

Space Weather Workshop 2012

NATIONAL RADIO RESEARCH AGENCY

# KOREAN SPACE WEATHER CENTER



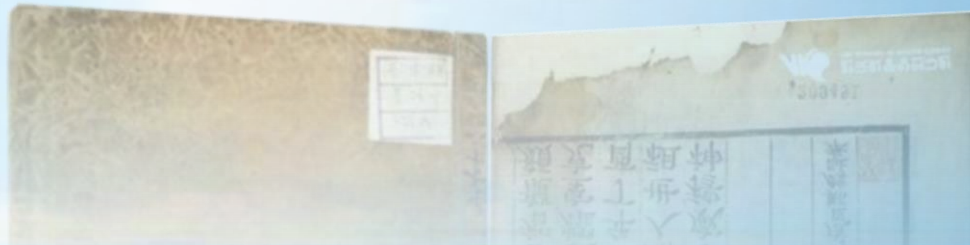
Jae-hyung Lee, Sun-hak Hong, Jin-wook Han, Young-kyu Kim

# Early SWX Records in Korea

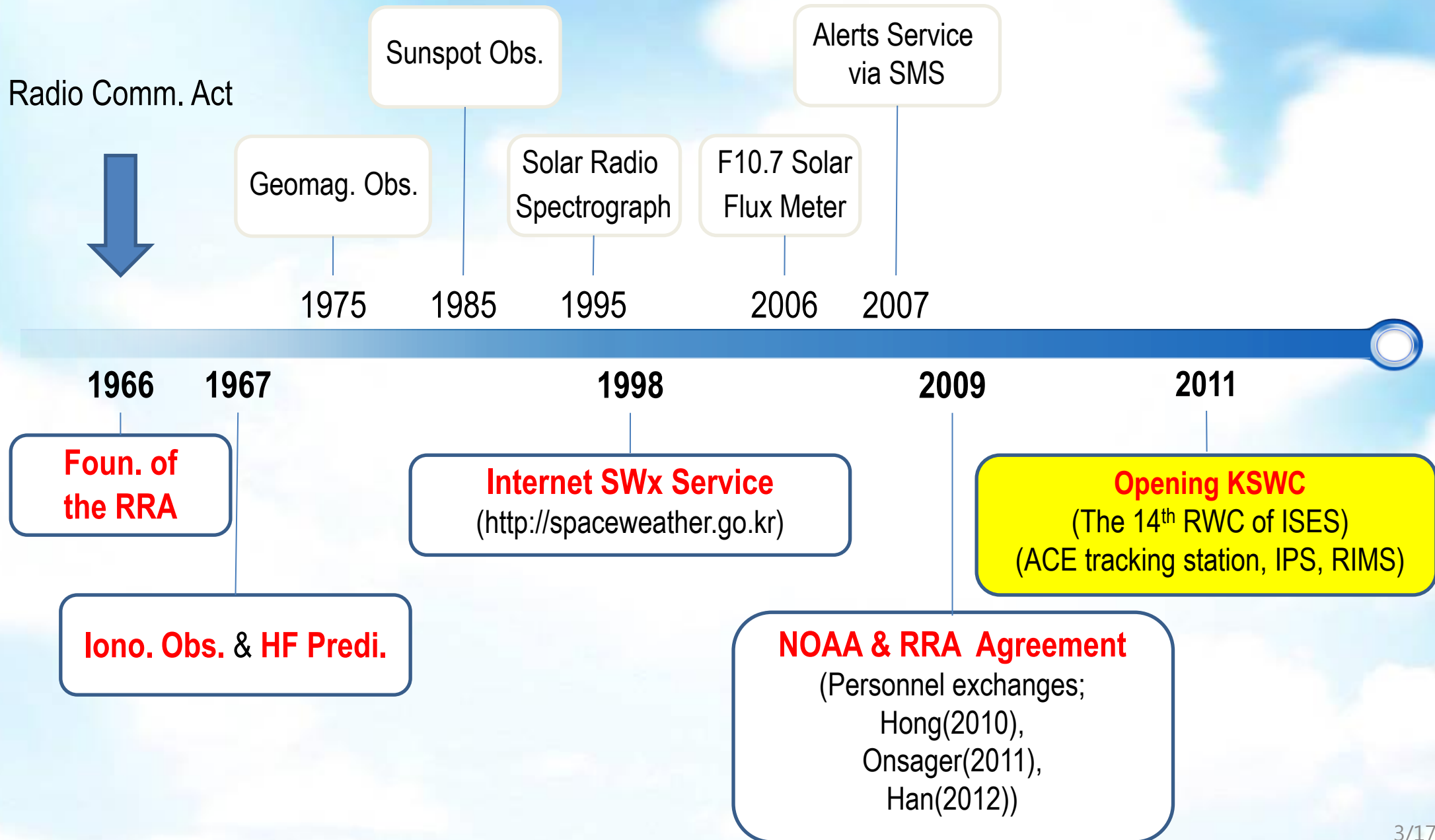


“There is a black spot in the sun as large as an egg” (1151, Goryeo-Sa)

“It spread across the sky like a piece of silk cloth and then dispersed” (1770, Chan-jip-cheong)



# History & Origin of KSWC



# Its' Launch & Orbit On



**Dec 2010**

Building  
Completion



**Nov 2011**  
Ceremony  
for Opening &  
ISES member

**Dec 2011**  
Forecast  
System  
Completion



**Feb 2011**

Starting  
ACE tracking

**Mar 2012**

User  
Conference



# Organization Chart



## Key Message

- Joint operation by RRA and KAF
- Begin with 23 staff and 4 teams (15 Gov. + 2 AF(July 2012) + 2 Researchers + 4 Technicians)
- 24x7 operations in the near future

# Forecasting Office

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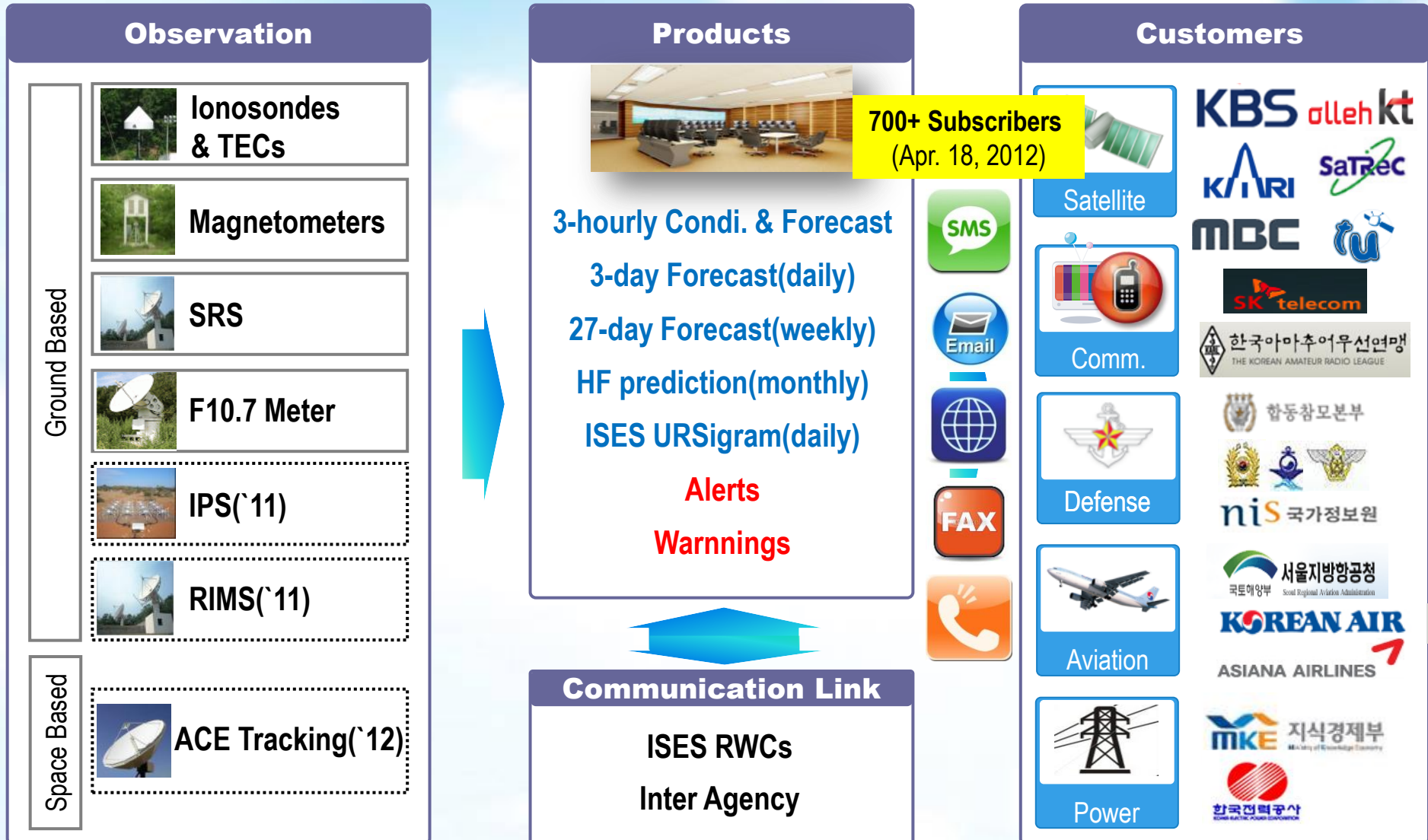
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## Key Message

- Monitoring space weather conditions and data collecting networks
- Producing daily forecast and issuing Alerts and Warnings
- 9hr/weekday in norm days, 24hr in SWx critical days

# Operational Flow



# Observation Networks in Korea





Alerts & Forecasts

Real Time Data

Space Weather and Effects

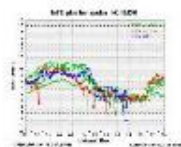
Instruments

About the Center

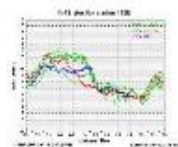
### Real time data

[ Click the images for a larger one ]

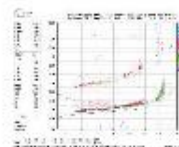
#### • Ionosphere



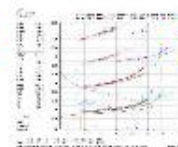
Icheon Ionosphere (foF2)



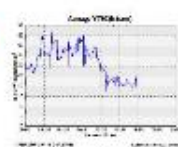
Jeju Ionosphere (foF2)



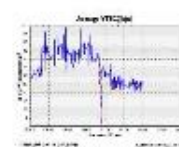
Icheon Ionosphere (ionogram)



Jeju Ionosphere (ionogram)

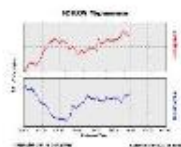


Icheon TECs

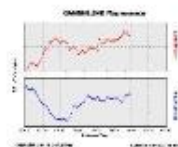


Jeju TECs

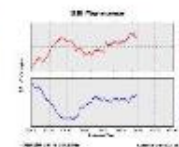
#### • Geomagnetic activity



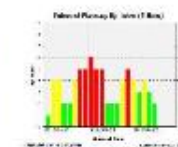
Icheon geomagnetic



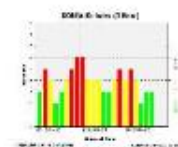
Gangneung geomagnetic



Jeju geomagnetic

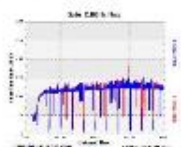


K<sub>p</sub> Index

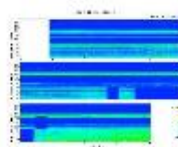


K<sub>s</sub> Index

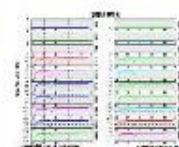
#### • The Sun



Sunspot activity (28GHz)

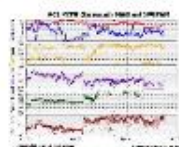


Solar radio activities

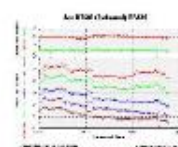


Solar Radio Noise Monitor

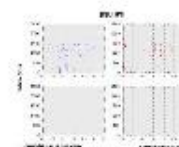
#### • Solar Wind



SOLAR WIND: Mag field & Plasma



Low Energy Electrons & Protons



Solar Wind Ground scope for Solar Wind

What does the space radio affects the Earth?

Provides information on HF-Communication, satellites, and solar activities to the public.

GO

Cartoons about space weather for Children.



GO



Observation Data

Go

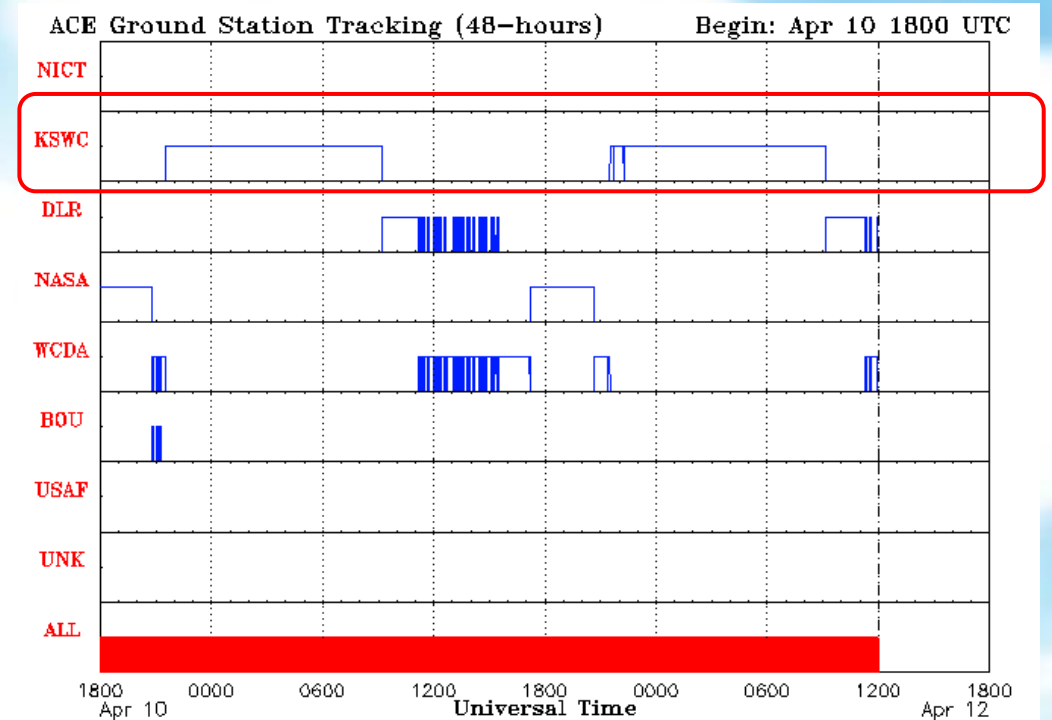


Space Weather Report

Go



# ACE Satellite Tracking Station



Updated: 2012 Apr 12 12:00 UTC

NOAA/SWPC Boulder, CO US

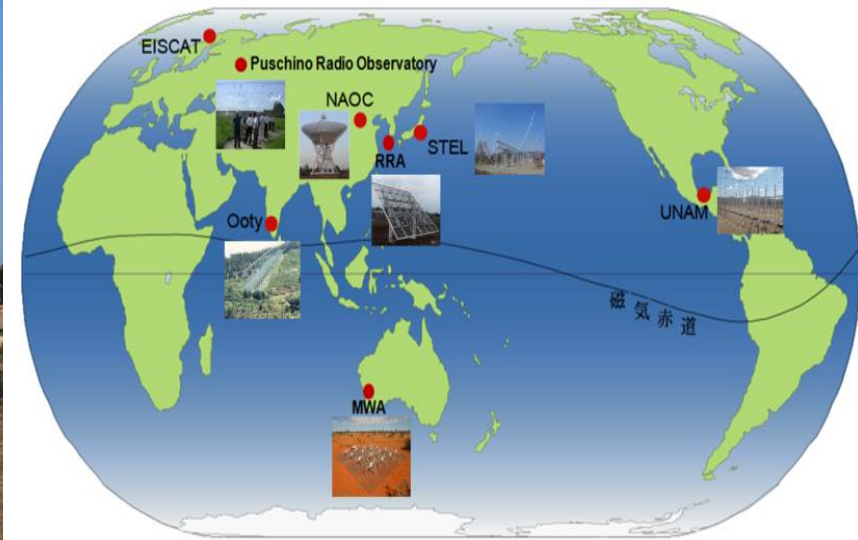
## Key Message

- A 13-meter dish for receiving ACE's real-time solar wind data
- Serving the East Asia region starting Feb 2012
- Ready for ACE follow-on (DSCOVR)

# Interplanetary Scintillation Monitor

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## Key Message

- 32 tiles × 24 array elements (768 antennas, Active aperture  $\approx 760 \text{ m}^2$ )
- Digital beam formers for tracking 80 radio sources (327 MHz)
- Providing CME's speed, direction & density

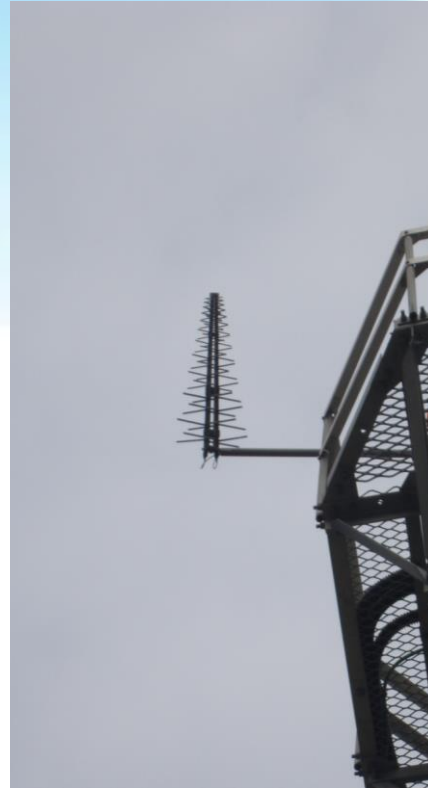
# Solar Radio Interference Measurement System

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**20~500 MHz**



**0.5~1 GHz**



**1~8 GHz**

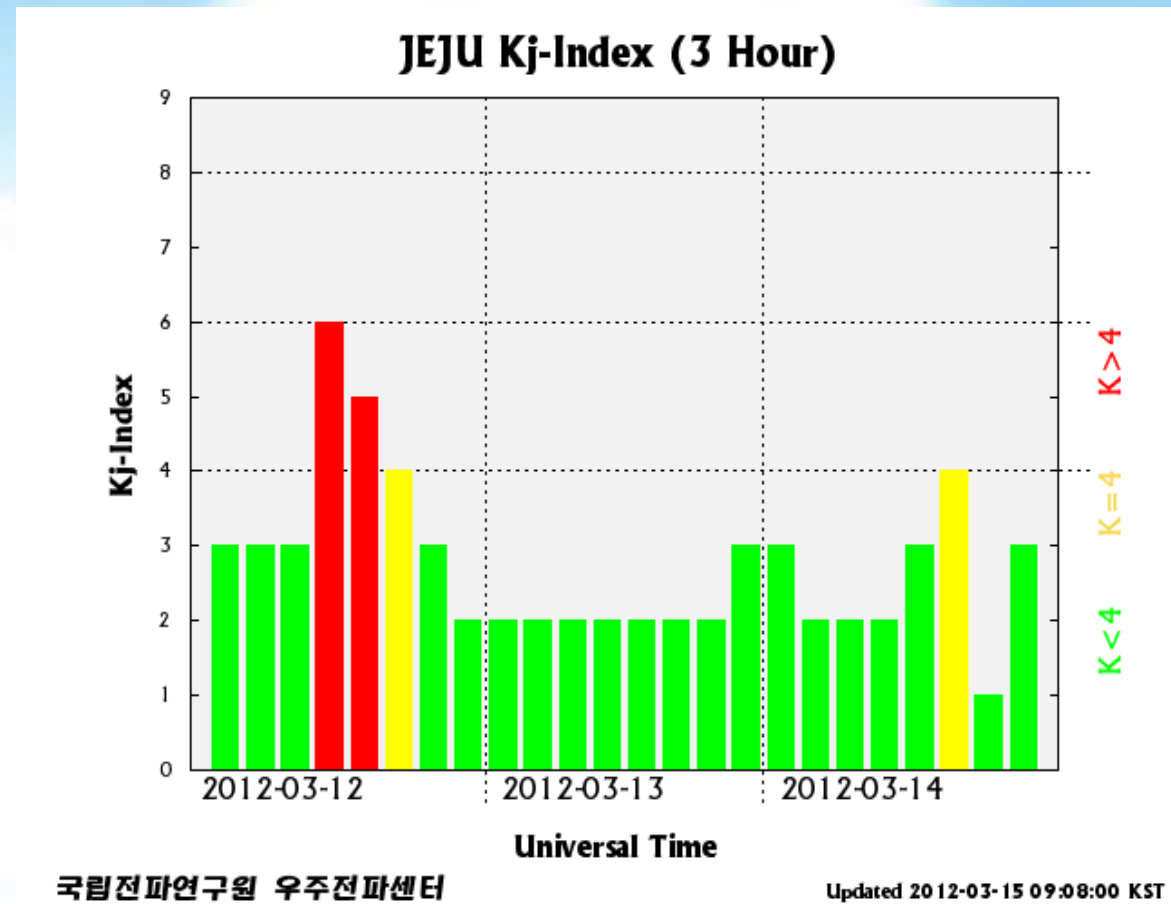
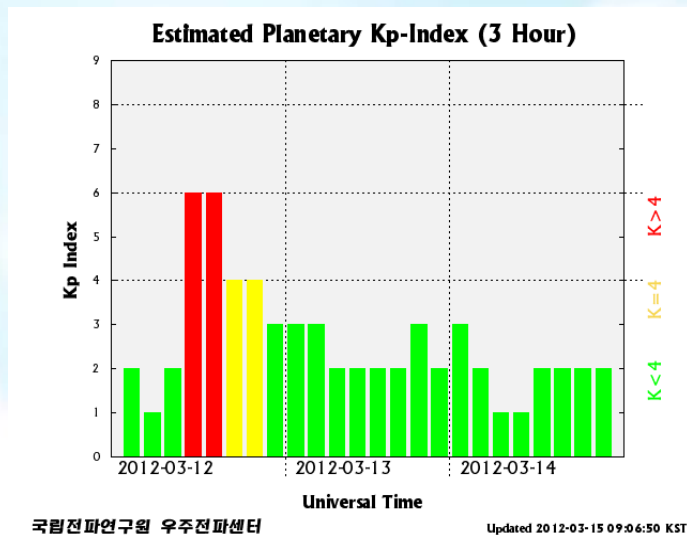


**8~18 GHz**

## Key Message

- 20 points selectable, 20 MHz ~ 18 GHz
- Monitoring SRI on critical communication bands
- Validation is needed by comparing with USAF's RIMS

# Real-time Local K-index



## Key Message

- Using SWPC(Dr. Christopher Balch) algorithm
- Expecting to be added in SWPC's estimated Kp calculation

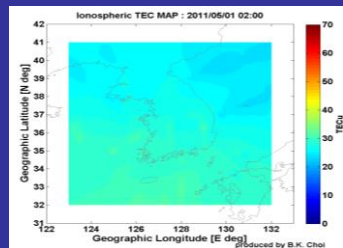
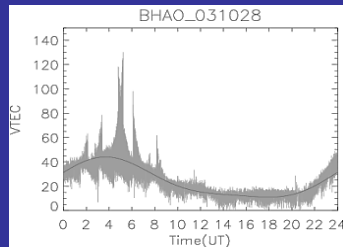
# Migration to Customer Oriented Services

**Alerts & Warnings  
for Global Disturbance**



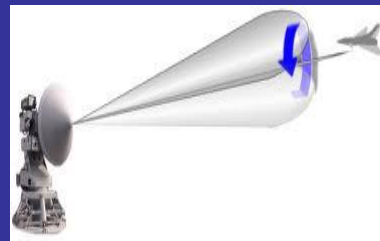
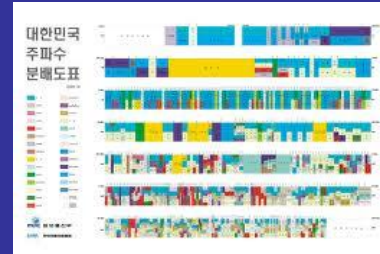
**Customized Alerts & Warnings  
to Each User**

**Ionospheric  
Disturbance Effect  
Prediction**



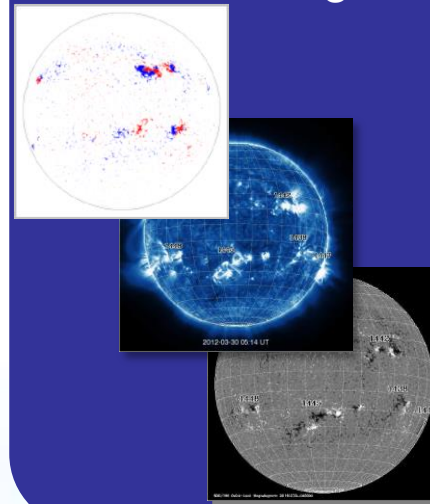
**KASI**

**Solar Radio Noise  
Effect  
Prediction**



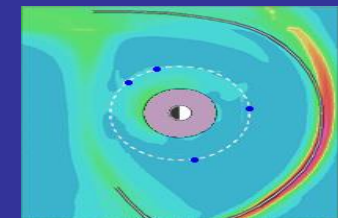
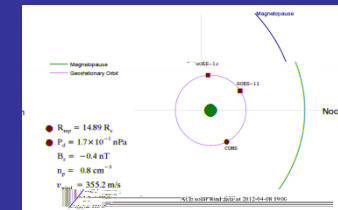
**SET**

**Solar Activity  
Prediction  
using Image  
Processing**



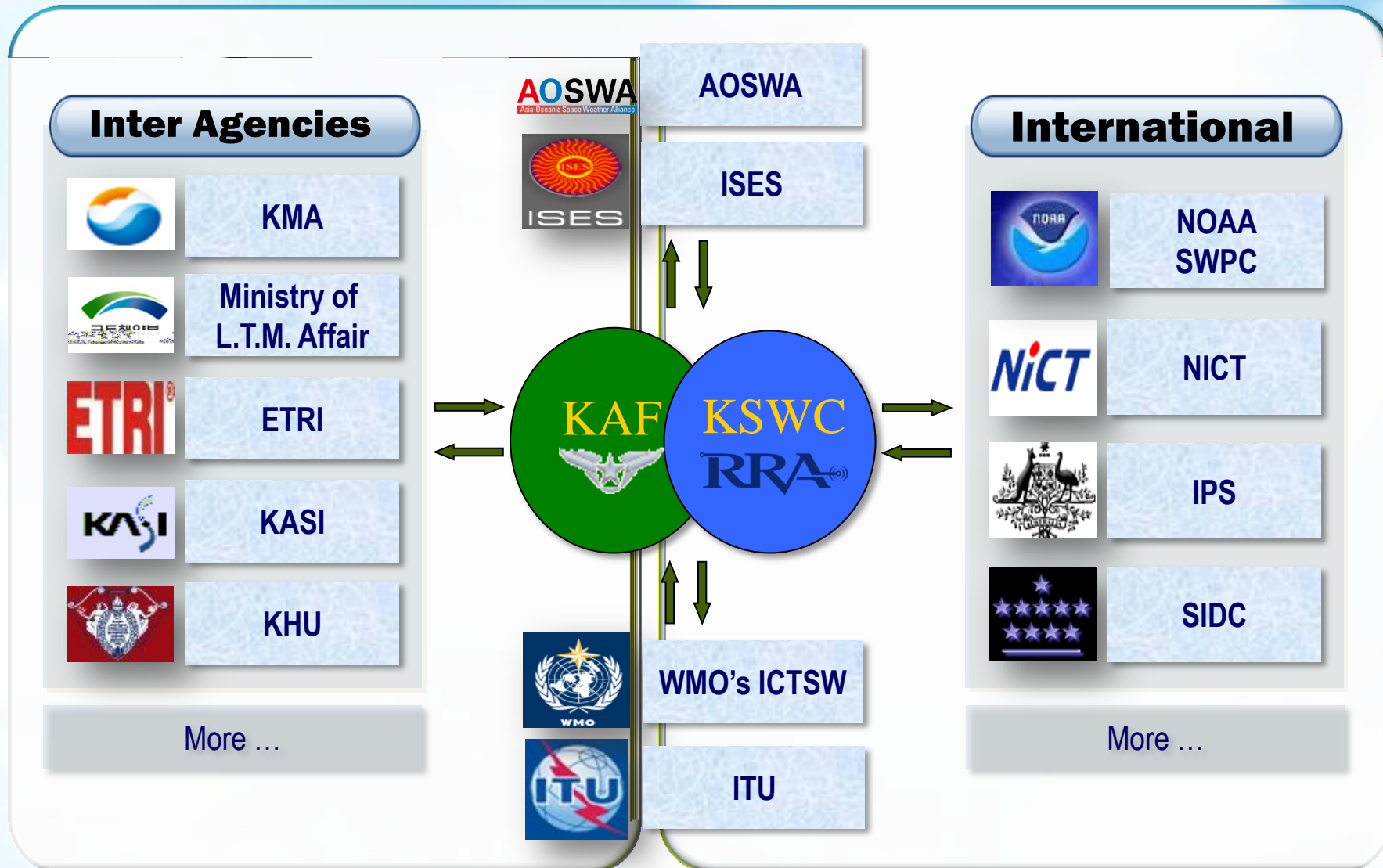
**SELab**

**GEO Satellite  
Environment  
Prediction**



**SELab**

# Strong Partnership



# The 14th RWC of ISES

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Thank you