anymore known earthward transients, conditions at ACE are expected to continue to moderate and gradually return to nominal levels. There is a chance for a co-rotating interaction region followed by a high speed stream in about 3-4 days due to the position of a coronal hole on the solar disk. In addition, there is a chance for an additional major flare and fast CME from either of Region 1484 or Region 1486 which would certainly change the expected conditions in the solar wind.

Geospace

24hr Summary...moderate (G2) storm level activity with some strong-to-severe (G3-G4) levels at high latitudes were seen early in the interval (24/1530-25/0000 UTC), but activity has clearly decreased since then with quiet to unsettled levels prevailing.

Forecast...Generally quiet to unsettled levels should prevail but there is a chance for some isolated active or minor storm (G1) periods due to local substorms during the nighttime hours. An increase to active levels is forecast for 28 October due to a favorably positioned coronal hole. In addition, there is a chance for higher storm level activity during the next few days if Region 1484 should manage to produce a fast, earthward directed CME.

2. **Space Weather Product Identification.** The following are specific identification for SWPC products, issued under the SWPC's World Meteorological Organization (WMO) identifier, KWNP. A complete list of SWPC Space Weather Products transmitted on the National Weather Wire Service (NWWS) Direct Broadcast Systems can be found at <http://www.swpc.noaa.gov/wwire.html>. Note: WMO header identifiers appear on messages from NWS systems, but not on SWPC messages.

AWIPS ID	WMO ID	Title	Issue Frequency/Time
SWXDAYTDF	FXXX10	NOAA 3-Day Space Weather Forecast	Twice Daily, 0030&1230 UTC
SWXDAYDIS	FXXX12	NOAA Space Weather Forecast Discussion	Twice Daily, 0030&1230 UTC
SWXCURIND	AXXX83	Current Space Weather	Hourly, beginning 0035 UTC

Indices – Current Day			
AWIPS ID	WMO ID	Title	Issue Frequency/Time
SWX3HRCON	FXXX04	3-hourly Space Weather Conditions and Forecast	Every 3 hours, beginning 0000 UTC
SWXDAYSGA	AXXX01	Solar and Geophysical Activity Summary	Daily at 0245 UTC
SWXDAYSR	AXXX02	Solar Region Summary	Daily at 0030 UTC
SWXDAYIND	AXXX81	Daily Space Weather Indices	Every 6 hours beginning 0015 UTC
SWXDAYOBS	AXXX82	Summary of Space Weather Observations – Previous Day	Daily after 0030 UTC
SWXDAYEVT	AXXX80	Space Weather Event Reports – Previous Day	Daily after 0250 UTC
SWXDAYDSF	FXXX01	Consolidated Daily Summary	Daily after 2200 UTC
SWXDAYPRE	FXXX04	Geomagnetic and Flare Probability Predictions	Daily after 2200 UTC
SWXWEKHIL	FXXX06	7-Day Space Weather Highlights	Tuesdays, 2212 UTC
SWXWEKFOR	FXXX02	27-Day Space Weather Forecast	Tuesdays, 2212 UTC
SWXWEKOUT	FXXX05	27-Day Space Weather Outlook Table	Tuesdays, 2212 UTC
SWXADVOUT	NWXX04	Space Weather Advisory Outlook	Tuesdays, 1800 UTC
SWXADVBUL	NWXX05	Space Weather Advisory Bulletin	As needed
SWXADVMSG	NWXX06	Space Weather Advisory Messages – General messages from SWPC	As needed

SWXxxxxxx See second Space Weather Alerts As conditions warrant
 (See first column column below (See third column below)
 below for xxxxxxx) (add KWNP)

X-ray Flux Alert and Event Summaries				
ALTXMF	WOXX01	ALERT: X-ray Flux exceeded M5	R2	
SUMXM5	WOXX01	SUMMARY: X-ray Event exceeded M5	R2	
SUMX01	WOXX02	SUMMARY: X-ray Event exceeded X1	R3	
SUMX10	WOXX02	SUMMARY: X-ray Event exceeded X10	R4	
SUMX20	WOXX02	SUMMARY: X-ray Event exceeded X20	R5	
Radio Burst Summaries				
ALTTP2	WOXX04	ALERT: Type II Radio Emission		
ALTTP4	WOXX04	ALERT: Type IV Radio Emission		
SUM10R	WOXX03	SUMMARY: 10cm Radio Burst		
Geomagnetic Warnings, Alerts, and Watches				
WARSUD	WOXX10	WARNING: Geomagnetic Sudden Impulse expected		
SUMSUD	WOXX10	SUMMARY: Geomagnetic Sudden Impulse		
WARK04	WOXX13	WARNING: Geomagnetic K-index of 4 expected	G1 G2 G3 or greater	Extended Warning Extended Warning Extended Warning Extended Warning
WARK05	WOXX11	WARNING: Geomagnetic K-index of 5 expected		
WARK06	WOXX12	WARNING: Geomagnetic K-index of 6 expected		
WARK07	WOXX14	WARNING: Geomagnetic K-index of 7 or greater expected		
ALTK04	WOXX13	ALERT: Geomagnetic K-index of 4	G1 G2 G3 G4 G5	
ALTK05	WOXX11	ALERT: Geomagnetic K-index of 5		
ALTK06	WOXX12	ALERT: Geomagnetic K-index of 6		
ALTK07	WOXX14	ALERT: Geomagnetic K-index of 7		
ALTK08	WOXX15	ALERT: Geomagnetic K-index of 8		
ALTK09	WOXX16	ALERT: Geomagnetic K-index of 9		
WATA20	WOXX20	WATCH: Geomagnetic Storm Category G1 predicted	G1 G2 G3 G4 or greater	
WATA30	WOXX21	WATCH: Geomagnetic Storm Category G2 predicted		
WATA50	WOXX22	WATCH: Geomagnetic Storm Category G3 predicted		
WATA99	WOXX23	WATCH: Geomagnetic Storm Category G4 predicted		

		or greater predicted		
Electron Flux Alert				
ALTEF3	WOXX30	ALERT: Electron 2MeV Integral Flux exceeded 1000pfu		
Proton Flux Warnings, Event Alerts, and Event Summaries				
WARPX1	WOXX32	WARNING: Proton 10MeV Integral Flux above 10pfu expected	S1 to S5	Extended Warning
ALTPX1	WOXX32	ALERT: Proton Event 10MeV Integral Flux exceeded 10pfu	S1	Continued Alert
ALTPX2	WOXX32	ALERT: Proton Event 10MeV Integral Flux exceeded 100pfu	S2	Continued Alert
ALTPX3	WOXX32	ALERT: Proton Event 10MeV Integral Flux exceeded 1000pfu	S3	Continued Alert
ALTPX4	WOXX32	ALERT: Proton Event 10MeV Integral Flux exceeded 10000pfu	S4	Continued Alert
ALTPX5	WOXX32	ALERT: Proton Event 10MeV Integral Flux exceeded 100000pfu	S5	Continued Alert
SUMPX1	WOXX32	SUMMARY: Proton Event 10MeV Integral Flux exceeded 10pfu	S1	
SUMPX2	WOXX32	SUMMARY: Proton Event 10MeV Integral Flux exceeded 100pfu	S2	
SUMPX3	WOXX32	SUMMARY: Proton Event 10MeV Integral Flux exceeded 1000pfu	S3	
SUMPX4	WOXX32	SUMMARY: Proton Event 10MeV Integral Flux exceeded 10000pfu	S4	
SUMPX5	WOXX32	SUMMARY: Proton Event 10MeV Integral Flux exceeded 100000pfu	S5	
WARPC0	WOXX31	WARNING: Proton 100MeV Integral Flux above 1pfu expected		Extended Warning
ALTPC0	WOXX31	ALERT: Proton Event 100MeV Integral Flux exceeded 1pfu		Continued Alert
SUMPC0	WOXX31	SUMMARY: Proton Event 100MeV Integral Flux exceeded 1pfu		