방송통신위원회
KOREA COMMUNICATIONS COMMISSION

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Press release

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Short wave communication failure continued in polar regions on March 6 due sunspot activity

- Airlines have been using the Kamchatka route instead of the North Pole route since the afternoon of March 7. There has been little influence on the geomagnetic field from yesterday till now with the alert being Level-1 (minor) or lower. -

The National Radio Research Agency (Director general Dong-Hyung Lee) of the Korea Communications Commission announced that there was short wave communication failure due to a Level-3 (strong) eruption of sunspots that occurred around 9:10am on March 7 (Wednesday).

※ Levels: Level 1 (minor), Level 2 (moderate), Level 3 (strong), Level 4 (severe) and Level 5 (extreme)

According to the Korean Space Weather Center of the National Radio Research Agency, in charge of space environment forecasts and alerts, short wave communication was disrupted in Korea for about an hour due to X-rays emitted by the sun when the sunspot erupted on March 7.

Also, from 11:20pm on March 7, high-energy particles caused short wave communication in polar regions to fail, and the Korean Space

Weather Center predicted that this phenomenon would continue for another day.

※ High-energy particles: high energy protons (10 MeV or more) emitted into space after eruption of a sunspot. In most cases they arrive at the polar regions and travel along the geomagnetic field.

If a sunspot erupts, X-rays and high-energy particles are emitted that, when reaching the Earth's ionosphere (which is used for reflecting radio waves), interfere with the short wave communication used by airlines and militaries.

Currently, as for domestic airlines, flights returning from North America have been using the Kamchatka route instead of the North Pole route since March 7 for fear of short wave communication failure. As a result, flight time has increased by about an hour.

Meanwhile, the coronal mass emitted by a sunspot arrives at the Earth a little later creating a strong geomagnetic storm. Such a storm was predicted for last night, but so far there has been little influence on the geomagnetic field from yesterday until now (10:00am) with the alert being Level-1 (minor) or lower.

※ Coronal mass: particles existing in the solar atmosphere such as protons, electrons and helium ions

Ordinary sunspots are one to two times bigger than the Earth, but sunspot No. 1429, which erupted this time, is 11 times bigger than the Earth.

Also, as sunspot No. 1429 is currently located in the center of the sun, it is predicted to be highly likely to affect the Earth for the next week during which it will go to the other side of the Earth due to solar rotation.

“As we predict little damage to the everyday lives of citizens, there is no need to be concerned about it,” said Jae-Hyung Lee, Director of the Korean Space Weather Center emphatically.

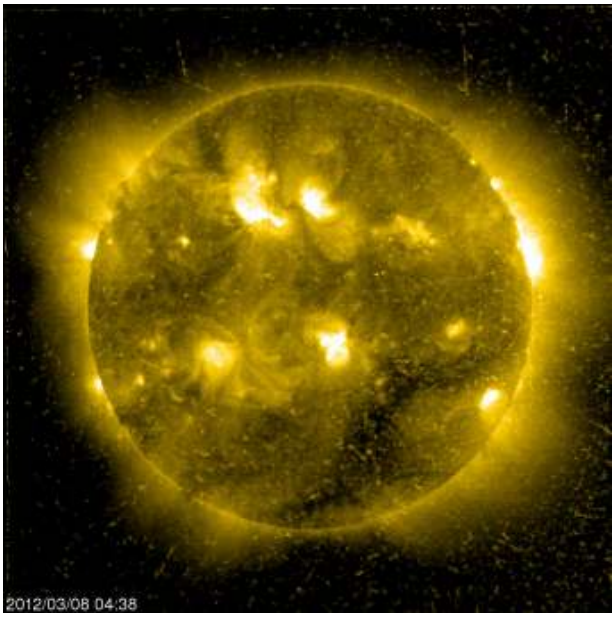
“However, as any sunspot can affect short wave communication or satellites, airlines, the military and organizations managing satellites must continuously pay attention to the space environment forecasts and alerts issued by the Korean Space Weather Center.”

The Korean Space Weather Center provides forecasts and an alert service for solar activities via e-mail and SMS. Anyone can apply for this service at www.spaceweather.go.kr.

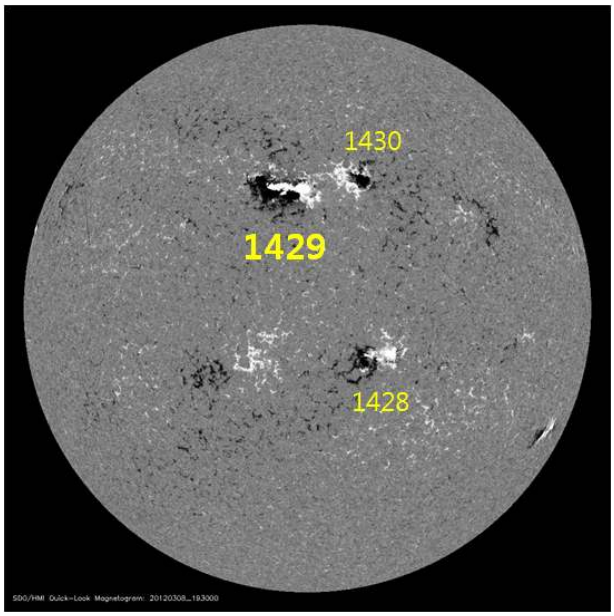
※ Attachments: 1. Recent image of sunspot No. 1429, and observation of impacts
2. Overview of sunspot eruptions

[Attachment 1] Recent image of sunspot No. 1429 and observation of impacts

□ Recent image of sunspot No. 1429



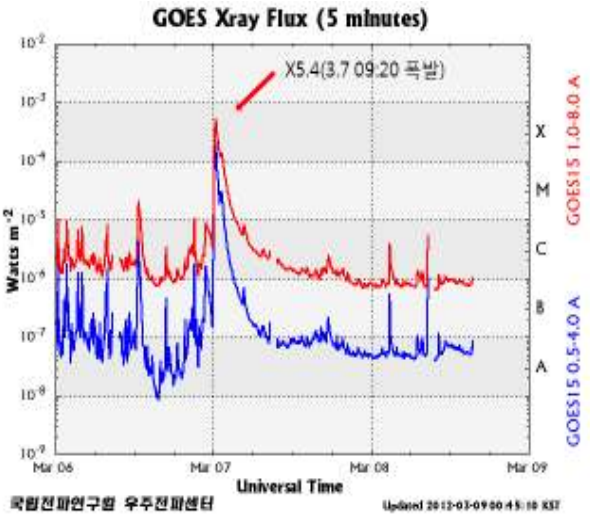
[Figure 1] Upper part of the solar atmosphere
(13:38 March 8, KST)



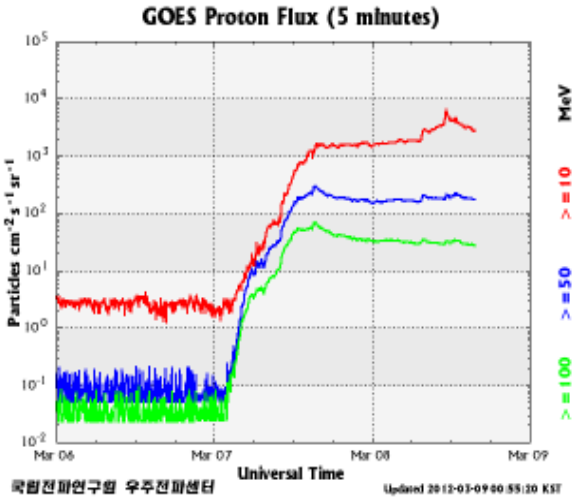
(06:00 March 9, KST)
[Figure 2] Magnetic field structures on the surface of the sun

※[Figure 1] Illustrates the location of the sunspot as observed by the SOHO satellite.
[Figure 2] Illustrates the distribution of the magnetic field around the sunspot.

□ X-ray and high-energy particle observation data



[Figure 3] Solar X-rays during the past three days



[Figure 4] High-energy particles during the past three days

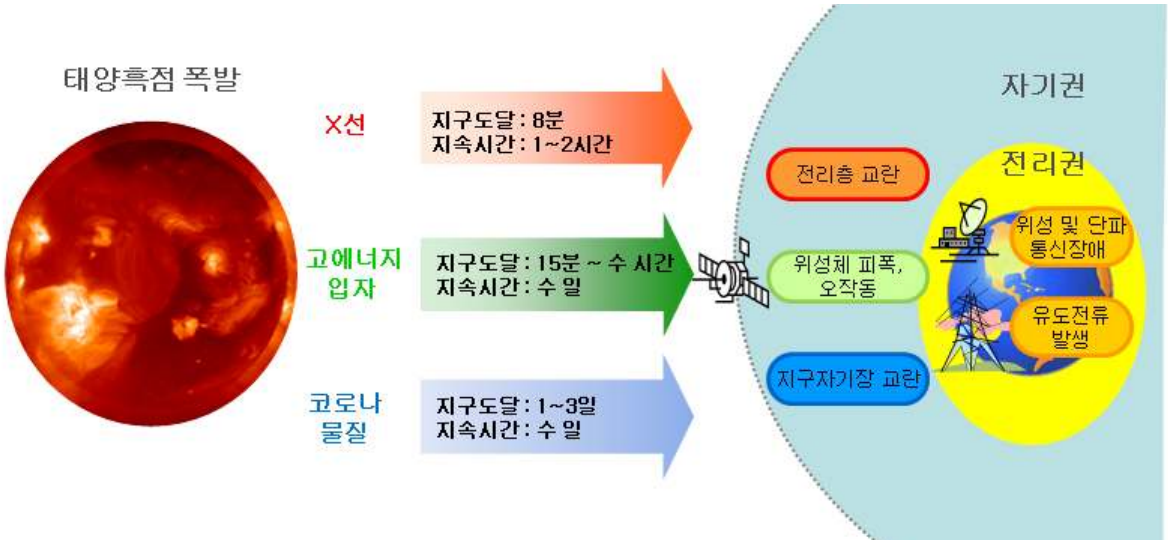
[eruption]

[the Korean Space Weather Center]

※ High-energy particles, which accompanied the sunspot eruption on March 7 [Figure3], began to be observed starting 23:20 on March 7, and reached Level 3 (strong), and has maintained its current status [Figure 4].

[Attachment 2] Overview of sunspot eruptions

□ Overview



Eruption of sunspots	X-ray High-energy particles Coronal mass	Time to Earth: 8 minutes Duration: 1~2 hours Time to Earth: 15 minutes ~ a few hours Duration: a few days Time to Earth: 1~3 days Duration: a few days	Ionospheric storm Satellites exposed to radiation and malfunctioning Geomagnetic disturbance	Magnetosphere Ionosphere Communication problems of satellites and short wave electronic equipment Induced current

o When sunspots erupt, **X-rays, high-energy particles** (protons) and coronal mass particles (protons, electrons, helium, etc.) are emitted into space.

o After eruption it ordinarily takes X-rays 8 minutes, high-energy particles a few hours, and coronal mass particles 1~3 days to reach the earth, disturbing **the ionosphere** and **geomagnetic field**.

□ Types of damage caused by sunspots

o **(X-rays)** These disturb the ionosphere during **daytime** causing **short wave communication failures**, satellite-to-satellite communication failures, and errors in receiving GPS signals.

o **(High-energy particles)** These affect the solar panels of satellites, cause **short wave communication failure of airplanes** flying over the North Pole, and expose astronauts to radiation sickness.

o **(Coronal mass)** These cause short wave communication failure due to the disturbance of the ionosphere, and can severely **damage electric power facilities due to induced current** caused by the disturbance of the geomagnetic field.

□ Sunspot alert issuance procedure

o When a sunspot erupts an alert will be issued automatically based on detection data from a NASA satellite and observation centers located around the world.

o **The data is classified into 5 levels** (minor [1], moderate [2], strong [3], severe [4], extreme [5]) **according to international standards** for the intensity of the solar flare, the quantity of high-energy particles, and the degree of disturbance of the geomagnetic field.

□ Statistics about alerts related to sunspot eruptions

o Solar activities occur in cycles that peak (rise to a maximum) and trough (fall to a minimum) over an approximate **11-year cycle**, and,

- as **a solar peak** is predicted for **May 2013**, the number of alerts

related to sunspot eruptions is increasing.

<Issuance of level-3 or higher alerts>

2010	2011	2012 (As of March 9)
-	level 3 ten times level 4 twice	level 3 six times (1.23, 1.28, 3.5, 3.7 [3 times])

□ The role of the Korean Space Weather Center of the National Radio Research Agency

o The KCC established the Korean Space Weather Center in August 2011 on the Jeju island as **an organization specializing in the space radio environment** to help minimize damages caused by sunspot eruptions.

o The Korean Space Weather Center provides the **forecast service** i.e. predicting solar activities and the **alert service** which propagates sunspot eruptions pursuant to **the Radio Waves Act**.

o The Korean Space Weather Center is a member of the **International Space Environment Service** (ISES), an international organization sharing solar activity observation data and analysis information.

- As a **Regional Warning Center** (RWC) representing Korea, it is working closely with the 14 member countries under the umbrella of the International Space Environment Service to actively respond to solar activities.

※ ISES: International Space Environment Service, RWC : Regional Warning Center