

2014 CCMC Workshop

NATIONAL RADIO RESEARCH AGENCY

KOREAN SPACE WEATHER CENTER

RRA NATIONAL RADIO
RESEARCH AGENCY

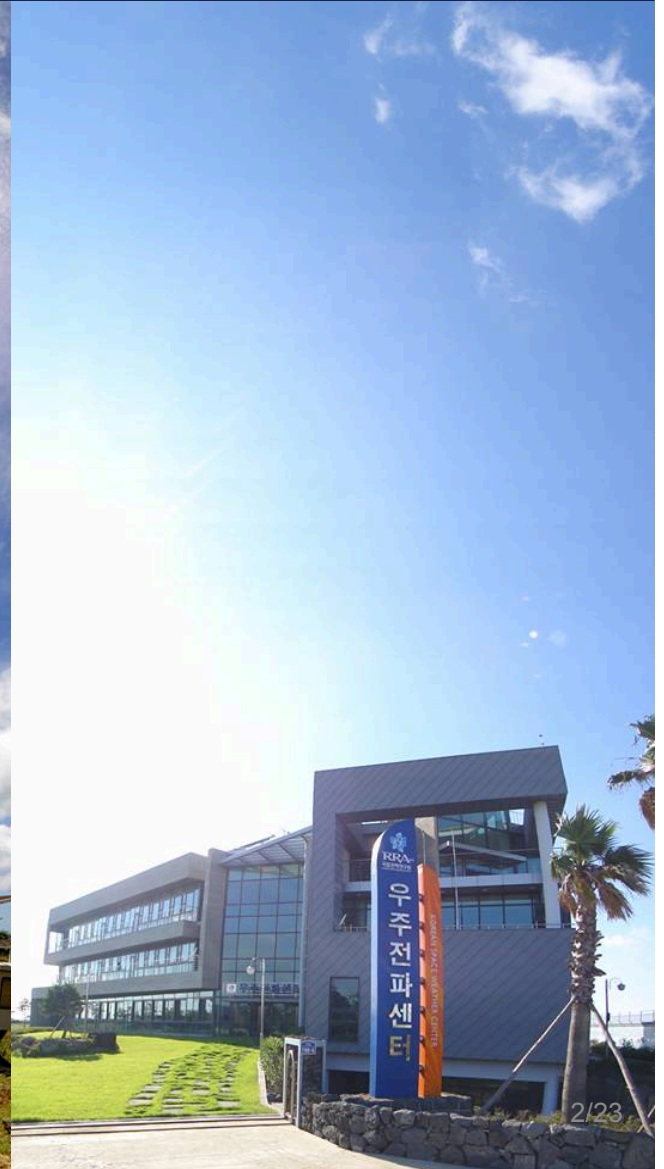
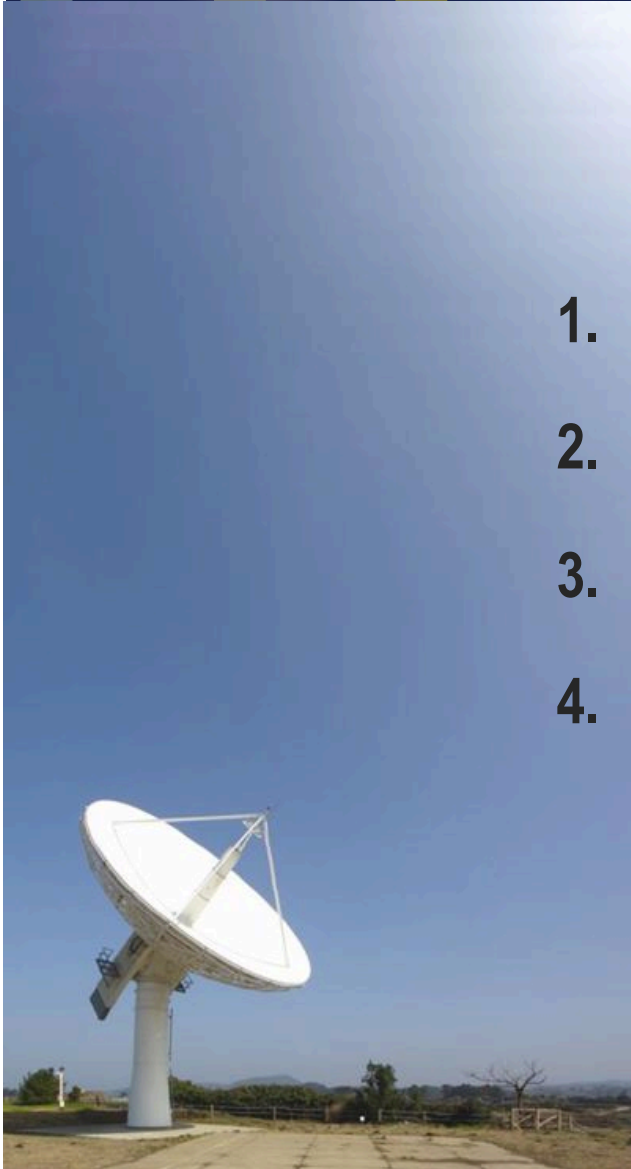
Sunhak Hong, Yung-kyu Kim, Seung-man Choi

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**KOREAN SPACE
WEATHER CENTER**

1. SWx Operations
2. Research Activities
3. National Preparations
4. Collaborations with CCMC



AGU Chapman Conference at Jeju

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**KOREAN SPACE
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Jeju Island, Republic of Korea | 31 August – 5 September 2014

PROGRAM

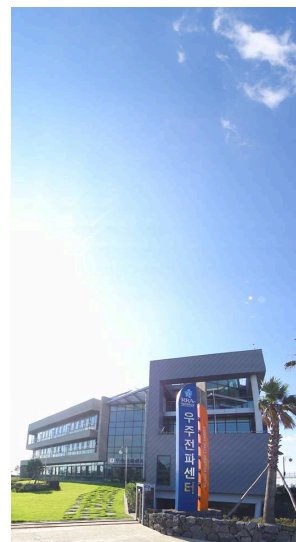
BOOK MY MEETING

GENERAL INFORMATION

AGU Chapman Conference on Low-Frequency Waves in Space Plasmas



Field Trips



Jeju Island is home to the Korean Space Weather Center (KSWC), which is a government agency that is responsible for space weather research and operations of the Republic of Korea. Established in 2011, KSWC has been a member of the World Meteorological Organization (WMO) Inter-program Coordination Team on space weather and became a regional warning center of the International Space Environment Service (ISES).

Space weather is one application of waves, and as such, we propose a field trip on Wednesday, 3 September, to KSWC. Field trip costs, including bus transportation and dinner, are part of the registration fees; however, most of the costs will be supported and sponsored by the KSWC.

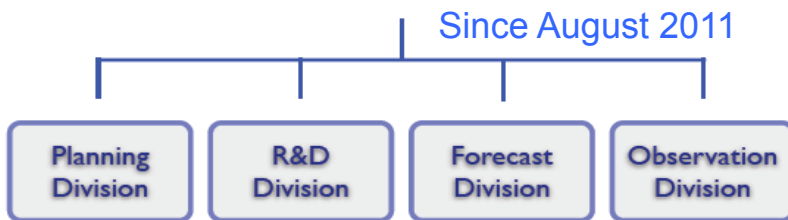
In addition, Jeju offers its visitors many activities. It is worth mentioning that in 2011 Jeju Island was included in the list of the [New Seven Wonders of Nature](#). This illustrates that the island will also offer the opportunity to enjoy some natural wonders and Jeju Island's culture before, during, or after the conference, as participants wish. For an additional fee (to be determined), possible activities for the conference participants include several half and/or full-day field trips to Mt. Halla, caves, folk villages and museums, and many other historic and scenic spots. Admission, dinner, and bus transportation are included in the fee.

Additional details will be posted as information becomes available.

KSWC Overview

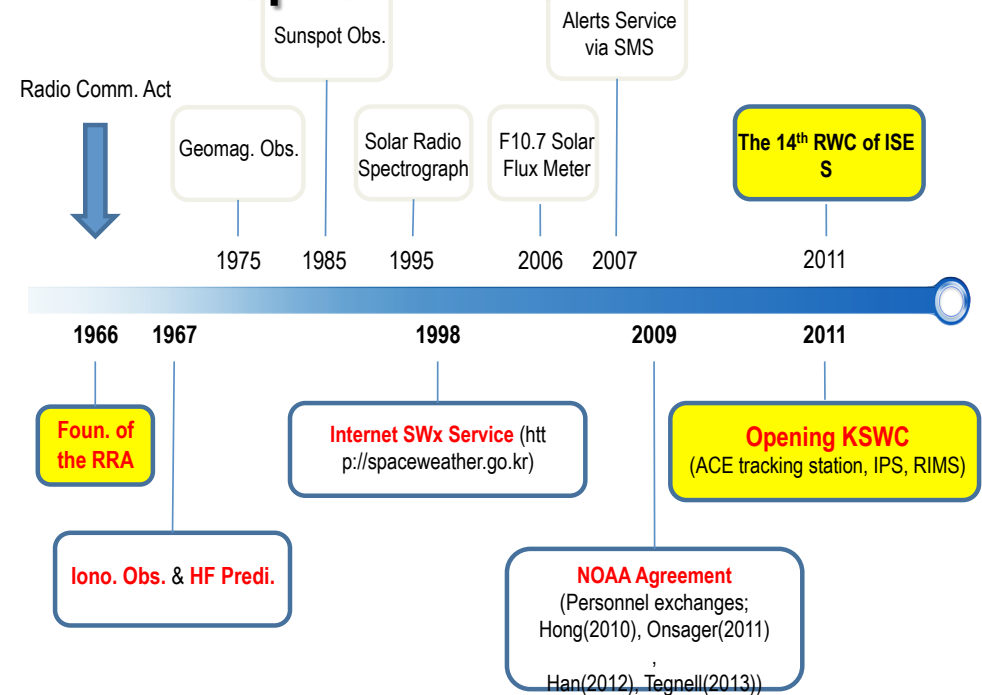
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The Korean Government Agency for SWx Operation & Research A Regional Warning Center of International Space Environment Service

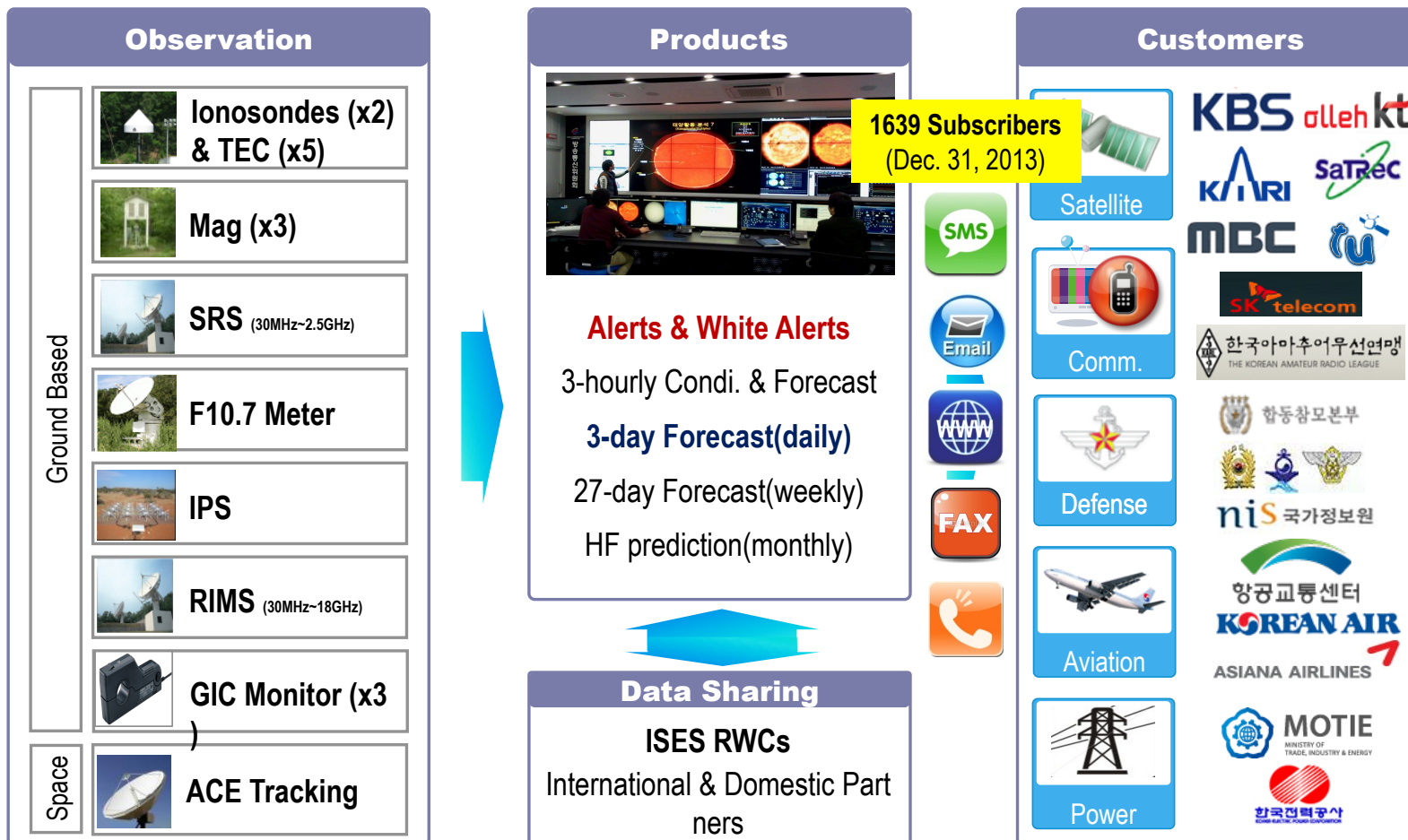


25 staff = 17 gov. + 5 researchers + 3 technicians

* 3 more gov. in 2014



SWx Operations – operational work flow



SWx Operations – observatory network



SWx Operations – satellite tracking antenna

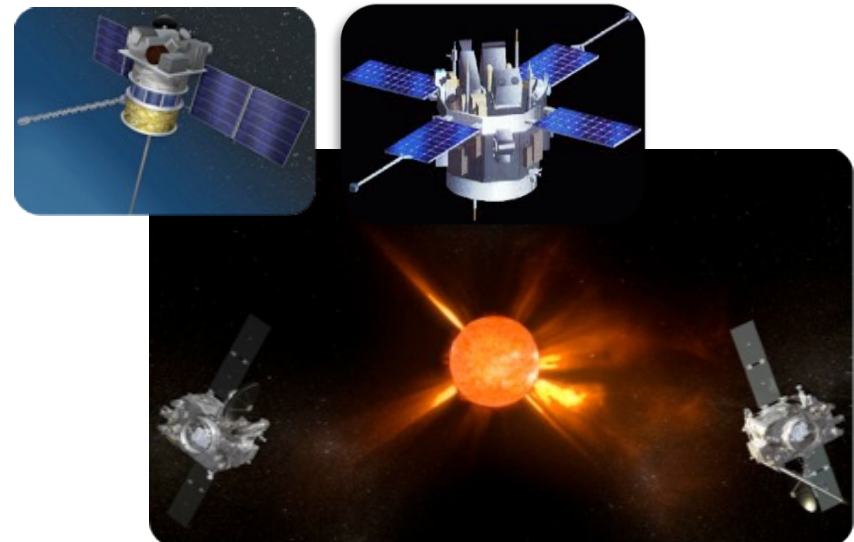
➤ ACE Tracking Antenna

- ✓ global tracking network for RTSW
- ✓ 13-meter dish antenna (S-band)
- ✓ in operation since Feb 2012
- ✓ will be upgraded for DSCOVR by Dec 2014



➤ New Tracking Antenna

- ✓ 13-meter dish antenna
- ✓ dual RF (X-band, S-band) & triple receiver switching for STEREO, ACE, DSCOVR tracking
- ✓ will be ready by Dec 2014



Alerts & Forecasts

Forecast Models

Real Time Data

Space Weather

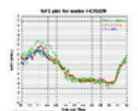
Instruments

About the Center

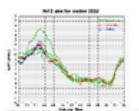
Real time data

[Click for more detailed images]

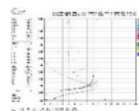
• Ionosphere



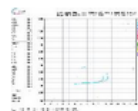
Icheon Ionosphere (foF2)



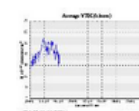
Jeju Ionosphere (foF2)



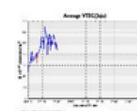
Icheon Ionosphere (ionogram)



Jeju Ionosphere (ionogram)

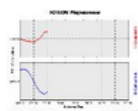


Icheon TECs

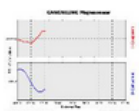


Jeju TECs

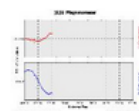
• Geomagnetic activity



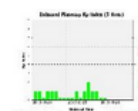
Icheon geomagnetic



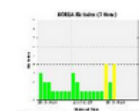
Gangneung geomagnetic



Jeju geomagnetic

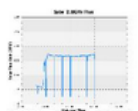


K_p Index

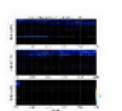


K_k Index

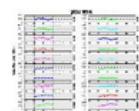
• The Sun



Sunspot activity (28GHz)

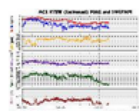


Solar radio activities Icheon | Jeju

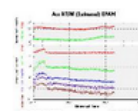


Solar Radio Noise Monitor

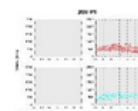
• Solar Wind



SOLAR WIND: Mag field & Plasma



Low Energy Electrons & Protons



Solar Wind Ground scope for Solar Wind



Would you like to know the impact of space weather on the Earth?

More detailed information for the nonprofessional on space weather, radio communications and satellites etc. [GO](#)

Educational cartoons on space weather for kids [GO](#)

Obervation Data [Go](#)

Space Weather Report [Go](#)

SWx Operations - SNS & Mobile App.

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➤ [SNS] The Facebook

- ✓ daily SWx cast video (2-min length), post analysis, tutorials, etc
- ✓ facebook.com/rwcjeju (Korean)



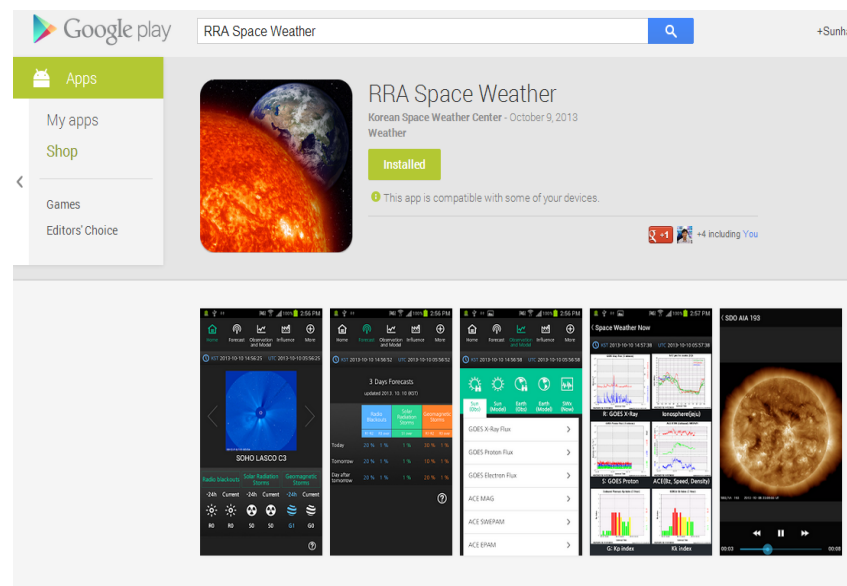
우주전파센터 Korean Space Weather Center

150 likes · 22 talking about this

Update Page Info

➤ [Mobile App] RRA Space Weather

- ✓ real-time SWx condition & forecast
- ✓ observation data and model results
- ✓ iOS & Android version (English)



SWx Operations – international forecast coordination

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➤ ISES's New Website (ises-spaceweather.org)

- ✓ [New functionalities] - 'SWx Now', 'Latest Forecasts'
- ✓ [Special tools for RWCs] - 'SWx Discussion', 'Enlil Discussion'

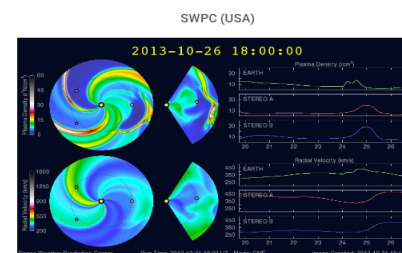
Space Weather NOW	48H	24H	Current
Radio Blackouts	R0	R0	R0
Solar Radiation Storms	S0	S0	S0
Geomagnetic Storms	G0	G0	G0

- Discussions >
- Latest Forecasts
- Space Weather Discussions
- Enlil Discussions

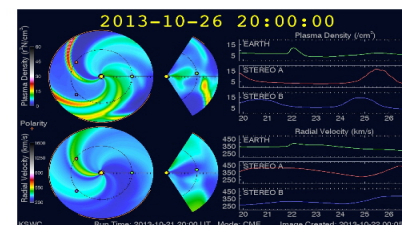
Enlil Discussion

Print This Page

Logout



For more information, please visit SWPC website.



For more information, please visit KSWC website.

Research Activities – prediction models

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Solar Activity

ASSA : Automatic Solar Synoptic Analyzer

solar cycle prediction

Solar Wind

WSA-Enlil + Cone (Dr. Dusan Odstrcil & SWPC)

IPS Solar Wind Reconstruction

(Dr. Bernard Jackson & STELab. of Nagoya Univ.)

Satellite

GEO environment prediction

LEO environment prediction

Airline

polar route communication prediction

polar route radiation dose prediction

GIC

local GIC prediction model

local GIC map

GPS

local TEC map

local GPS ionospheric error map

Communications

local ionospheric model (IRI-2012 + VOACAP + local data)

real-time usable HF frequency

Research Activities – ASSA

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<http://www.spaceweather.go.kr/assa>

ASSA Automatic Solar Synoptic Analyzer

About ASSA Program Latest Results Feedback

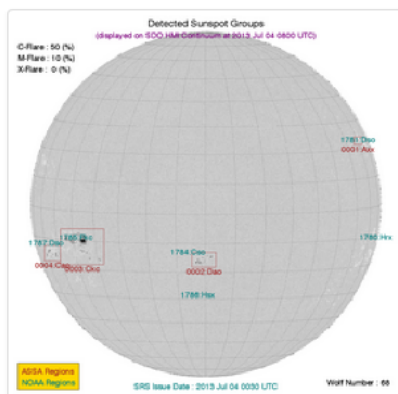
ASSA Categories

ASSA consists of the following three categories

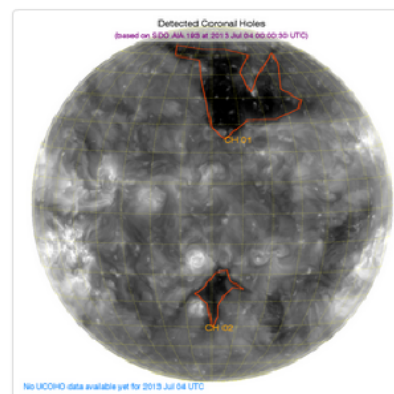
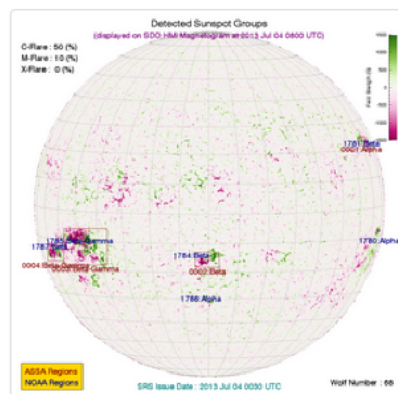
- * sunspot group identification and classification
- * coronal hole detection
- * filament detection

For each category, ASSA receives necessary solar raw images and processes them in a designated procedure to yield resultant output files.

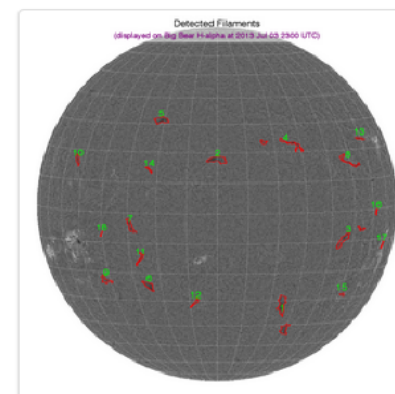
Latest Results



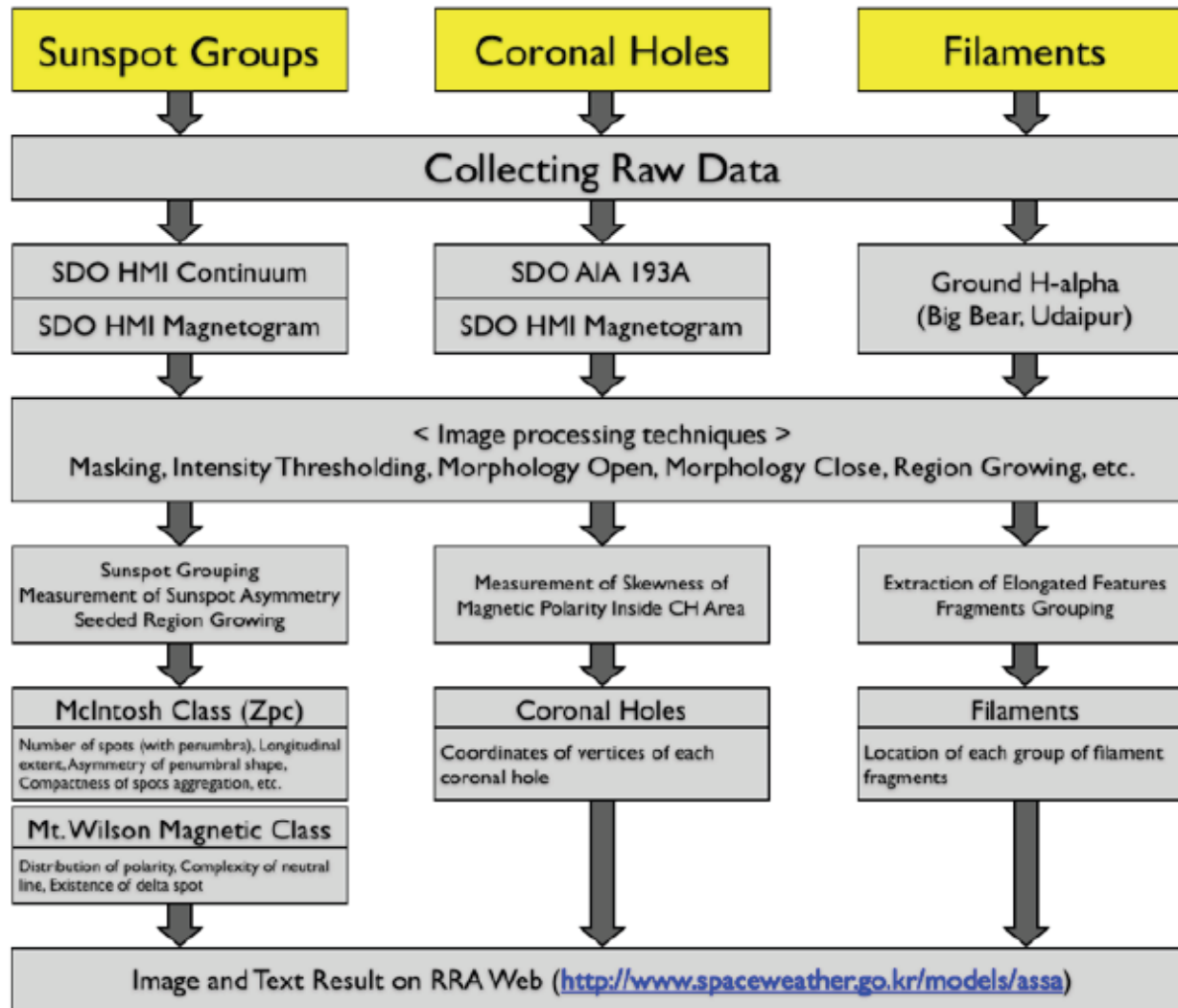
TEXT INFO



TEXT INFO



Research Activities – ASSA system diagram

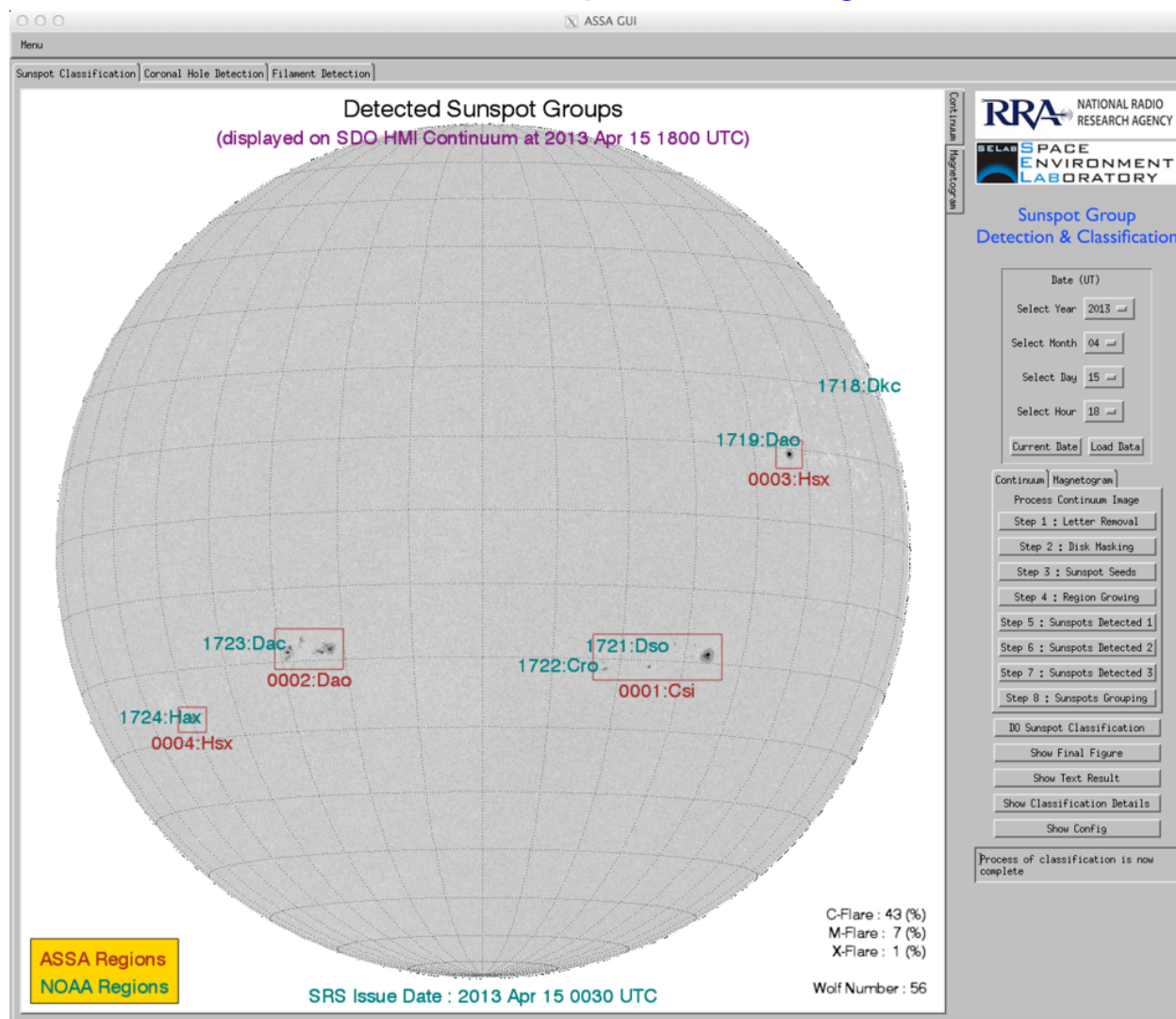


1. **[Consistency]** Same criteria in every analysis
 - ✓ Sunspot Catalog with SOHO MDI data (1996~2011)
 - ✓ Sunspot Catalog with SDO HMI data (will be generated soon)
2. **[Analog to Digital]** Gives Not only classifications but also all the Morphological parameters
 - ✓ Size, ratio, magnitude, skewness, polarity, etc.
3. **[High Cadence]** Runs every an hour
 - ✓ NOAA SRS is issued once a day
 - ✓ Some sunspot evolves very fast, ASSA can track the changes

※ It will be contributing to both of research and operations!

Research Activities – A standalone version of ASSA

Download from www.spaceweather.go.kr/assa

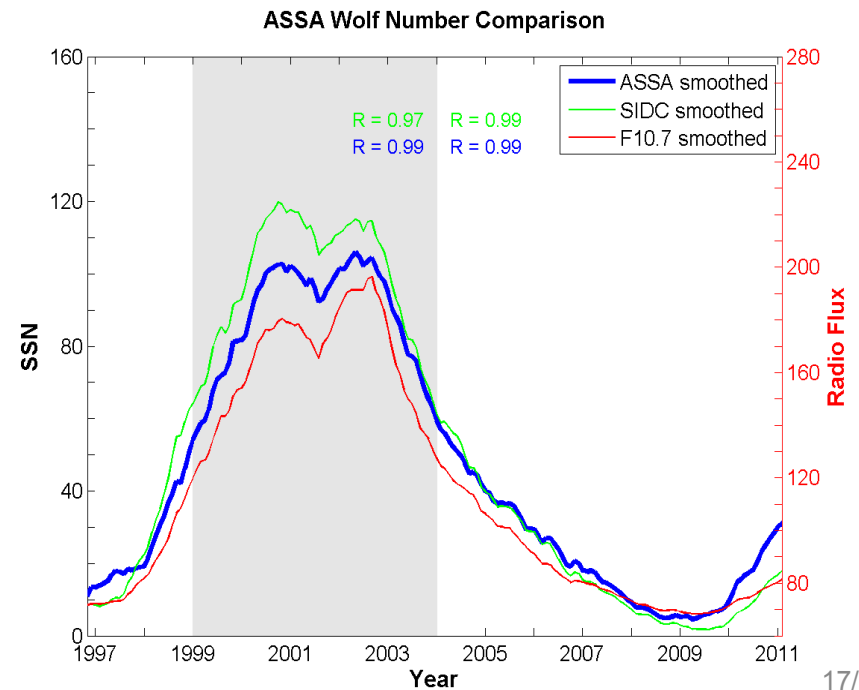
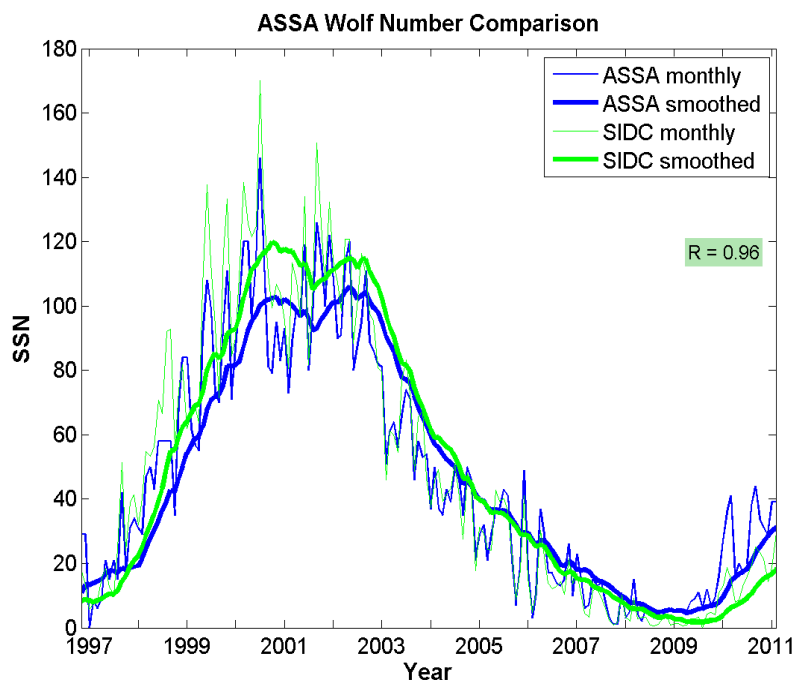


Research Activities – ASSA at NASA/CCMC

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➤ **ASSA Sunspot Catalog** (1996-2011, SOHO MDI)

- ✓ morphological parameters, classifications (McIntosh, Mt. Wilson), & flare information
- ✓ the first automatically generated sunspot catalog covering a complete solar cycle
- ✓ under developing new flare prediction model (based on the consistent sunspot archive)



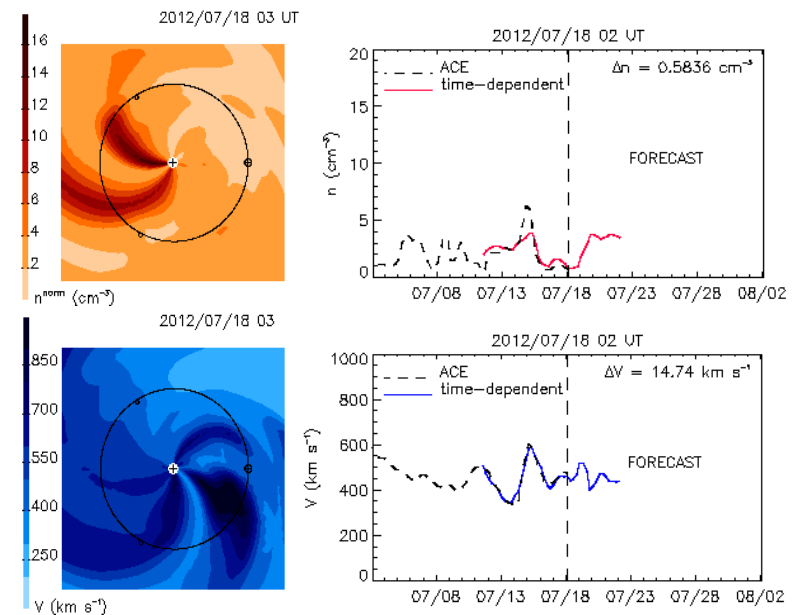
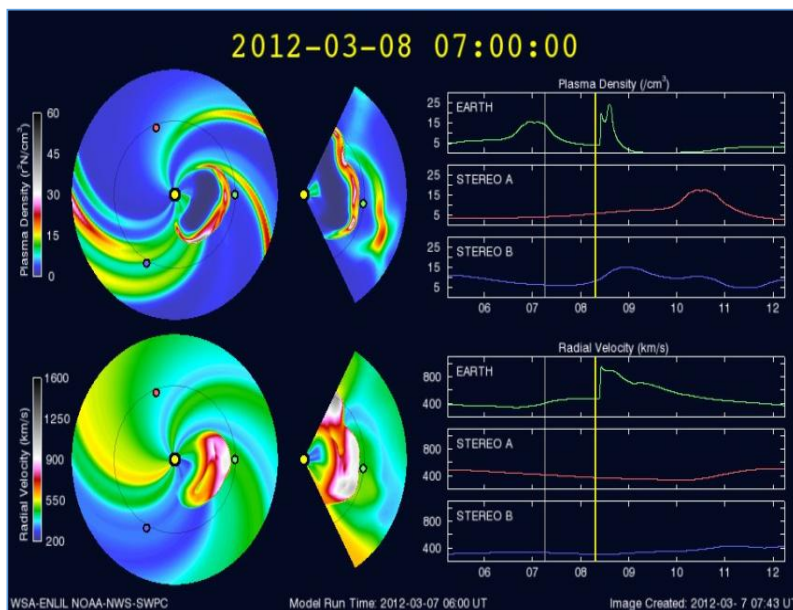
Research Activities – solar wind prediction

➤ Currently in Operation

- ✓ WSA-Enlil+CONE
: in operation since Dec 2012
- ✓ IPS Tomographic Model
: in operation since Mar 2013

➤ New Development

- ✓ KSWC is funding to UCSD & GMU perform **IPS-Driven Enlil** model study
- ✓ It will provide CME arrival prediction without coronagraph data.



Research Activities – support for aviation group

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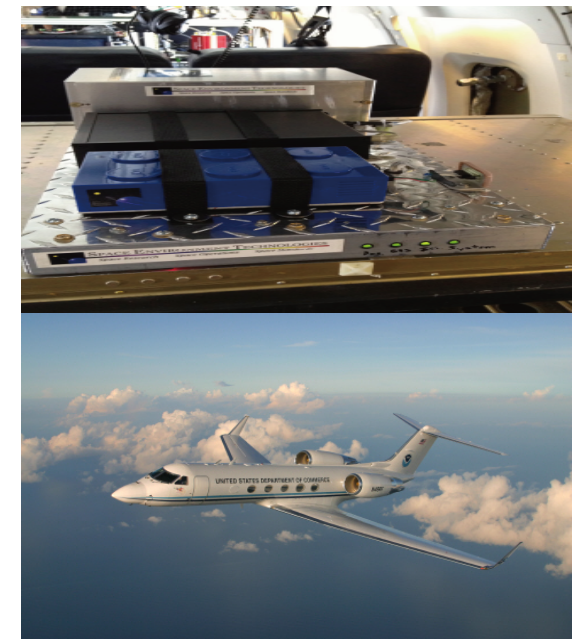
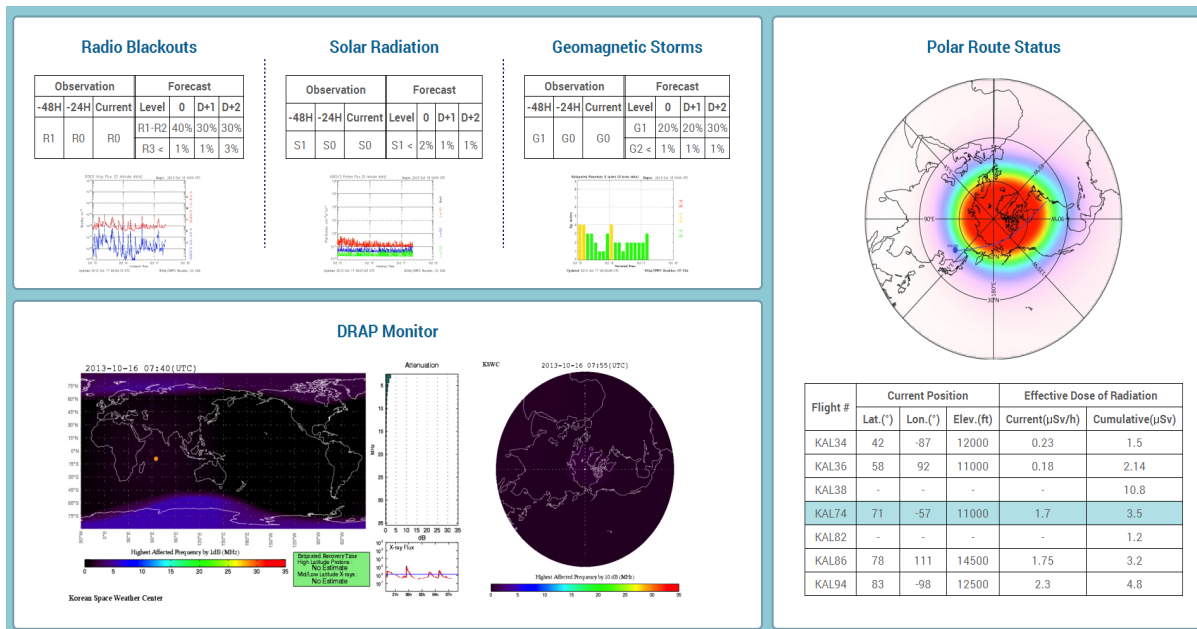
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➤ Polar route SWx monitor (Dec 2013~)

- ✓ A tailor made system - live flight position tracking (for Korean Air & Asiana Air)
- ✓ provide HF attenuation (D-RAP+PCA) & radiation dose rate (CARI-6)

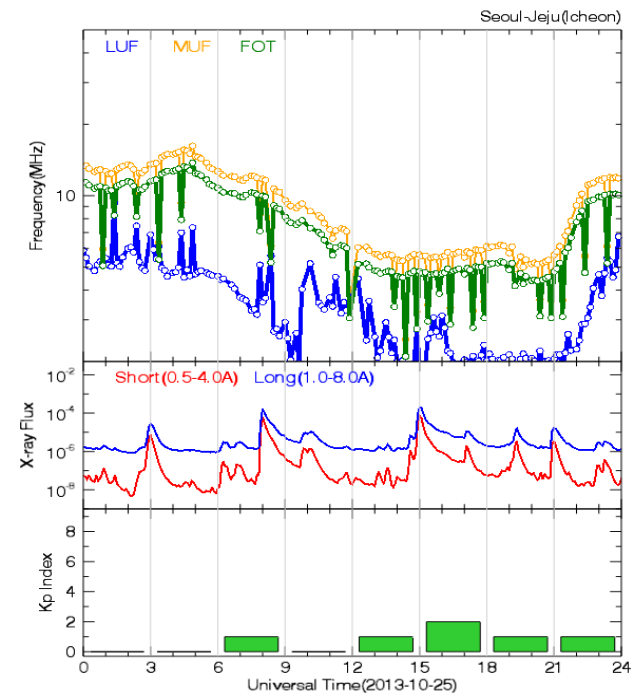
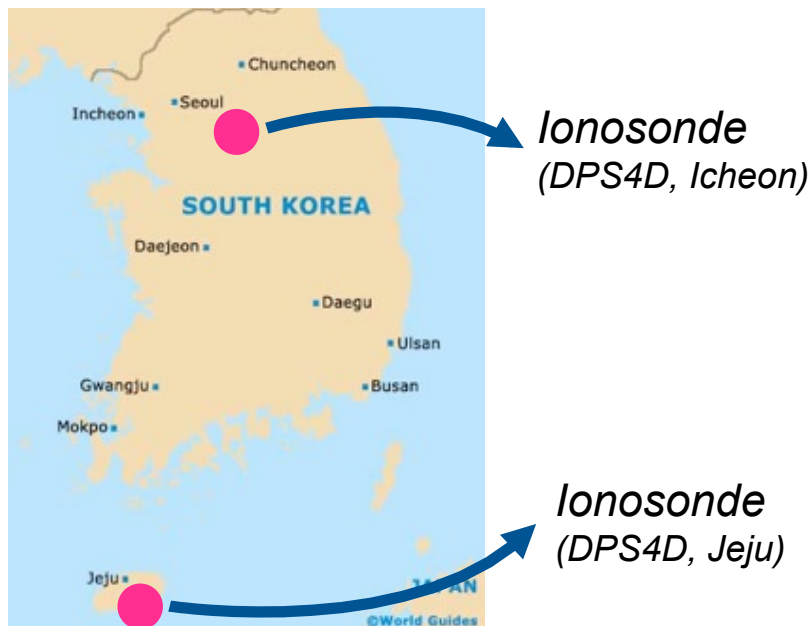
➤ ARMAS-Lite Project (2014~)

- ✓ Automated Radiation Measurements for Aviation Safety
- ✓ fly with airplanes of NOAA & NCAR
- ✓ comparison with NAIRAS model



➤ Local Ionospheric Model

- ✓ IRI-2012 + VOACAP + local data assimilation
- ✓ real-time usable HF frequency for airlines, ships, military, etc
- ✓ expand the model coverage to East Asia in 2014



➤ **Space Weather Response Guideline (2012)**

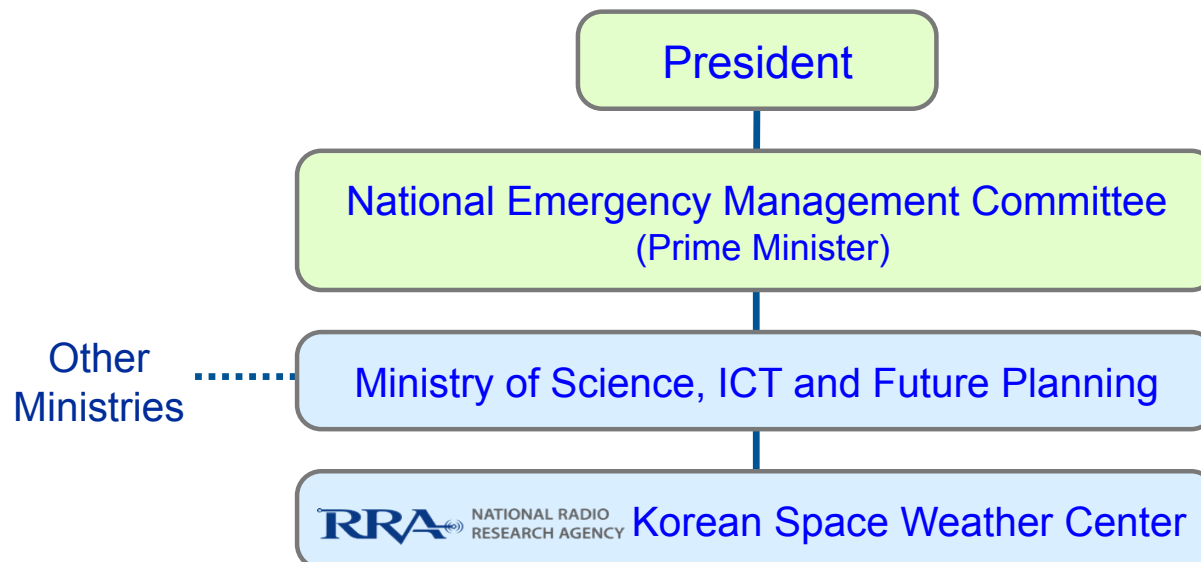
- ✓ describes possible damages from space weather
- ✓ suggests example actions to prevent/minimize damages
- ✓ 5 areas : satellite, airline, navigation, power grid, communications

➤ **National Plan for Space Weather (2012)**

- ✓ vision : “Safe Korea without Space Weather Disaster”
- ✓ 5-year plan (2013-2017)
 - provides accurate forecasts & real-time alarms
 - develops advanced models
 - expands observation networks
 - space weather awareness-raising

➤ **Space Weather Disaster Management Manual** (Feb. 2013)

- ✓ space weather was included in the national risk profile
- ✓ the government's official manual was approved
 - describes the roles & responsibilities of related ministries and agencies
 - removing confusion & increasing efficiency among different organizations



➤ **Ongoing**

- ✓ Providing ASSA to CCMC, available on iSWA (Nov 2013 ~)
- ✓ Participating in CCMC's SWx ScoreBoard (Sep 2013 ~)
- ✓ Training through SW REDI Boot Camp (June 3-14, 2013)

➤ **In the near future**

- ✓ Participating in Space Weather Database Of Notifications, Knowledge, Information (DONKI)
- ✓ Research cooperation such as model validations
- ✓ Personnel exchanges

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Questions?

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