방송통신위원회
KOREA COMMUNICATIONS COMMISSION

March 5, 2012.

Press release

To be reported on March 5, 2012 (Monday) upon the distribution time.

Inquiry: Yeong-Gyu Kim, Forecasting Team, Korean Space Weather Center (064-797-7030) ygheem@kcc.go.kr
Jae-Hoon Kim, Forecasting Team, Korean Space Weather Center (064-797-7033) snowqee@kcc.go.kr

Level-3 (Strong) Sunspot Eruption

The National Radio Research Agency (Director general Dong-Hyung Lee) of the Korea Communications Commission announced that there was a level-3 (strong, out of a possible 5) sunspot eruption at 12:56 on March 5 (Monday). This is the 3rd Level-3 alert issued for a sunspot eruption.

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

This sunspot eruption took place at sunspot No. 1429 located at the leftmost rim of the sun. This sunspot had Level-1 (minor) eruptions last Saturday and Sunday, and as its size and complexity still continues to increase, additional eruptions are highly likely.

This sunspot eruption cause short wave communication failure for about an hour in Korea, and the Korean Space Weather Center is trying to figure out when the high-energy particles or coronal mass accompanying a sunspot eruption will reach Earth, and what the magnitude will be.

Jae-Hyung Lee, Director of the Korean Space Weather Center said, “We need to continuously observe the sunspot, currently located in

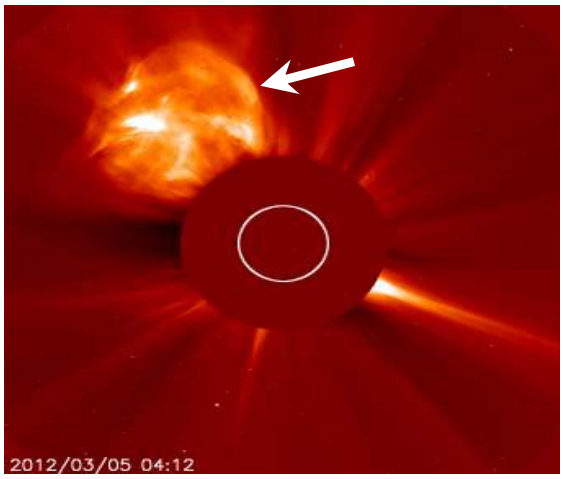
the left half of the sun, for the next two weeks while coronal mass etc. heads toward the other side of the Earth according to the solar rotation, and make preparations.”

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

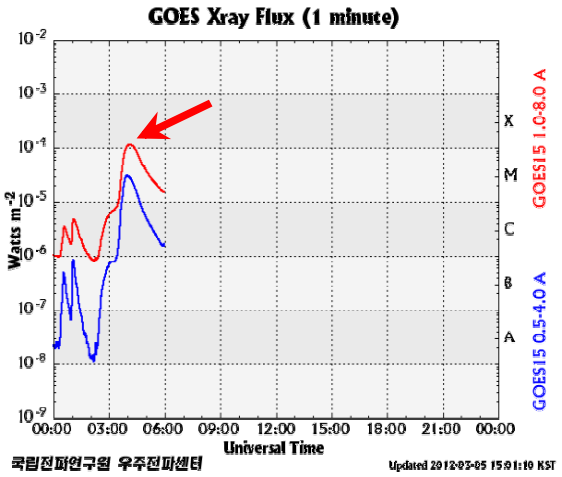
Because a peak of solar activity is expected for 2013, the Korean Space Weather Center is planning to invite 100 interested citizens and government officials to attend a special presentation about the space environment to be held on March 29.

※ Attachments: 1. Sunspot (No. 1429) eruption observation data
2. Overview of sunspot eruptions

[Attachment 1] Sunspot (No. 1429) eruption observation data



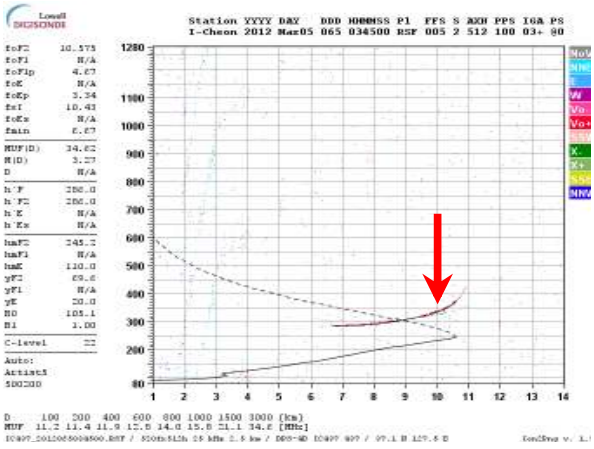
[Figure 1] Image of the sunspot eruption from NASA's SDO satellite



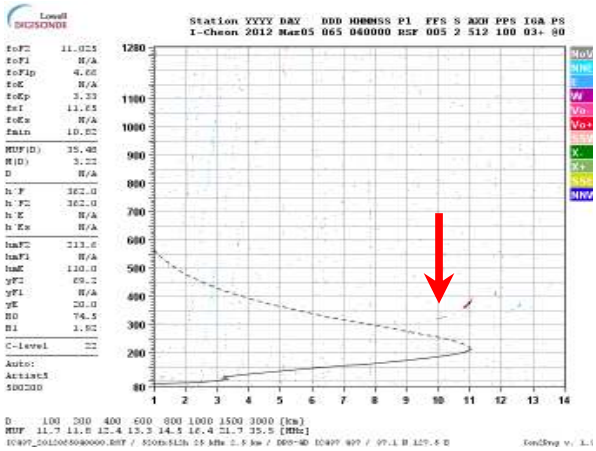
[Figure 2] Observation data of solar X-rays from GOES, the geostationary satellite of the National Oceanic and Atmospheric Administration (USA)

[the Korean Space Weather Center]

※ Figure 1. illustrates the image of coronal mass ejection after the sunspot eruption (white arrow). Figure 2. illustrates the intensity of solar X-rays in excess of grade X as observed by the GOES satellite (red arrow).



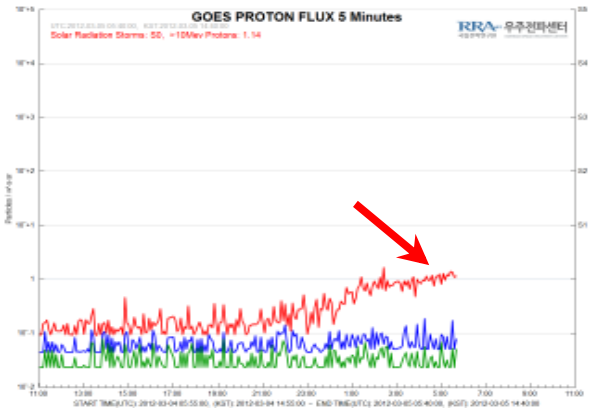
[Figure 3] Ionosphere before the sunspot eruption



[Figure 4] Ionosphere after the sunspot eruption

※ Short wave communication uses ionospheric to reflect radio waves. Figure 3. illustrates the ionosphere distributed between 200km and 500km. Figure 4 shows

that, as the entire ionosphere has disappeared, no short wave communication is possible.



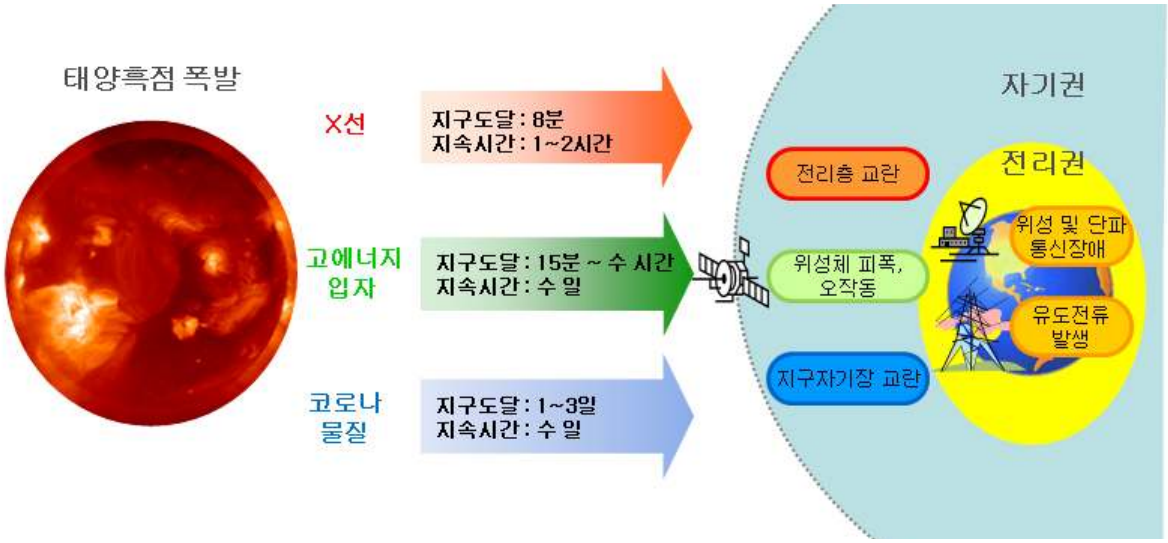
[Figure 5] GOES satellite's observation of high-energy particles of the sun

[Figure 6] Forecast situation room, Korean Space Weather Center, National Radio Research Agency

※ Figure 5. the slow increase of high-energy particles of the sun after the sunspot eruption as measured by the GOES satellite.

[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 5)
-	level 3 10 times level 4 twice	level 3 three times (1.23, 1.28, 3.5)

□ 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