Earthquake,Tsunami,Volcano Monitoring & Warning System in Korea

Jimin Lee
Earthquake & Volcano Monitoring Division
KMA

Korea Meteorological Administration

AUG
Antelope Users Group

Contents

Korea Meteorological Administration

SAFE VISION 2020

VISION

To ensure public safety by minimizing earthquake hazard through e arthquake and tsunami monitoring

MISSION

Accurate earthquake information & prompt notification

Strategy 1.

Implementation of National earthquake-tsunami Early Response System

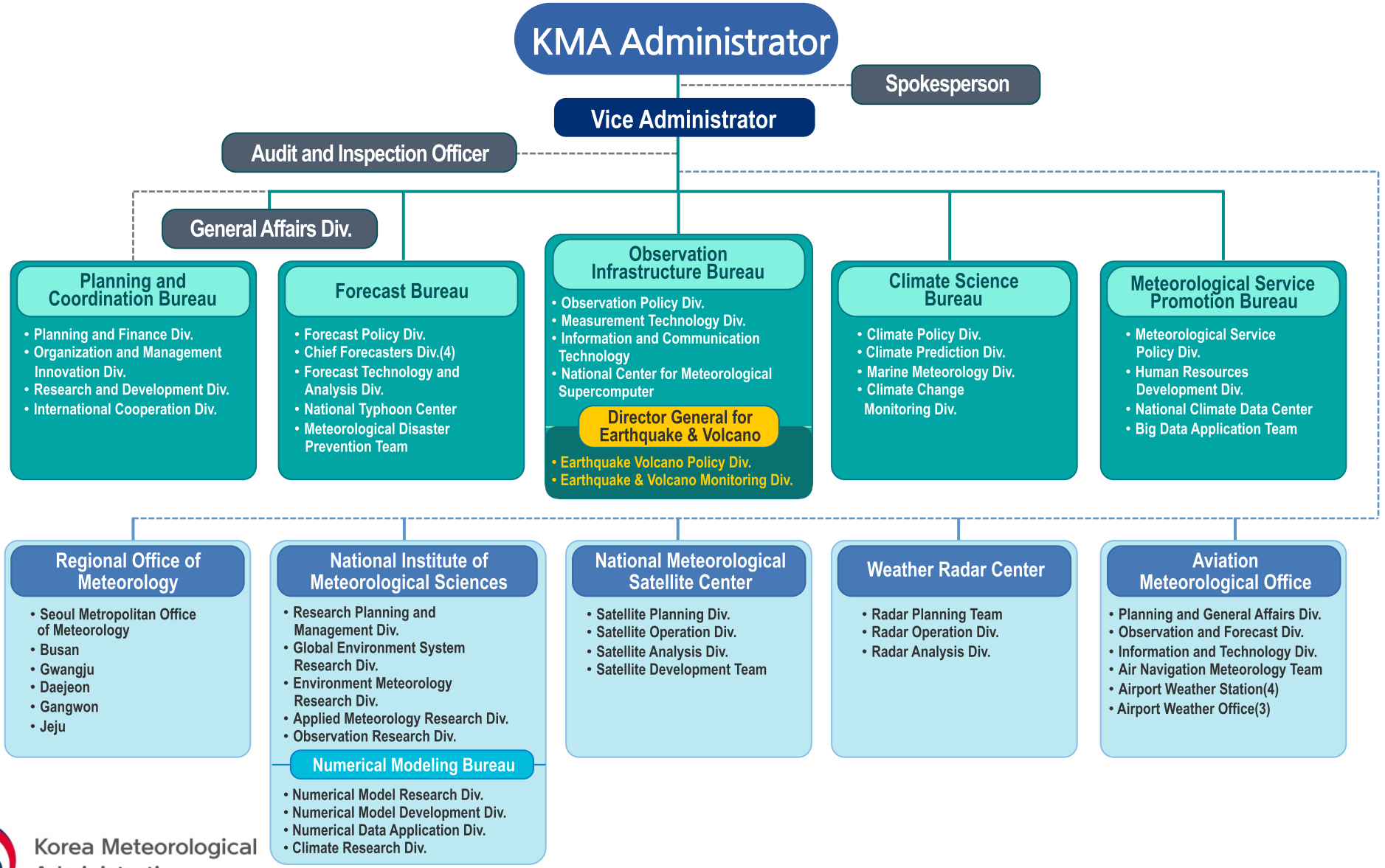
Strategy 2.

National earthquake-tsunami response of institutional strengthening

Strategy 3.

Goal-oriented long-term technology development

KMA Organization

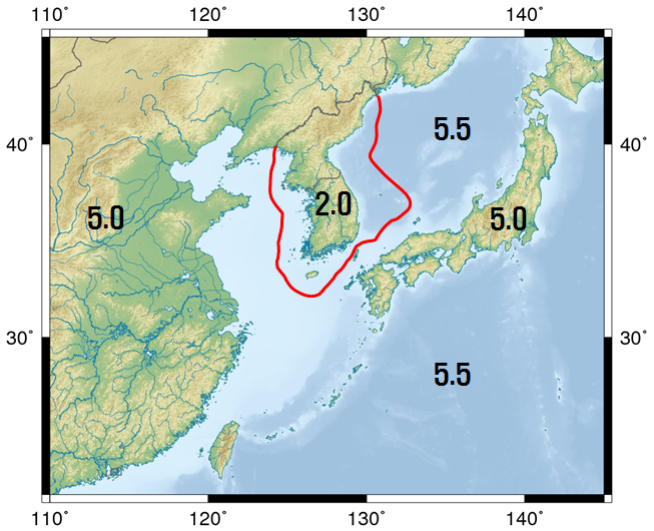


Korea Meteorological Administration

Brief History of Seismological Services

Year	Contents
1905	**Start of earthquake observations**
1944~ 1962	Suspension of observation
1963	World-standard seismograph network installed in Seoul
1978	**Analog seismic network constructed**
1996	Earthquake division was newly established
1999	**Digital seismic network constructed**
2005	Earthquake division divided into two divisions - Earthquake Planning Division / Earthquake Detection Division
2006	Ocean Bottom Seismometer installed
2007	Earthquake division elevated to Bureau level - Director General for Earthquake appointed
2015	Current Status - 1 Director-General, 2 divisions, 1 laboratory

Notification Standards



Domestic Earthquakes

Alerts	Magnitude		Time
Earthquake Flash	Inland	$M_L \geq 3.5$	Within 2 min.
	Ocean area♪	$M_L \geq 4.0$♪	
Earthquake Information	-	$M_L \geq 2.0$♪	Within 5 min.
Early Earthquake Warning	-	$M_L \geq 5.0$♪	Within 50 Sec.

Tsunami

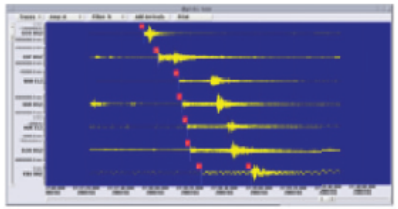
What	When	Time
Tsunami Watch	$M_L \geq 7.0$ & Expected wave height 0.5~1.0m	within 10 min
Tsunami Warning	$M_L \geq 7.5$ & Expected wave height over 1.0m♪	

Korea Meteorological Administration

One-Stop Notification System

Earthquake, Tsunami
Signal detection

Analysis System



USGS, JMA, C
EA…
Information

FAX

FAX Server

SMS/MMS
SNS

Internet

Notification Sy
stem (EBS)

Media:
- PC COMM.
- MULTI FAX
- SMS
- E-mail
- KMA website
- KMA portal
- Broadcast media

Notification

Total User : 1,5
00 persons

- Divisions of KMA
- Governmental organizations
- Local governments
- Related organizations
- Media organizations
- Public

Direct
indirect

E-mail
FAX
Computer

*** Earthquake flash in 2min.**
*** Earthquake information in 5min.**

Earthquake Info Alert App.

App. loading

Korea Earthquake I nfo

World Earthquake I nfo

Korea Meteorological Administration

Earthquake Info Alert App.

제보 상세 페이지

진원 시간	2013-10-15 09:12:38	발생 위치	필리핀 타그빌라란 북동쪽 33km 지역			규모	7.2
제보시간	2013-10-15 15:11:05	위도	10.2876	경도	124.0	제보 번호	2/2

진도

8

선택 내용

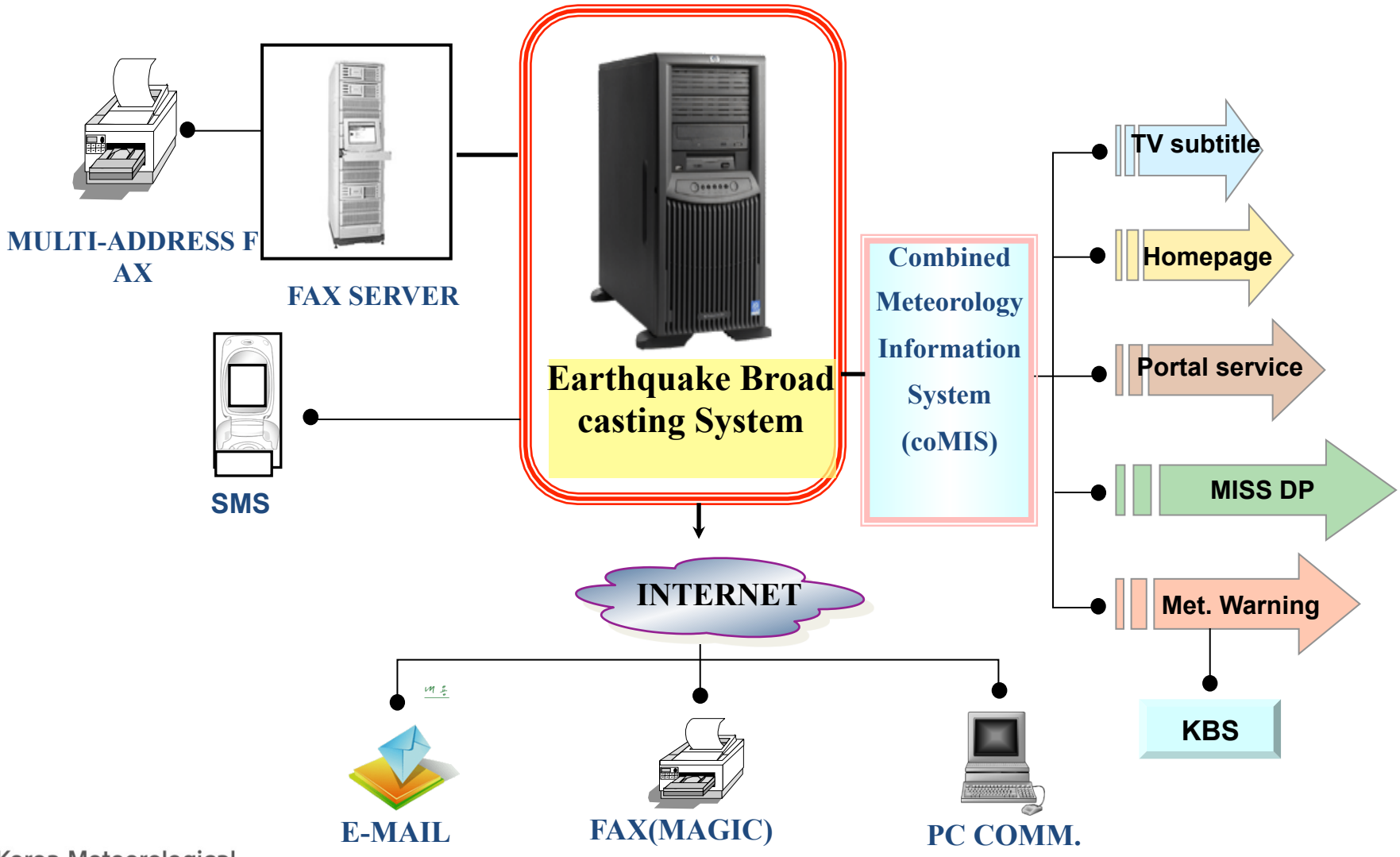
일반 건축물에 부분적인 붕괴 등 상당한 피해가 발생

사용자 작성 의견

프린트

Korea Meteorological Administration

Earthquake Broadcasting System



Korea Meteorological Administration

National Earthquake Comprehensive Information System(NECIS)

Observation network
Device, Location, History etc.,

Earthquake data
Earthquake event, Waveform download

Earthquake statistics
Earthquake occurrence year/area, search by scale

Geophysical observation data

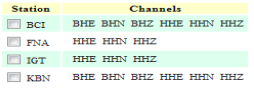
"All about **seismic** and **geophysical data**"

http://necis.kma.go.kr

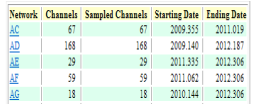
- Earthquake-related institution
- Academic research
- Industry

Data collection

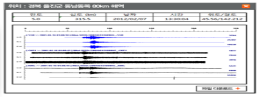
- Observatory



- Chart Data

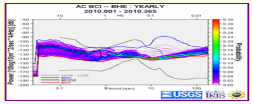


- Plot Data

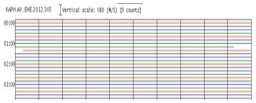


Data analysis

- Explore Data



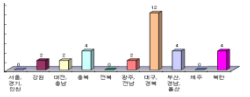
- View Report



Statistics

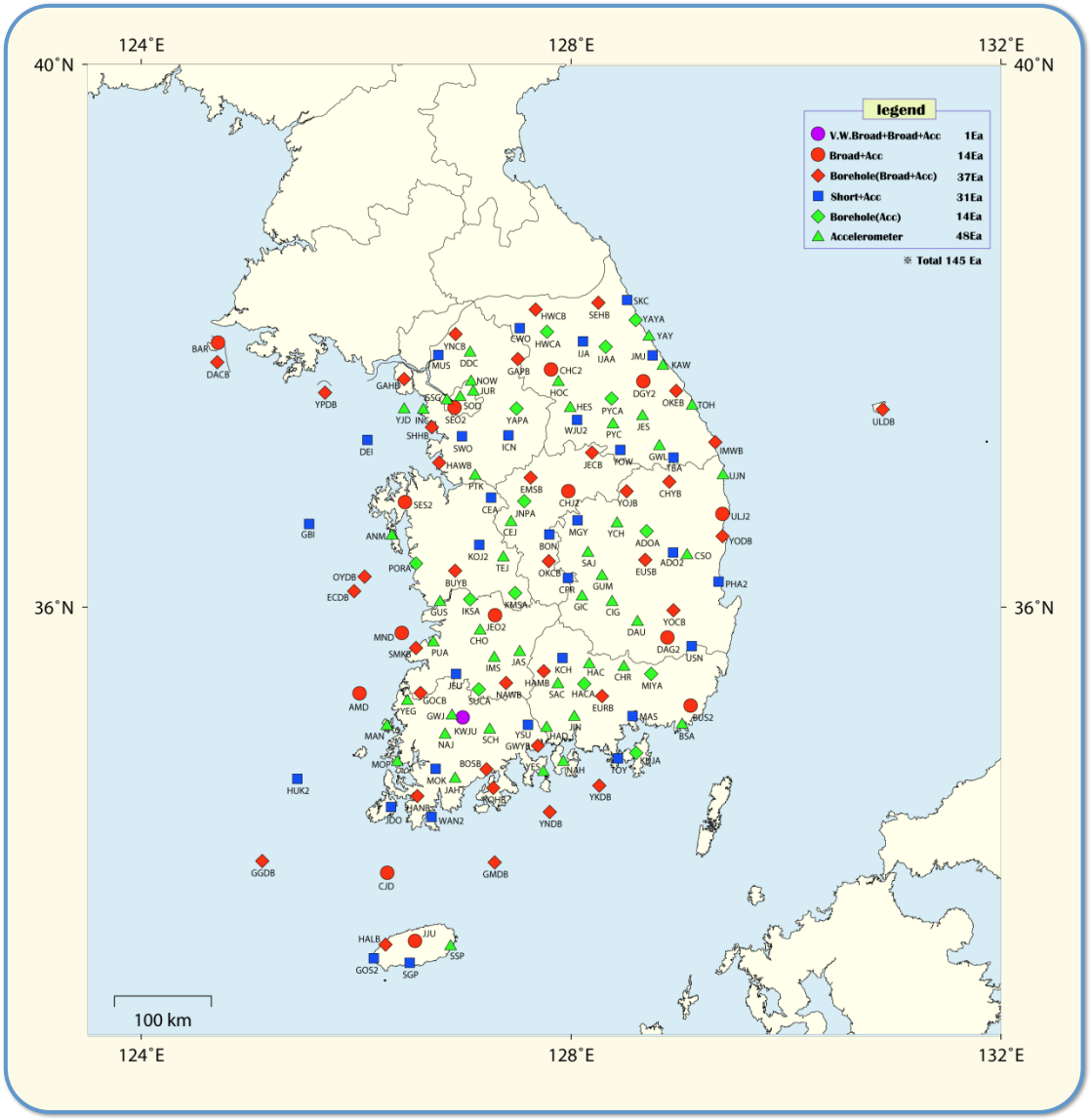
- Filter Result

- Statistics Report



- Alert & Notify

KMA Seismological Network



Sensor type	Numbers
Very Broadband	1
Broadband	11
Broadband(Borehole)	32
Short-period	31
Accelerometer	56
Accelerometer(Borehole)	14

Broad-band

Short-period

Accelerometer

Seismic Sensors in KMA

Broadband

< STS-1 >

< STS-2 >

< STS-2.5 >

< CMG-3T >

Short-period

< SS-1 >

< CMG-40T-1 >

Accelerometer

< ES-T >

Borehole

< CMG-3TB >

< ES-DH >

Korea Meteorological Administration

Seismic Data Acquisition Systems in KMA

Quanterra Inc.

< Q4120 >

< Q730 >

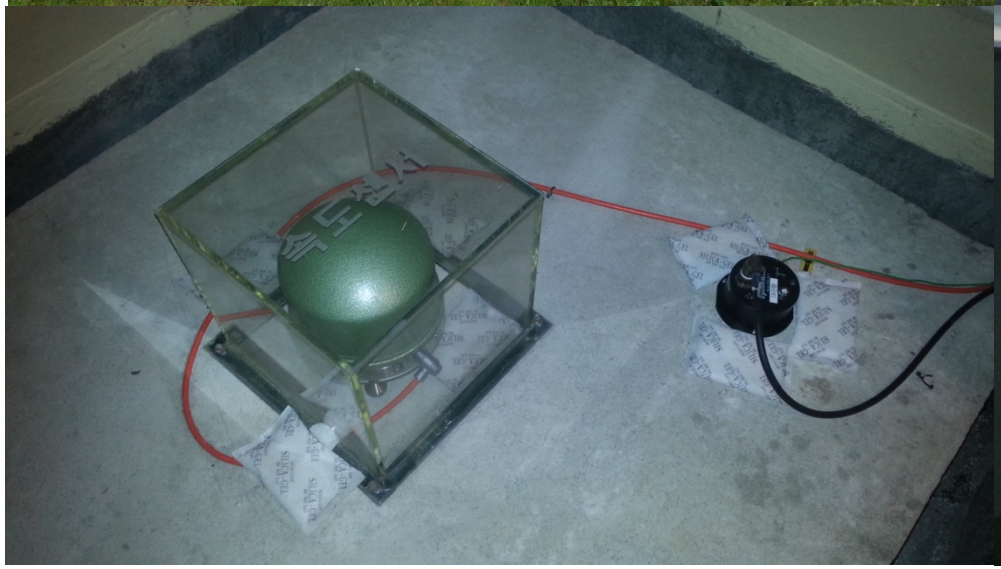
< Q330S >

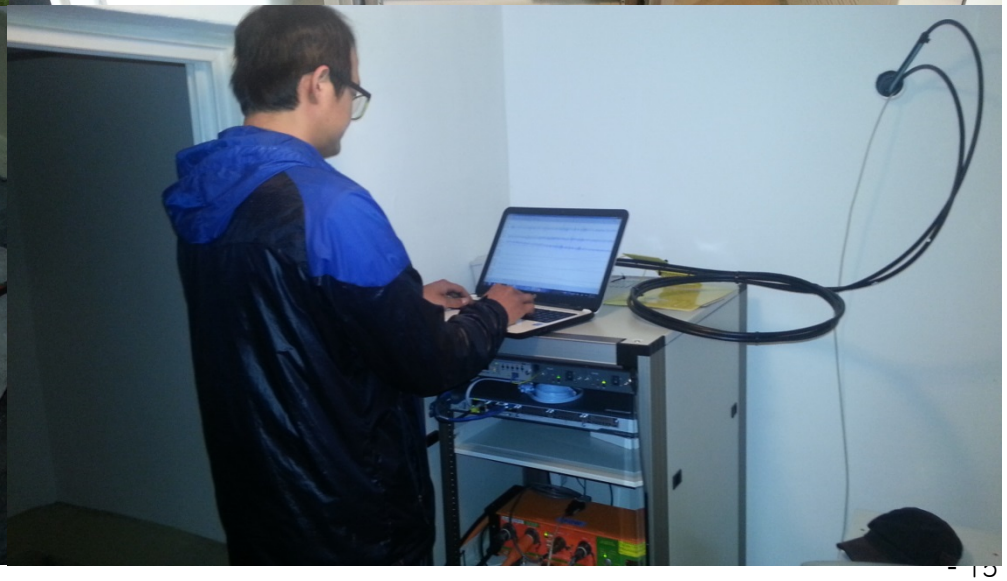
< Q330HRS >

Korea Meteorological Administration

KMA Broadband Station

Station ID : DGY2





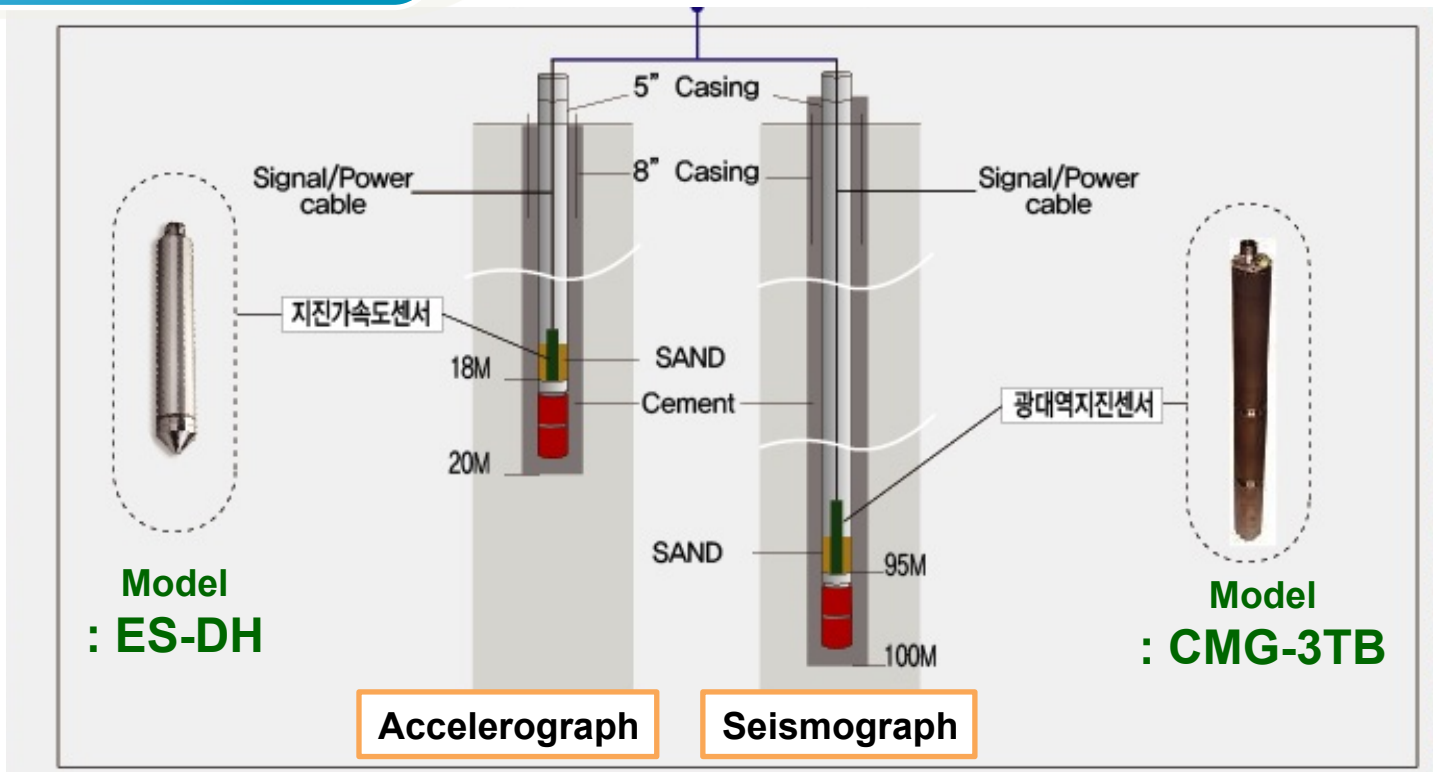
KMA Short-period Station

Station ID : DEI

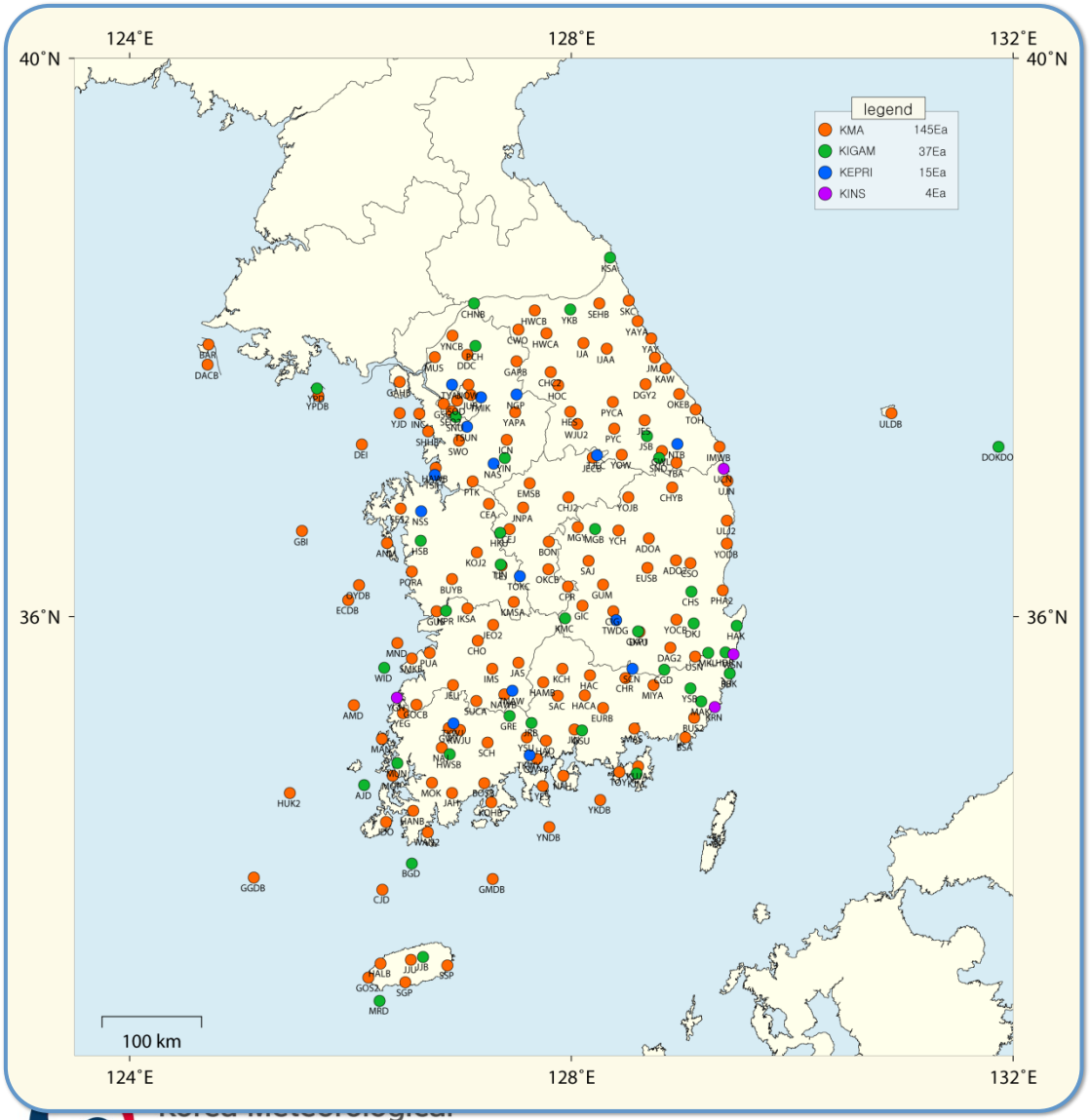
KMA Accelerometer Station

Station ID : GUM

Station ID : GAHB



Korea Integrated Seismic System

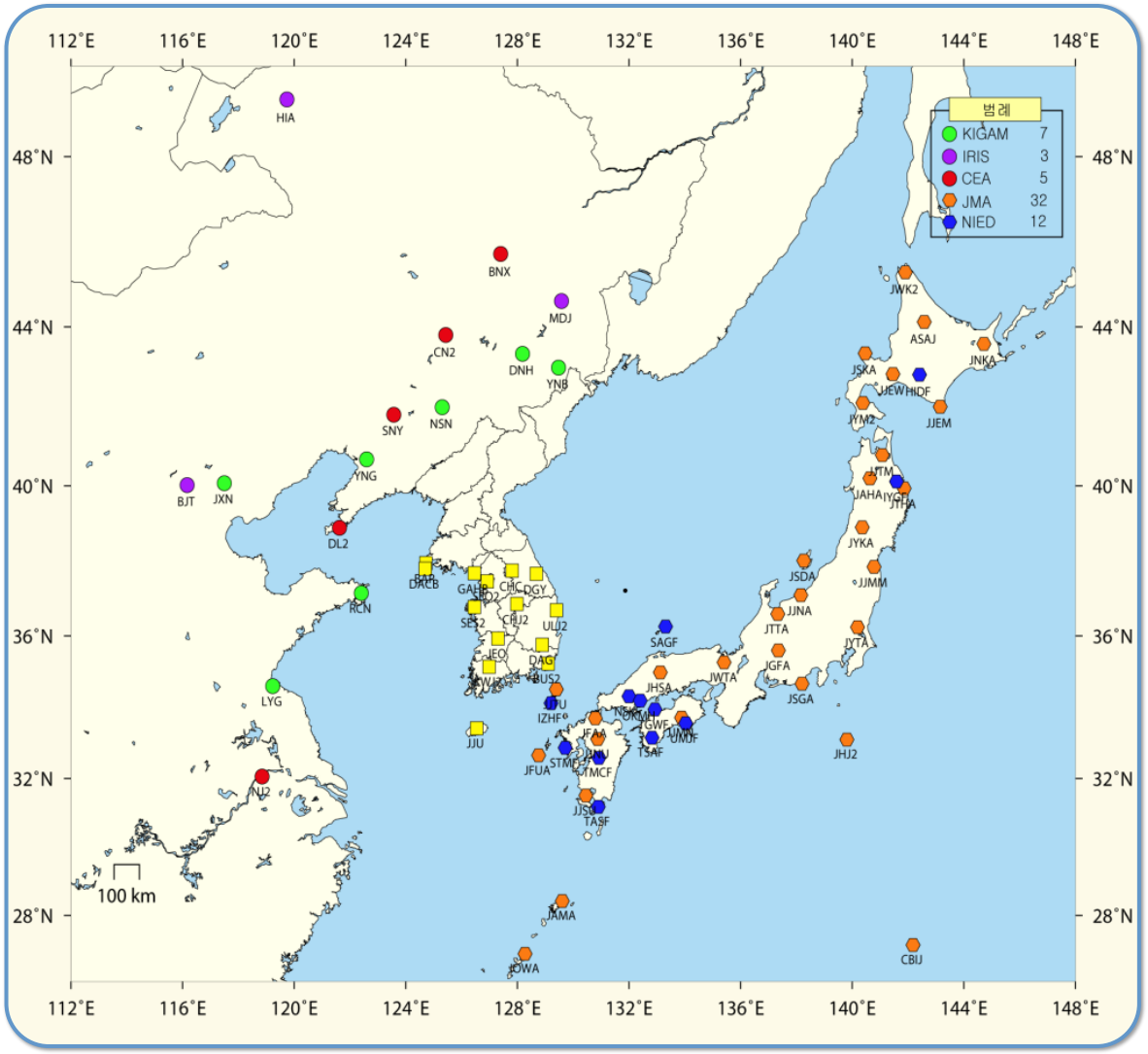


Institute	Stations
KMA	145
KIGAM	38
KEPRI	13
KINS	4

* **KMA** : Korea Meteorological Administration
* **KIGAM** : Korea Institute of Geoscience and Mineral Resources
* **KEPRI** : Korea Electric Power Research Institute
* **KINS** : Korea Institute of Nuclear Safety

Administration

International Integrated Seismological Network



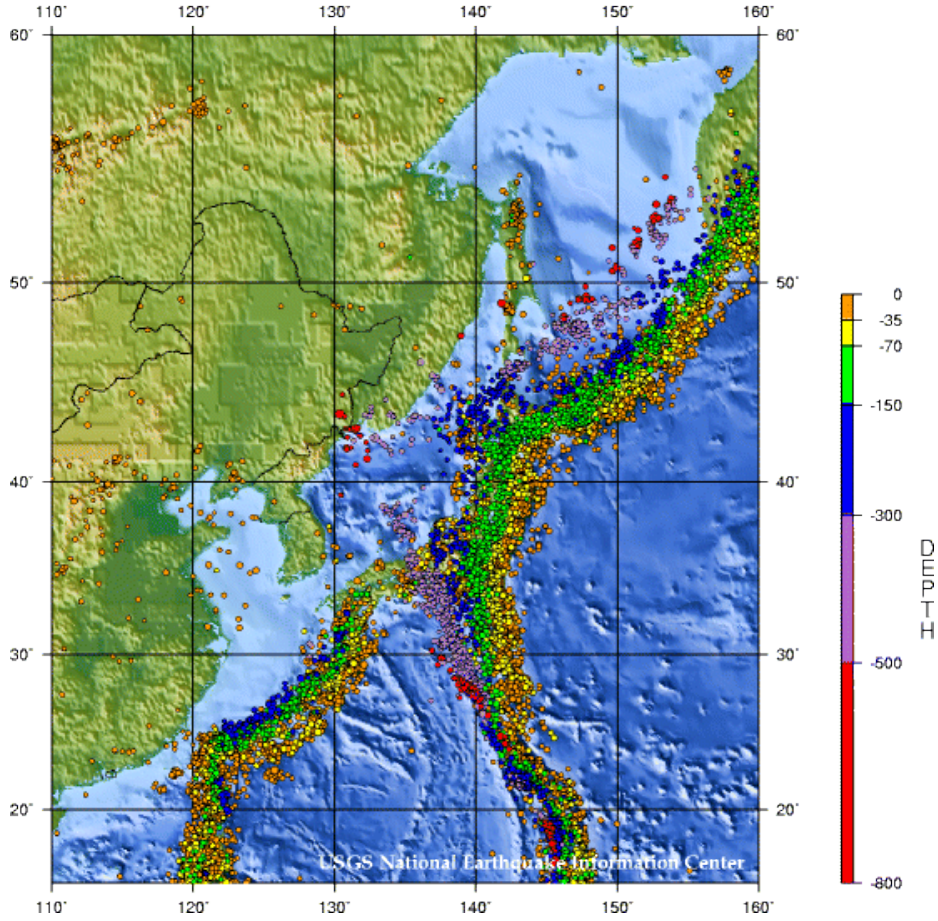
Country	Institute	Stations
Japan	JMA	22
	NIED	12
China	CEA	12
	IRIS	3

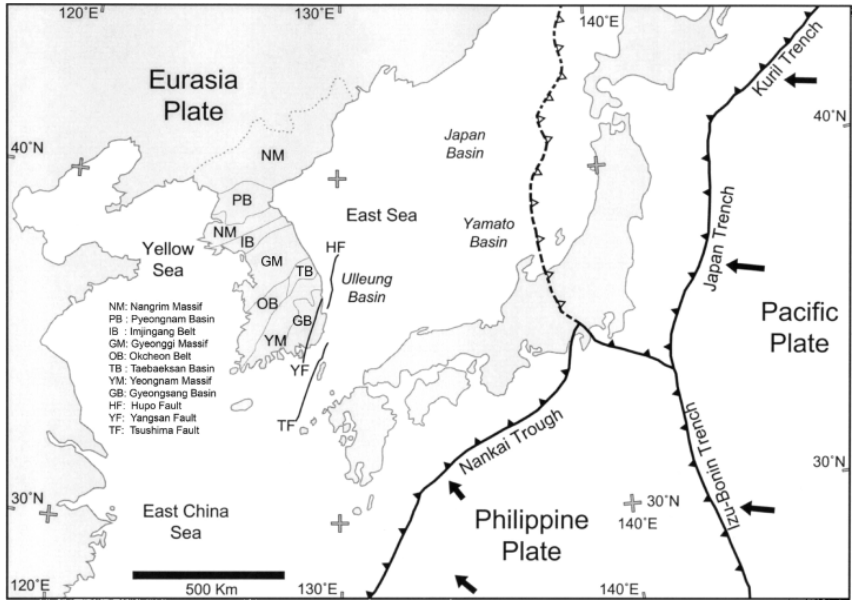
* **JMA** : Japan Meteorological Administration
* **NIED** : National Research Institute for Earth Science and Disaster Prevention in Japan
* **CEA** : China Earthquake Administration
* **IRIS** : Incorporated Research Institutions for Seismology

Korea Meteorological Administration

Seismicity in Northeast Asia

From 1990 to 2010 by USGS

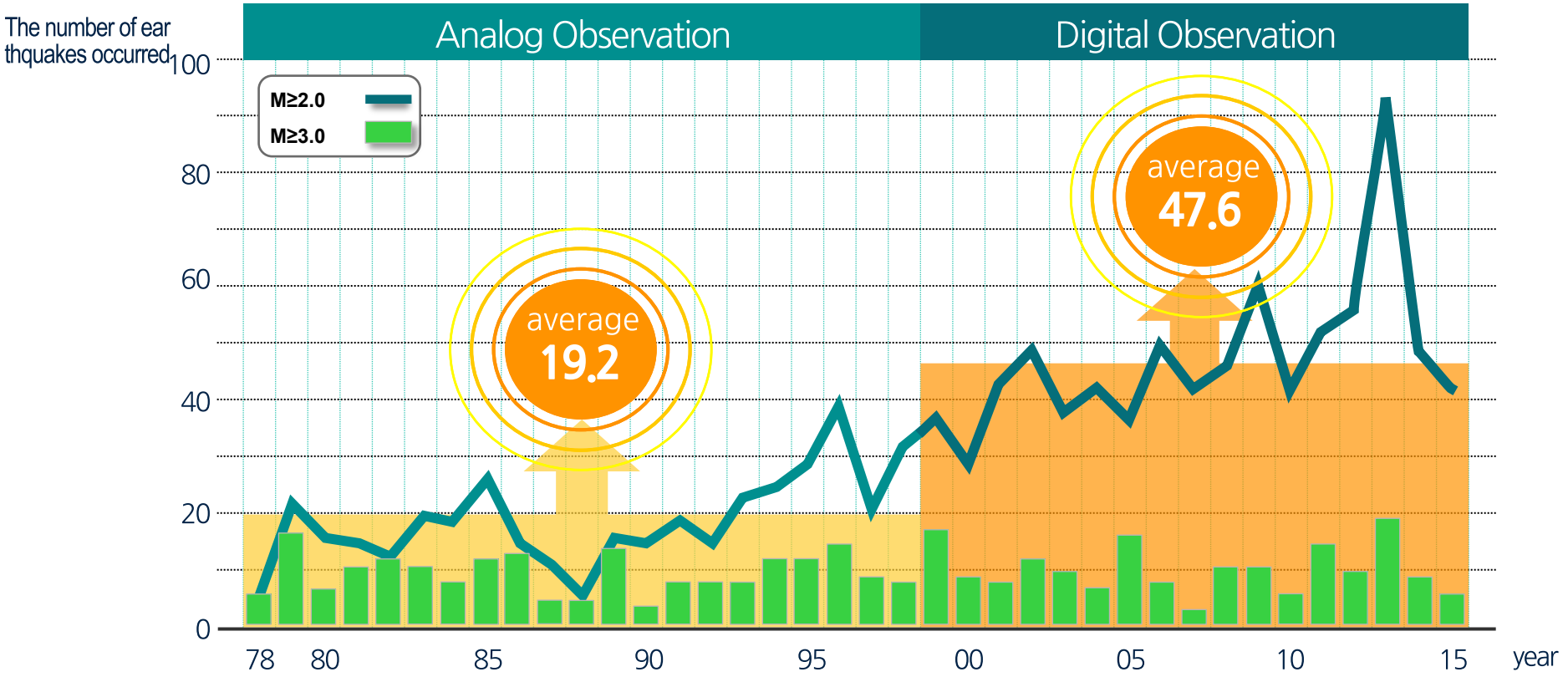




Korea Meteorological Administration

Seismicity in Korea

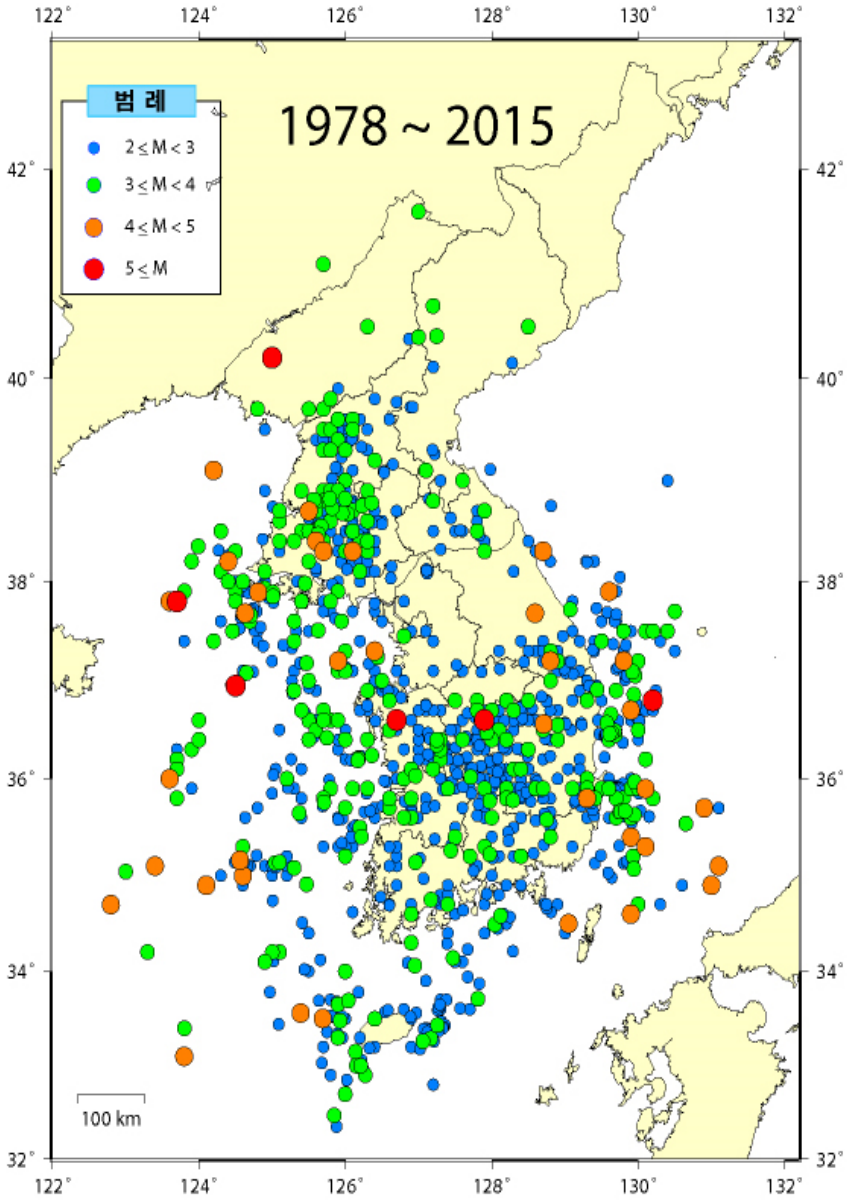
From 1978 to 2015



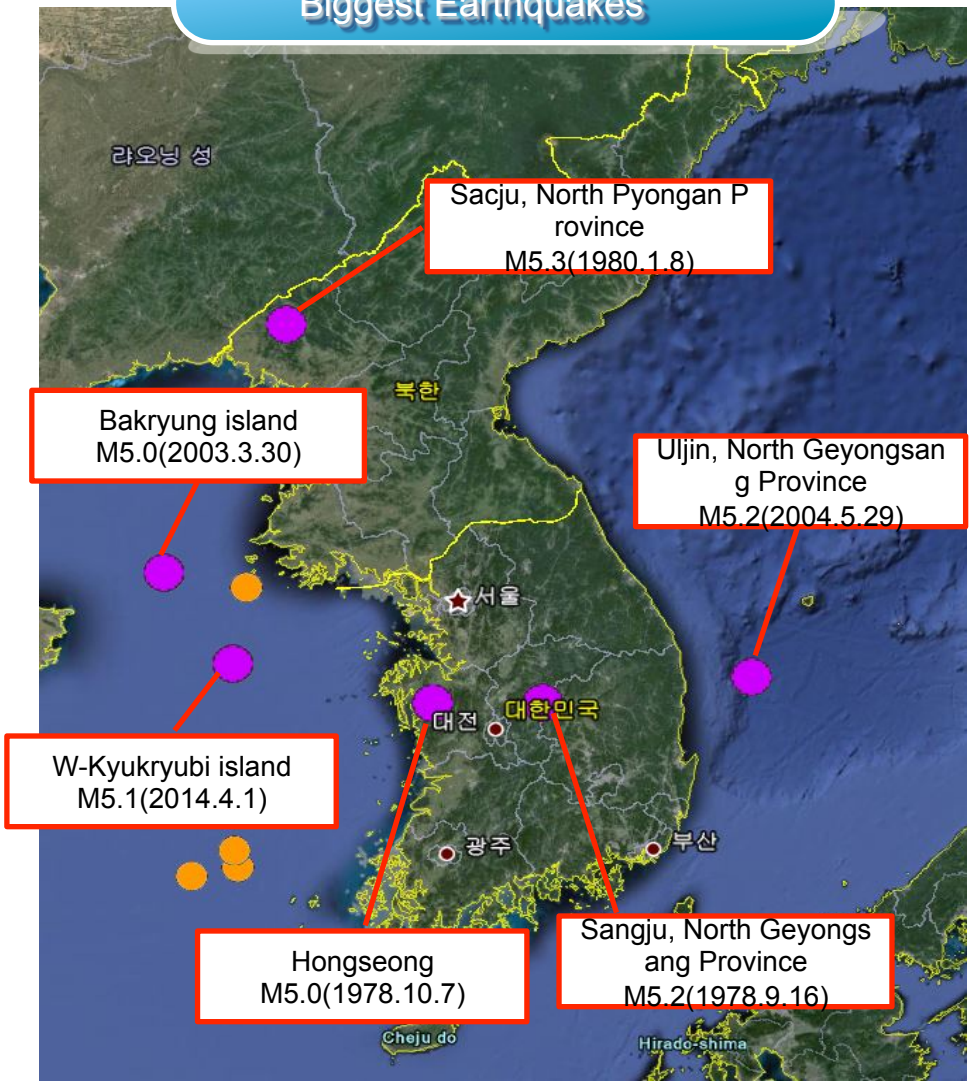
Occurrence	Annual Average	
	78~98(Analog Obs.)	99~15(Digital Obs.)
M≥2.0	19.2	47.6
M≥3.0	8.8	9.4

Korea Meteorolo
Administration

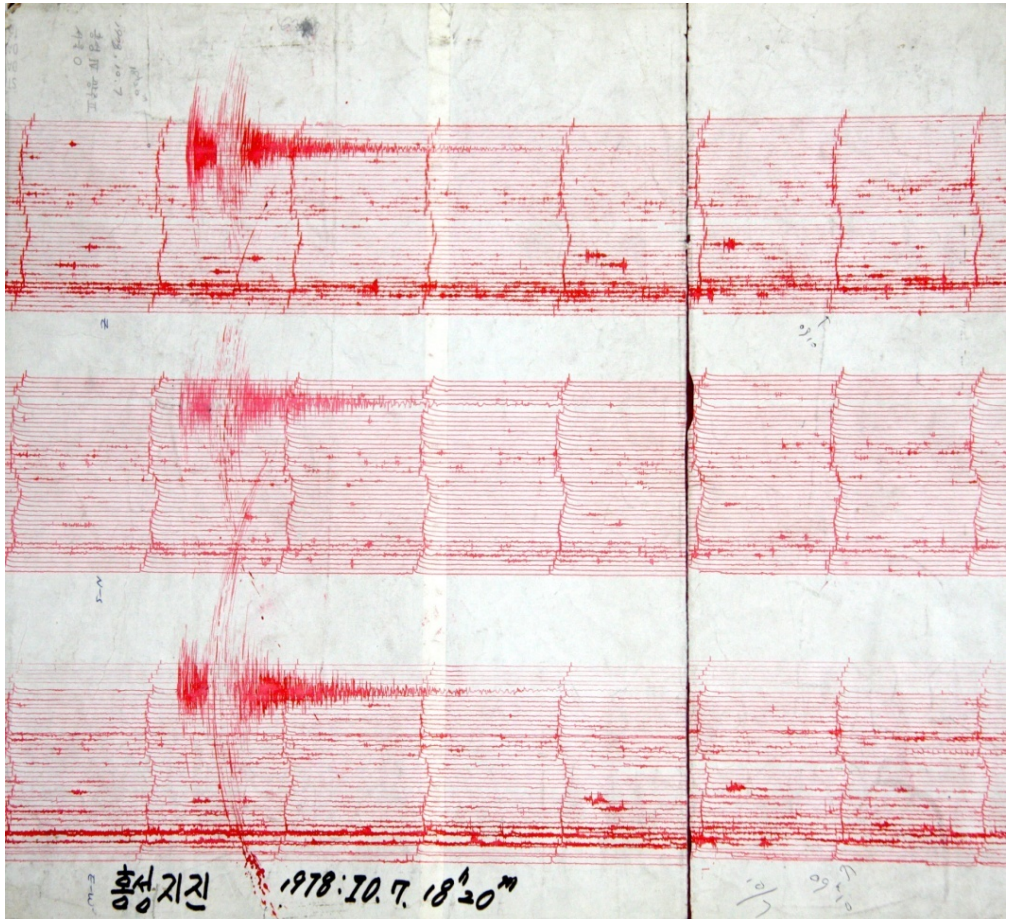
Seismicity in Korea



Biggest Earthquakes



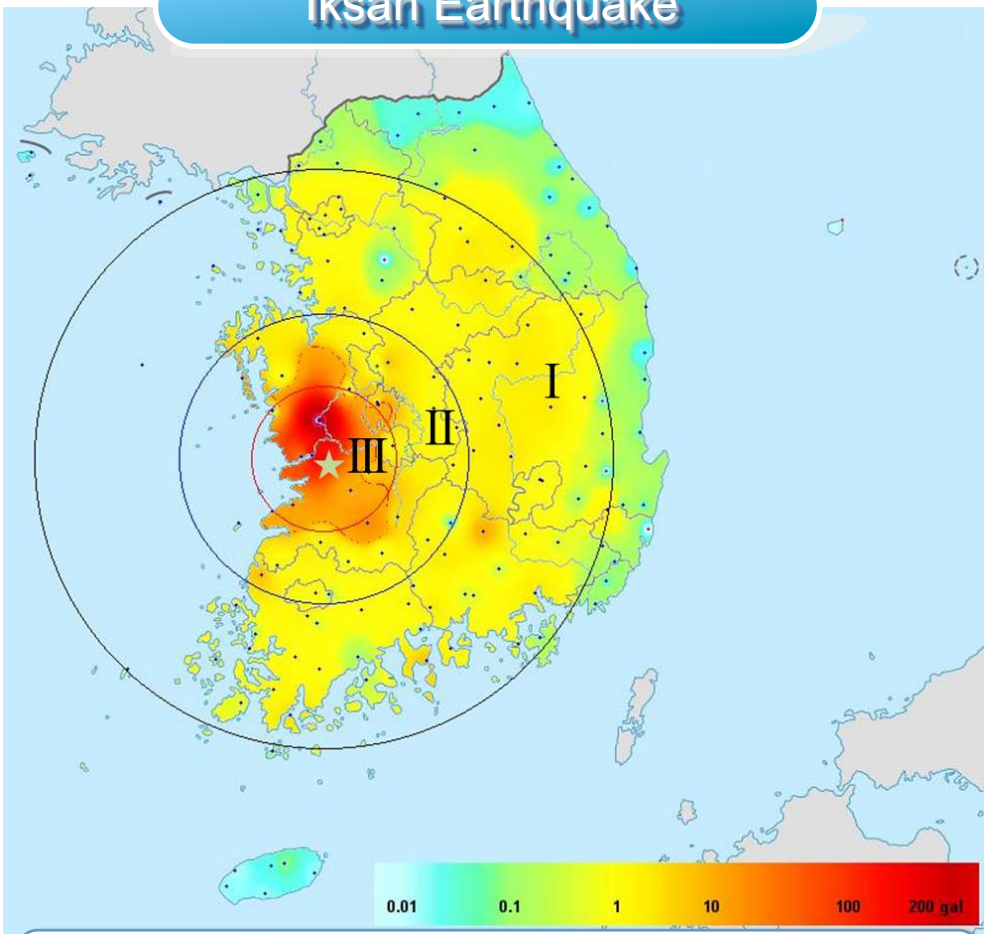
Hongseong Earthquake

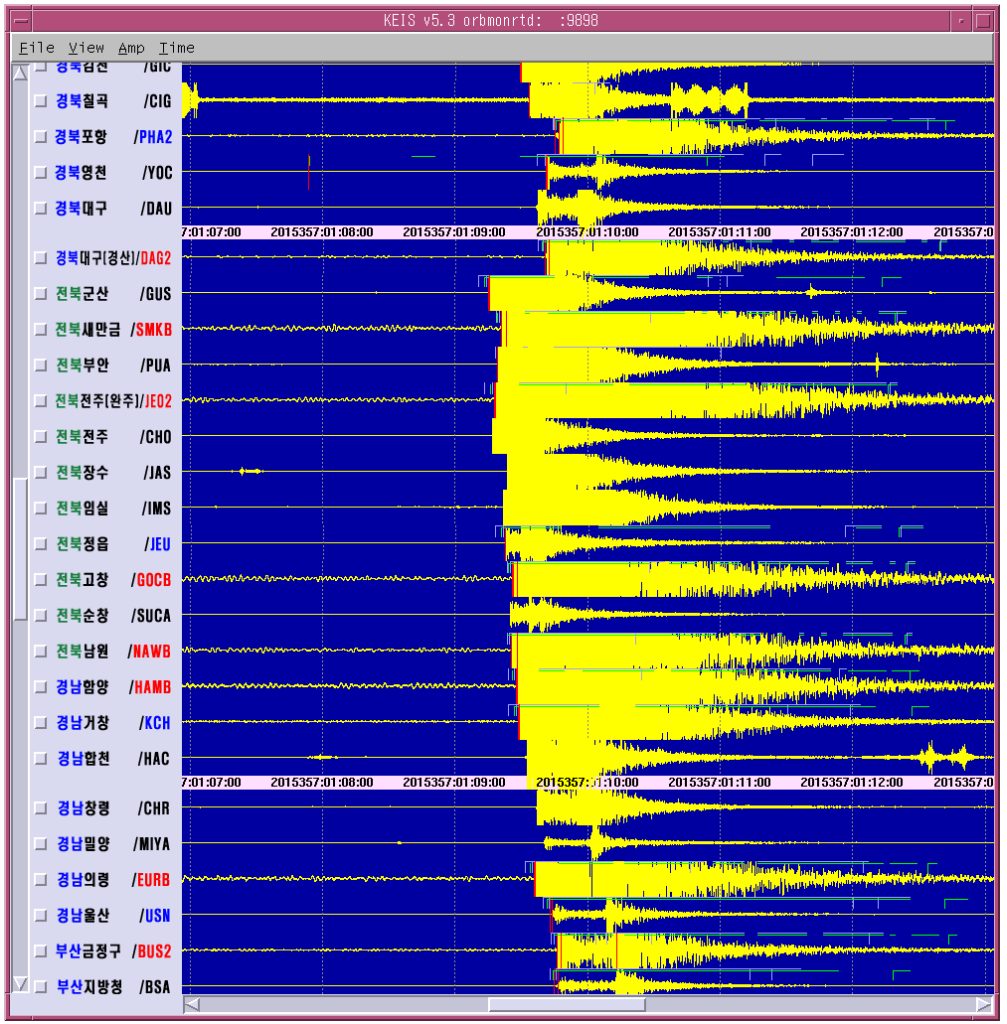


Korea Meteorological Administration

Recent Earthquake in Korea

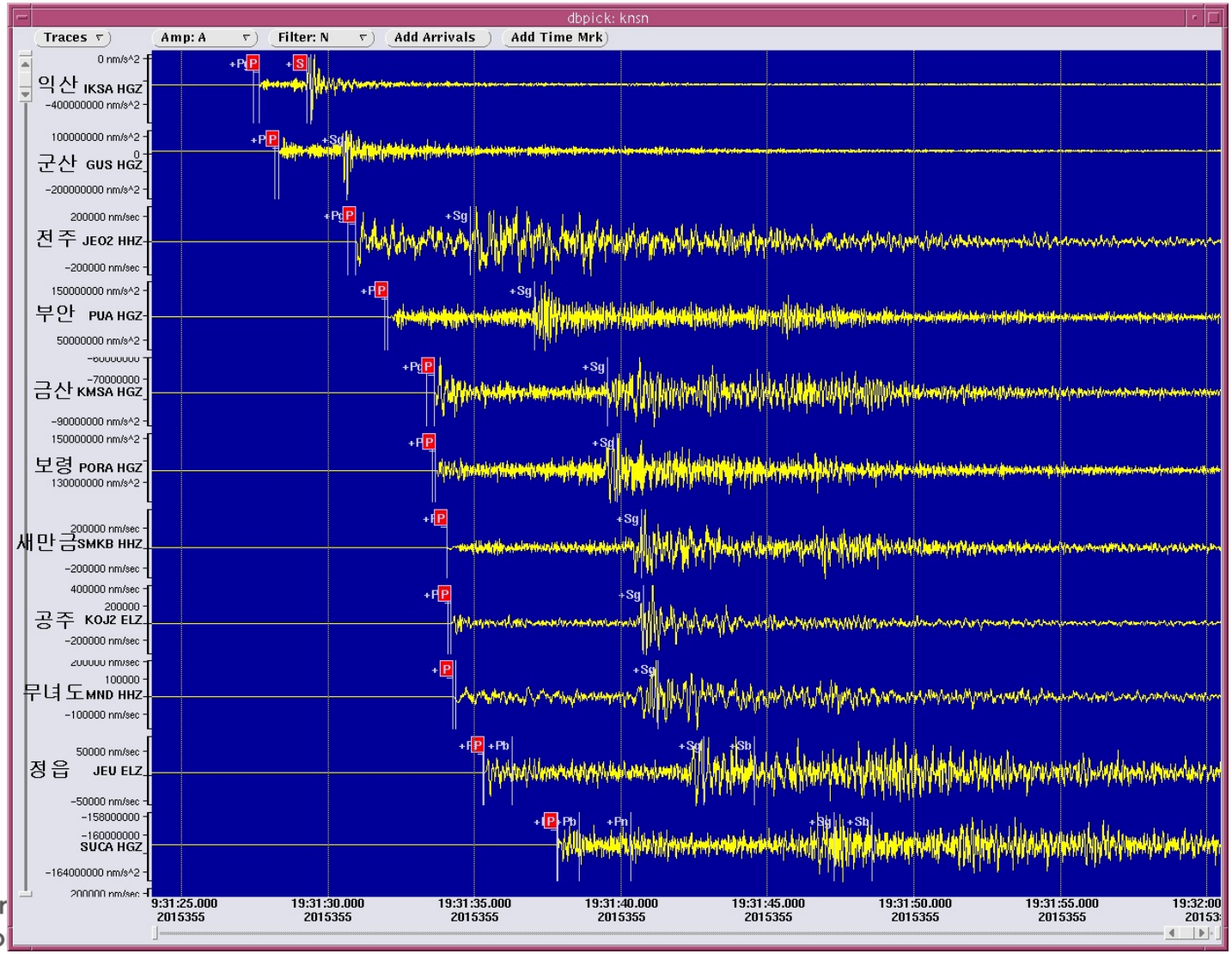
Iksan Earthquake





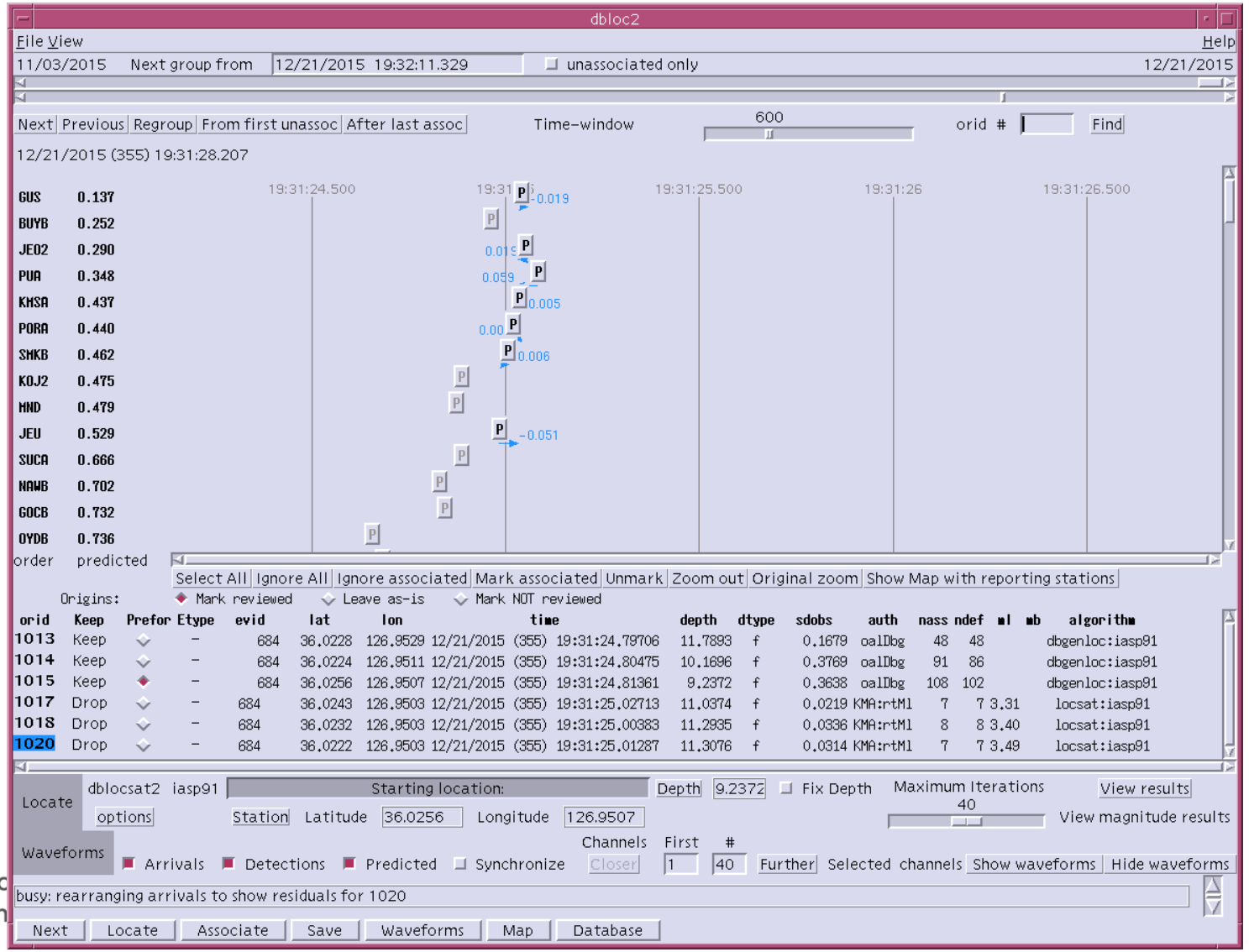
- **Origin Time : 2015. 12. 22. 04:31:25**
- **Epicenter : 9km North of Jeonbuk Iksan**
- **Magnitude : 3.9**
- **Aftershocks : 3**

Event Picking



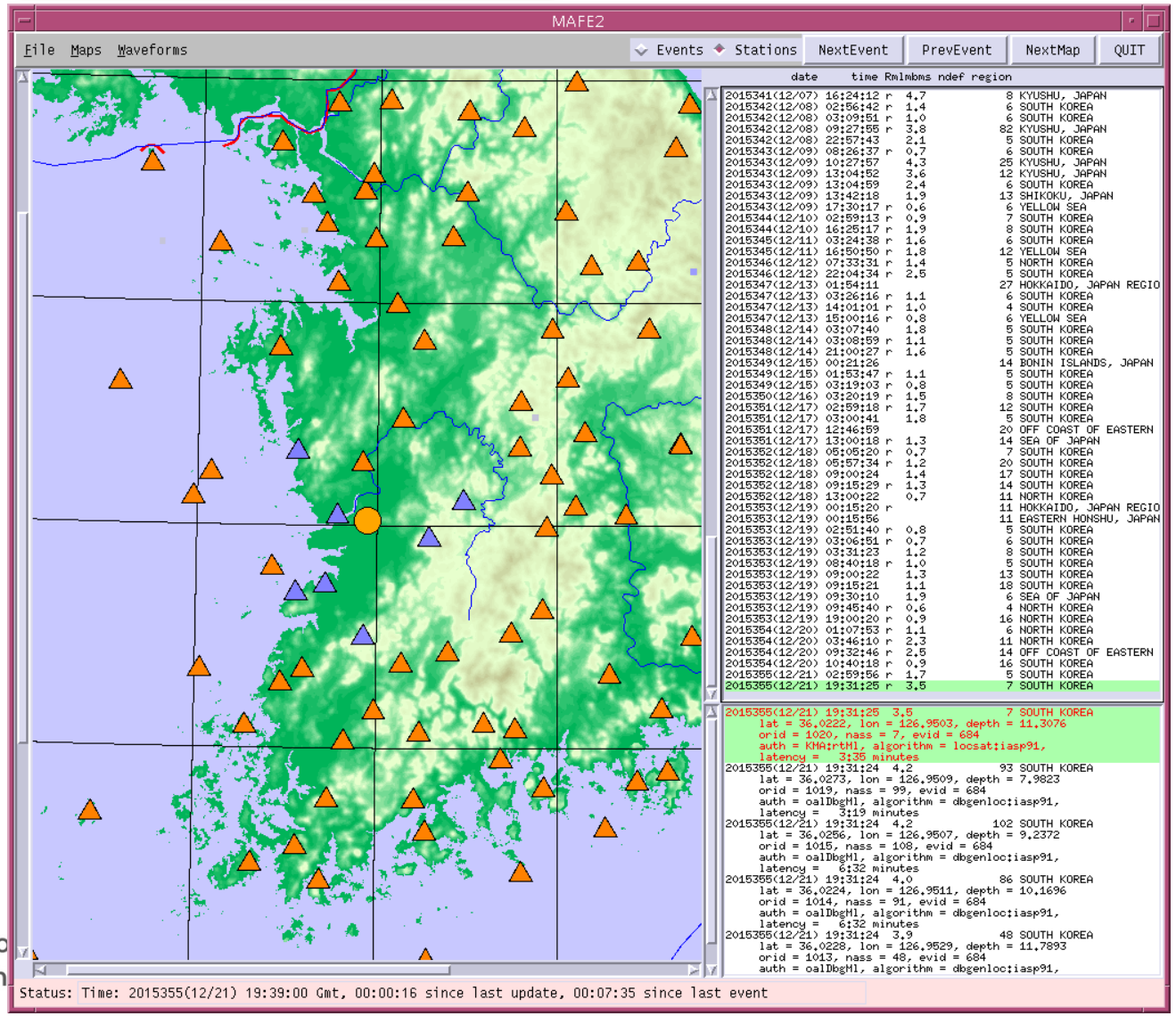
Korea Meteor
Administratio

Event Analysis



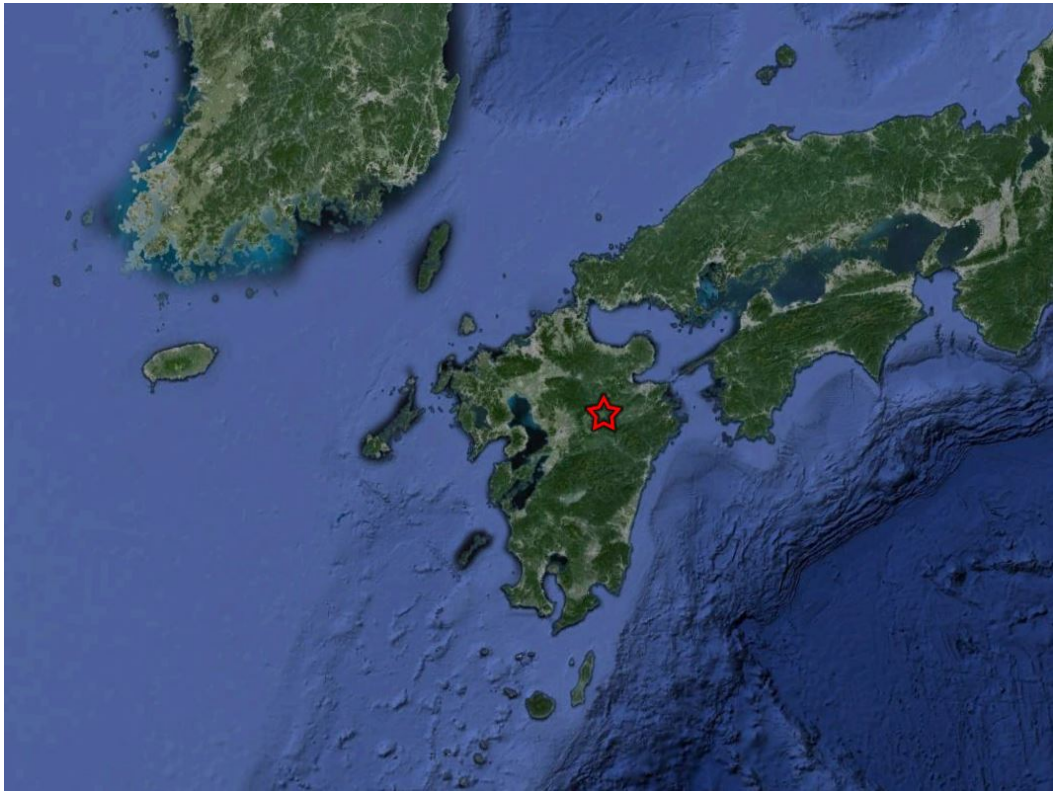
Korea Meteorological Administration

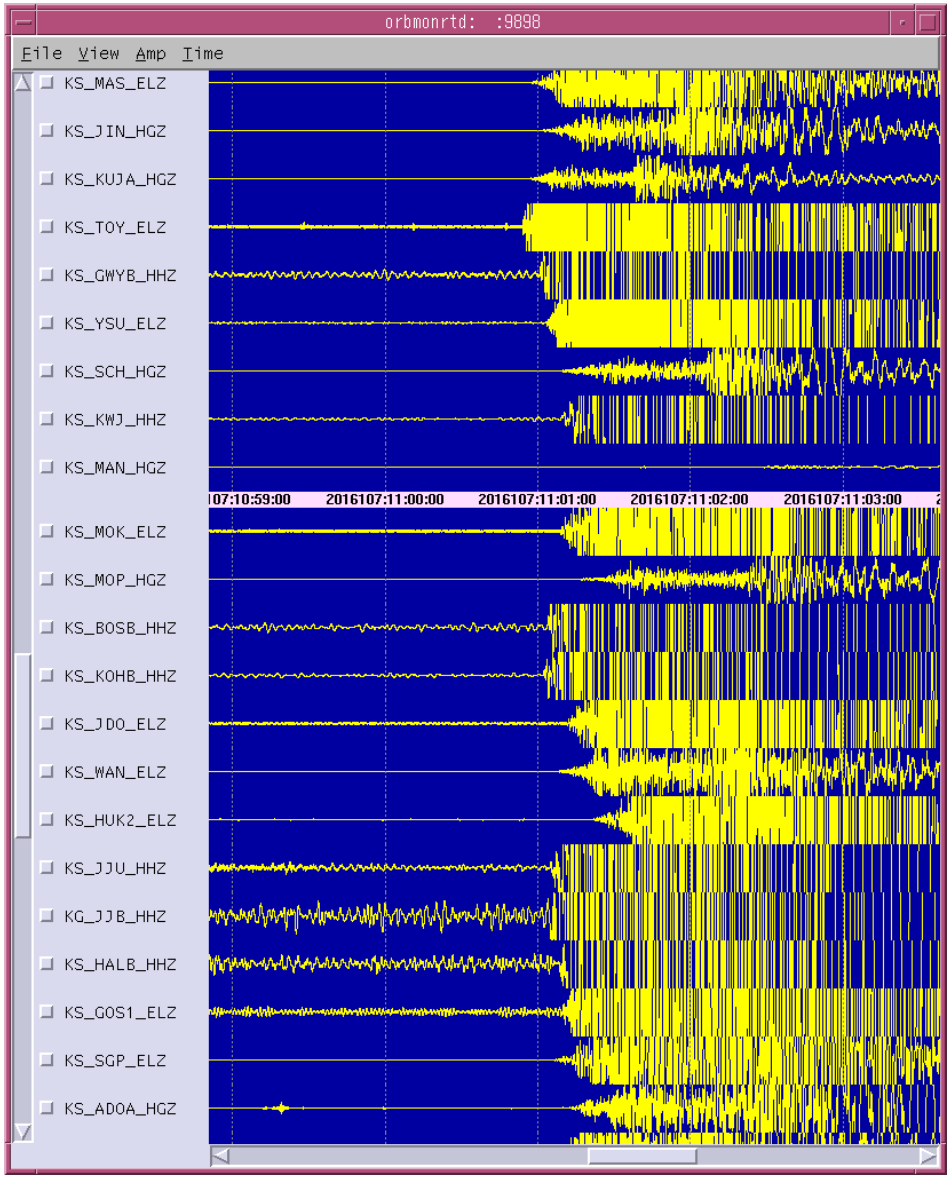
Analysis Result



Korea Meteoro
Administration

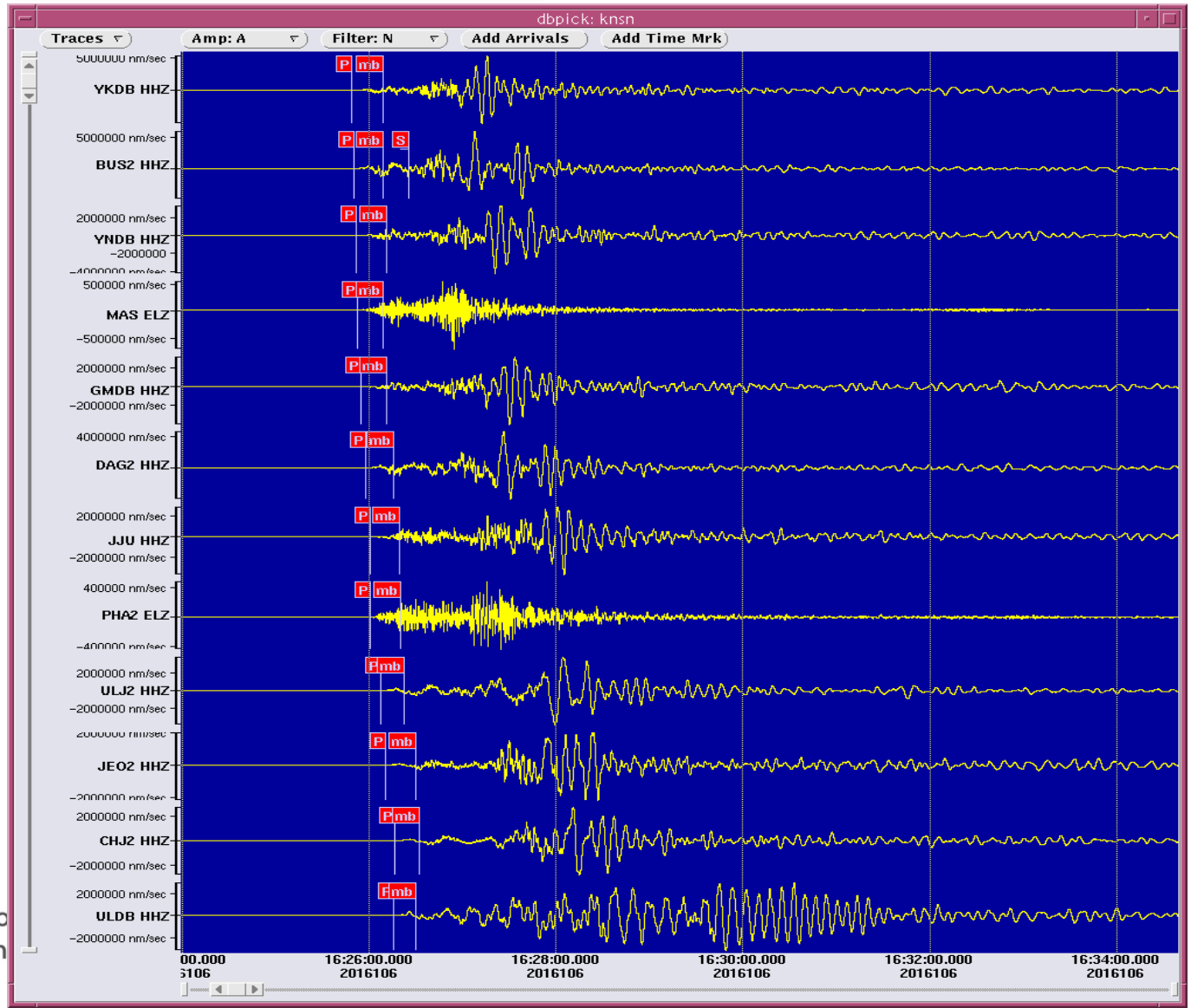
Kumamoto Earthquake in Japan





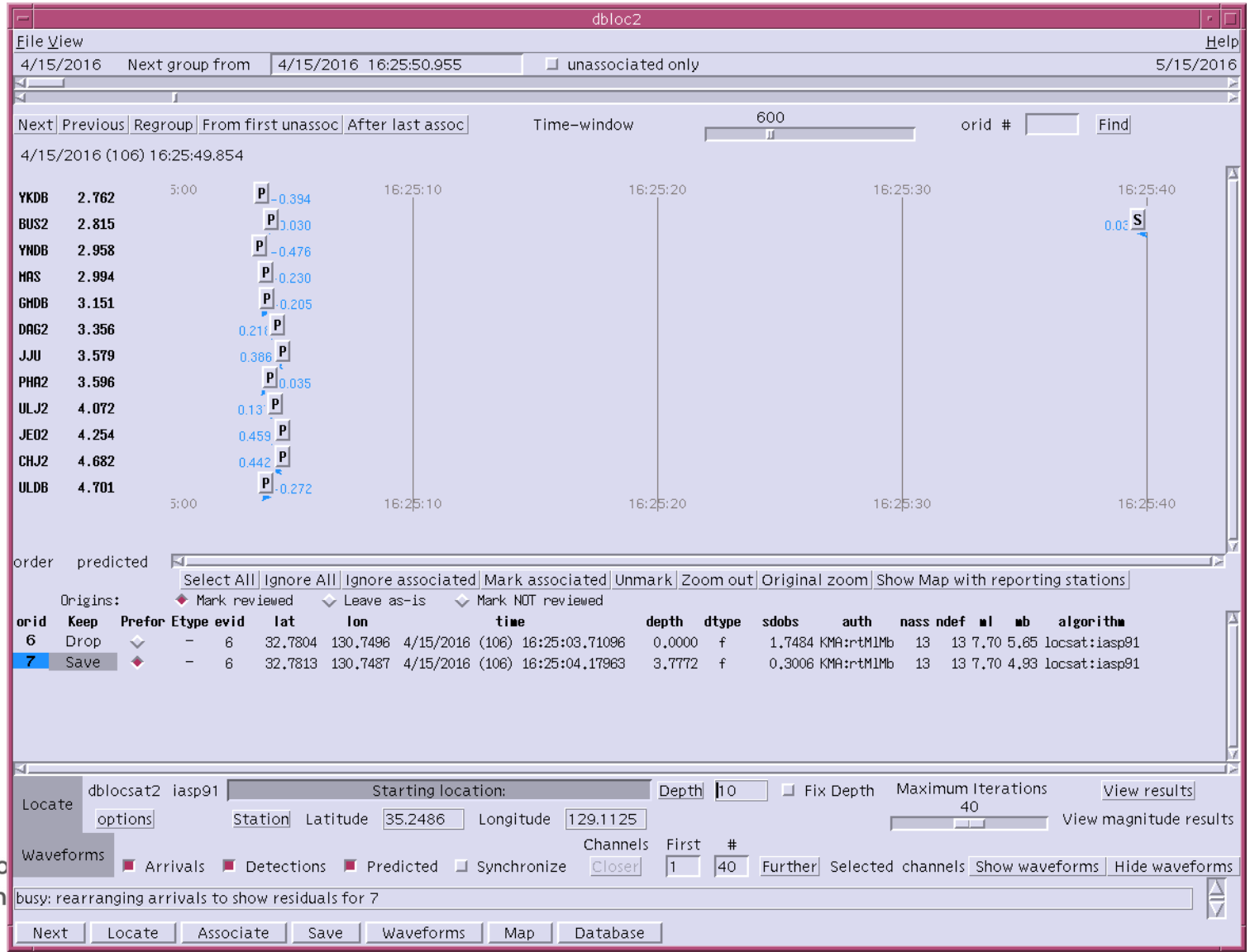
- **Origin Time : 2016. 4. 16. 01:25**
- **Epicenter : 9km East of Kumamoto**
- **Magnitude : 7.3**
- **Aftershocks : over 300(~2016.4.24)**

Event Picking



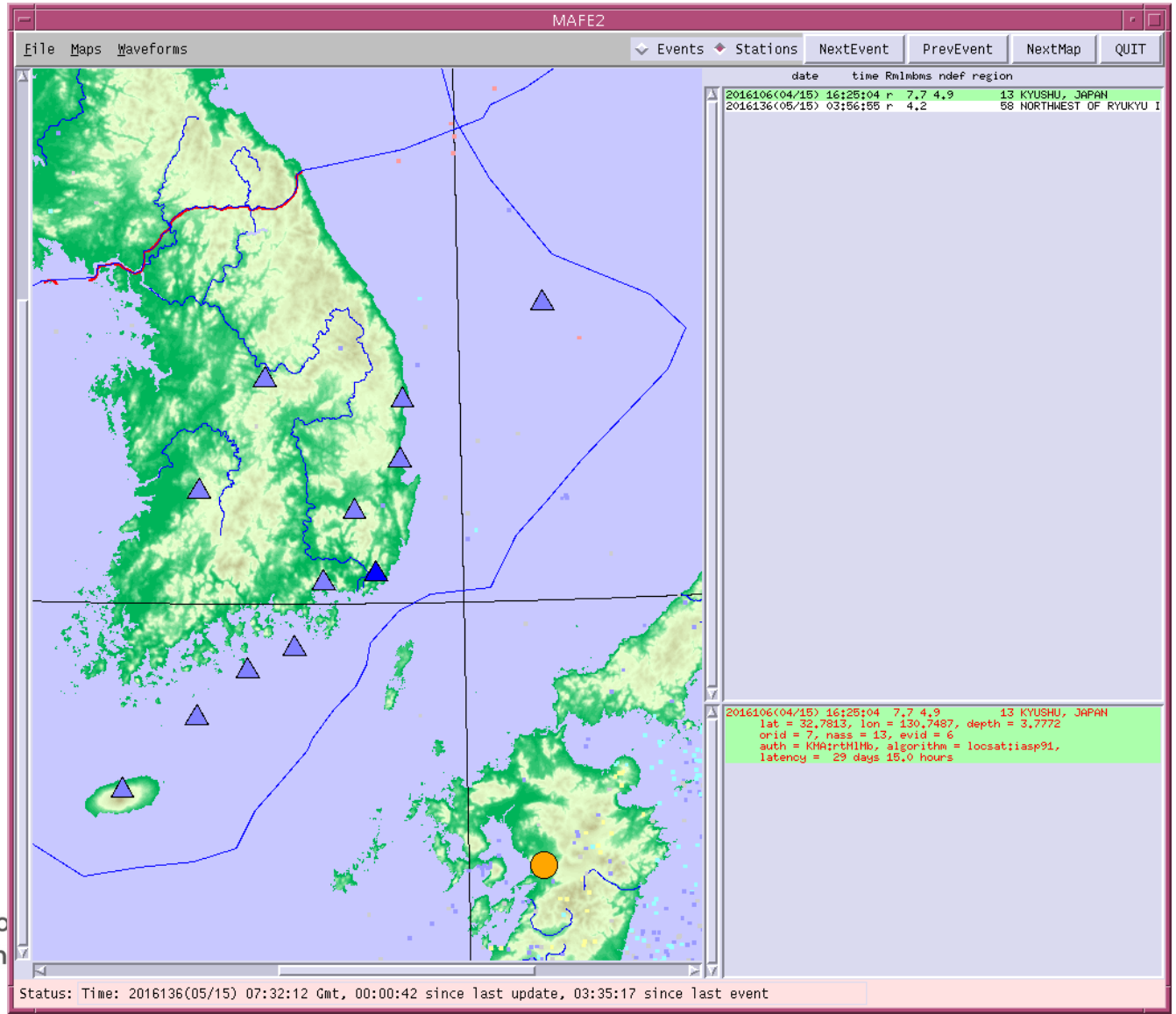
Korea Meteoro
Administration

Event Analysis



Korea Meteoro
Administration

Analysis Result



Korea Meteoro
Administration

Tsunami Observation

- **Real time monitoring of the long-period wave in the coast**

  - through ultrasonic wave-height meter, wager gauge and CCTV

Observation system for coastal disaster prevention at **18** stations

46 tidal stations of KHOA

Sea surveillance CCTV at **24** stations

Ultrasonic wave gauge in Ulleung island

Korea Meteorological Administration

Tsunami Damage

❑1993 July 12 (M=7.8)
- Casualty : None
- Ship Damage : 35

❑1983 May 26 (M=7.7)
- Death : 1 Missing : 2
- Ship Damage : 81

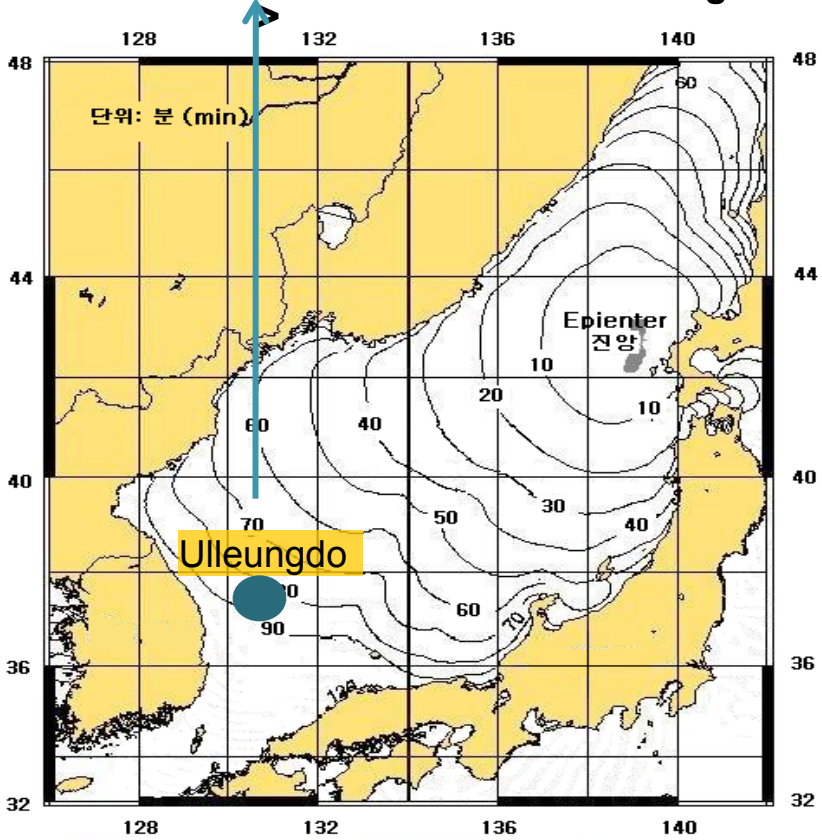
Damage of Tsunami(Imwon port)

Korea Meteorological Administration

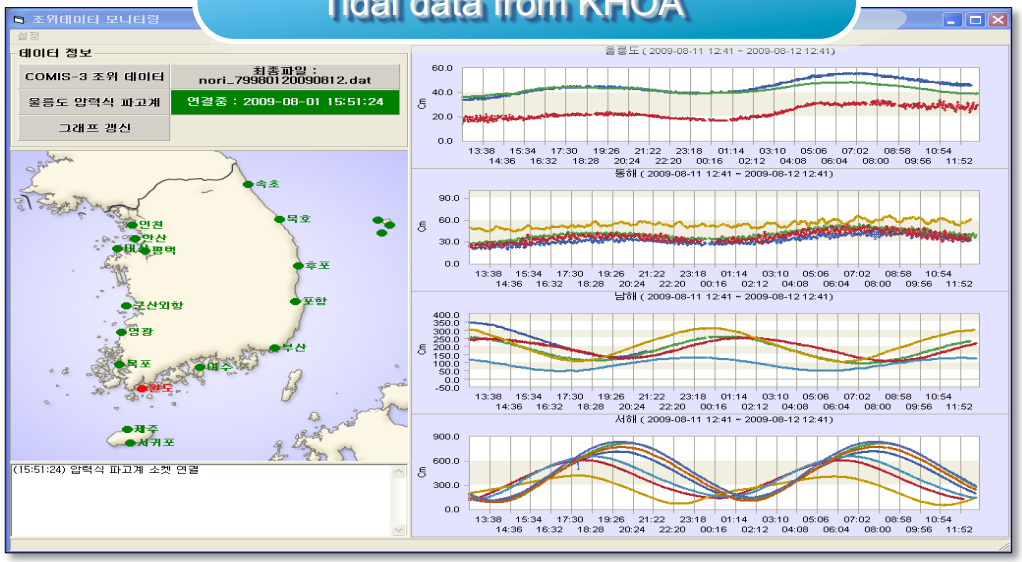
Tsunami Monitoring

<Ulleungdo

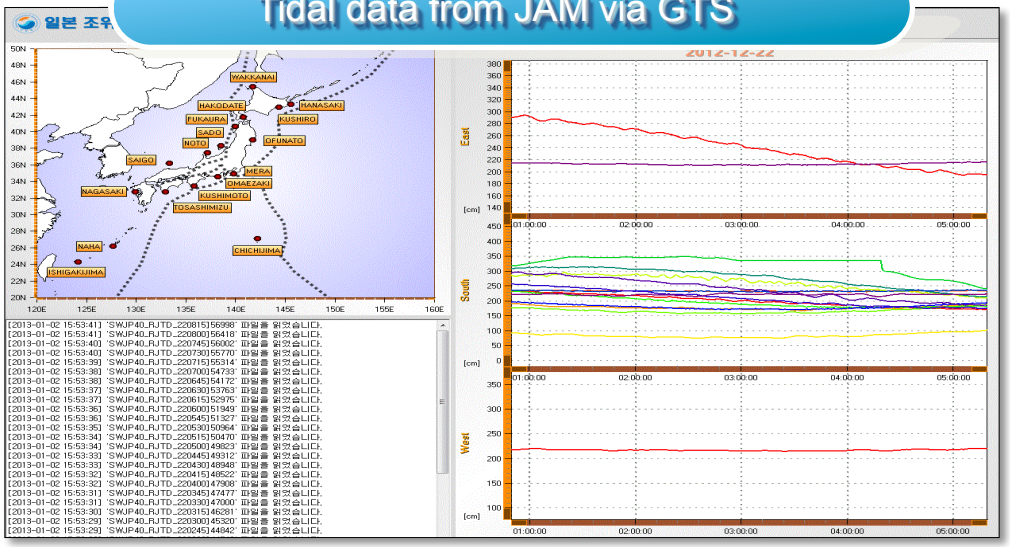
<Tsunami Gauge>



Tidal data from KHOA

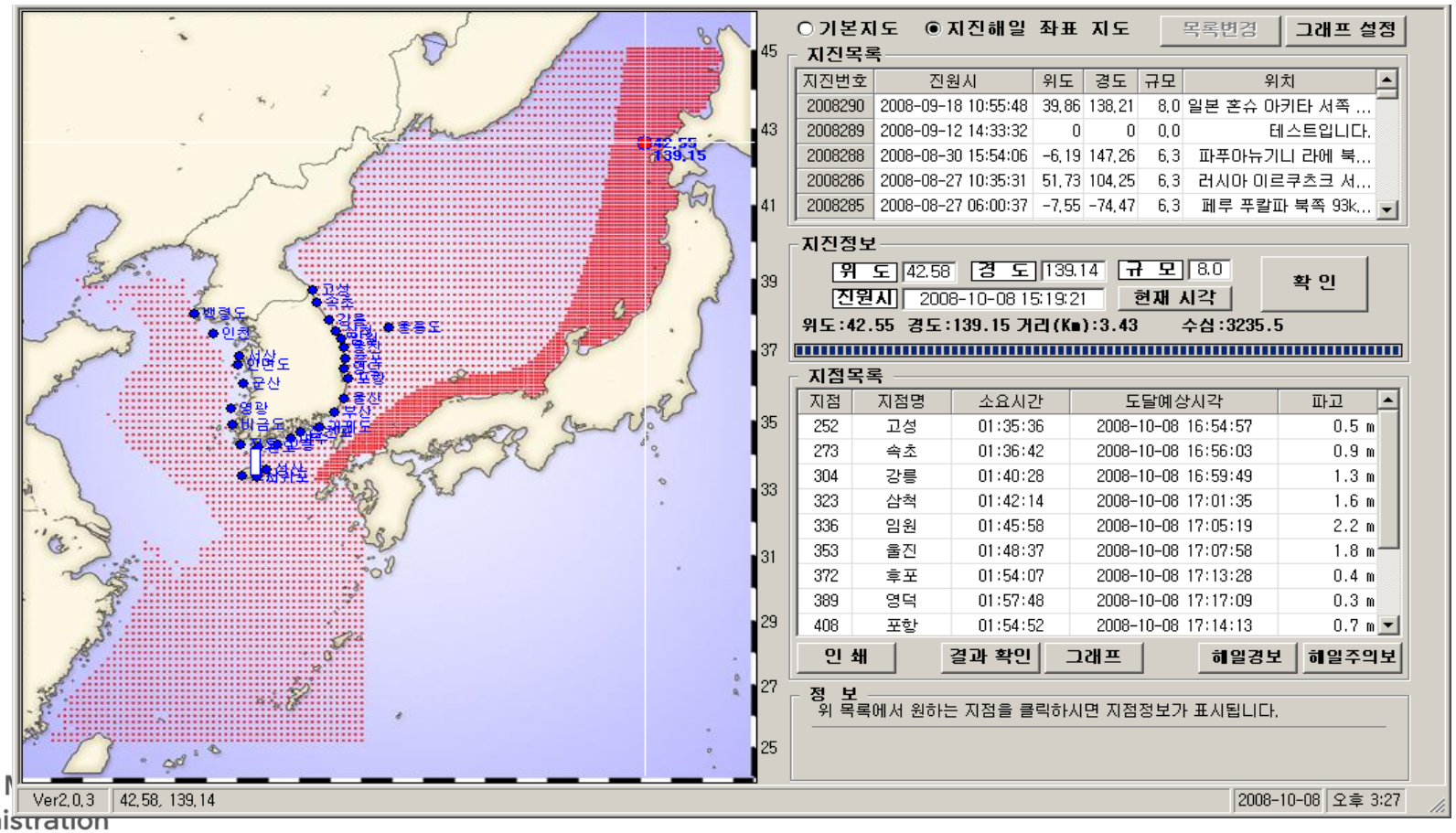


Tidal data from JAM via GTS

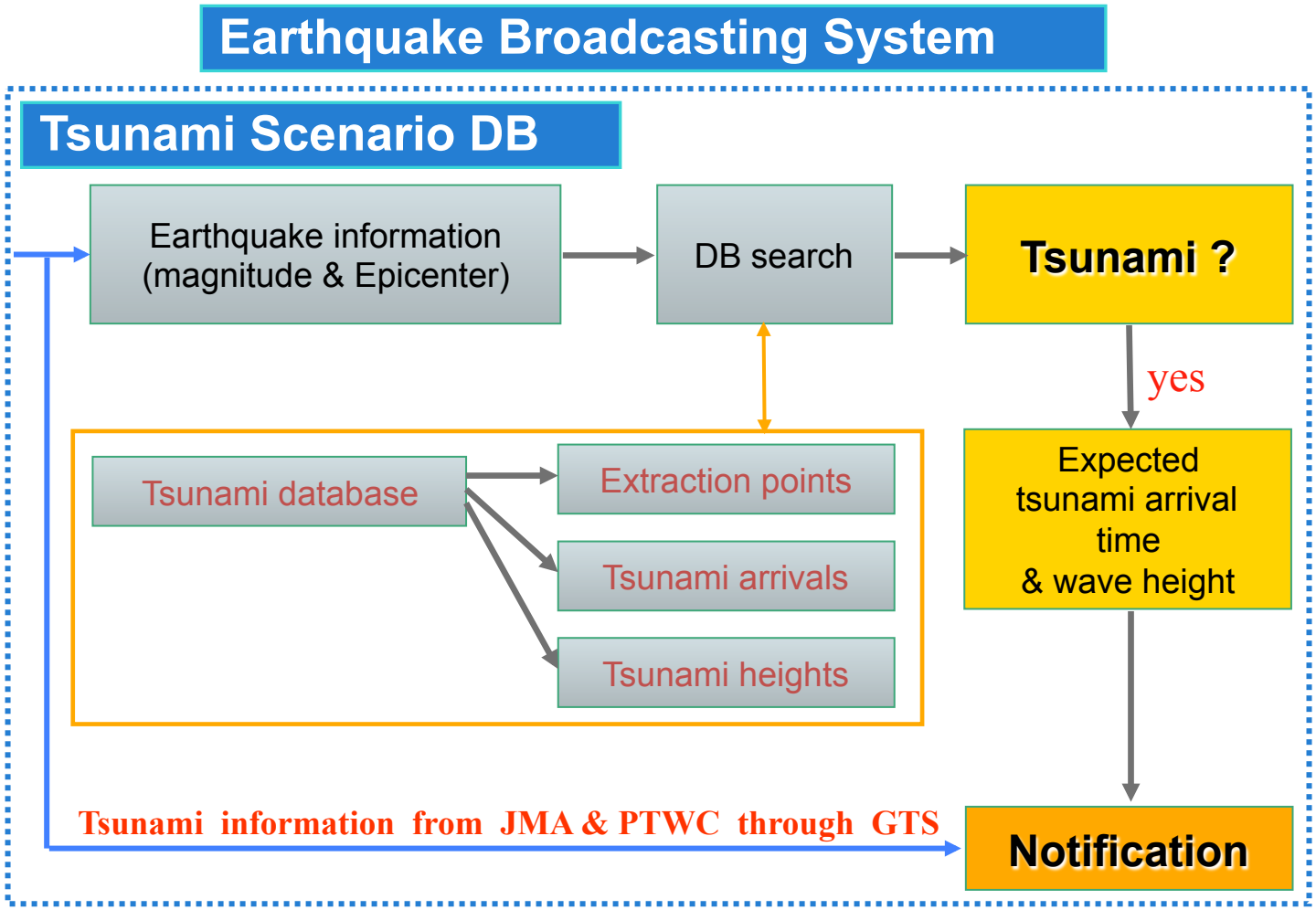


Tsunami Warning System

- **Forecasting tsunami arrival and height of waves in 90 sea areas throughout the country**
- **Building up database of 6,000 epicenters with a magnitude range of 6 to 9 in the sea area around the Korean Peninsula**

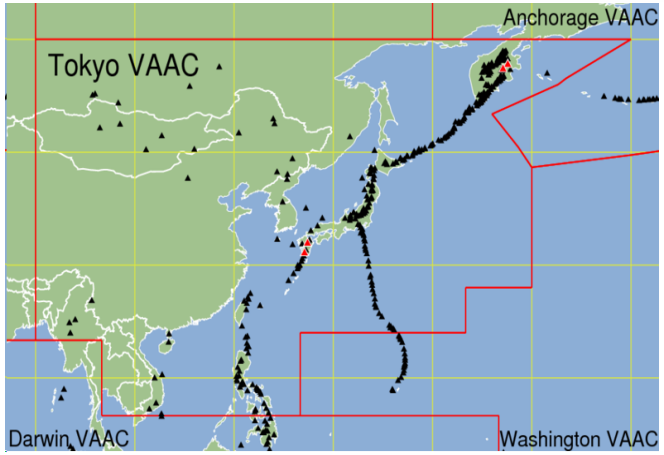


Korea Meteorological Administration

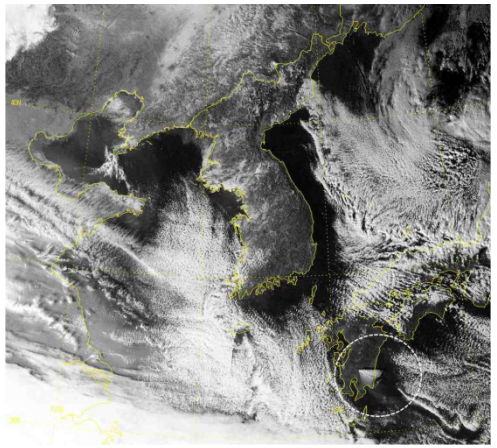

Earthquake Broadcasting System
Tsunami Scenario DB
Earthquake information
(magnitude & Epicenter)
DB search
Tsunami ?
yes
Tsunami database
Extraction points
Tsunami arrivals
Tsunami heights
Expected
tsunami arrival
time
& wave height
Tsunami information from JMA & PTWC through GTS
Notification

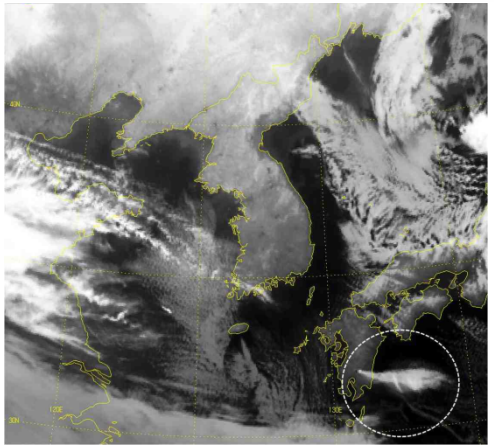
Volcano Monitoring

- Monitoring volcanoes around Korea Peninsula by collecting Tokyo VAAC & KMA satellite data etc.
- Issue special report on volcanic ash using Volcanic Ash Dispersion Forecasting System

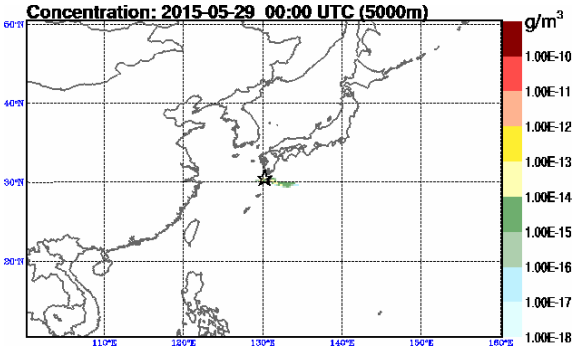


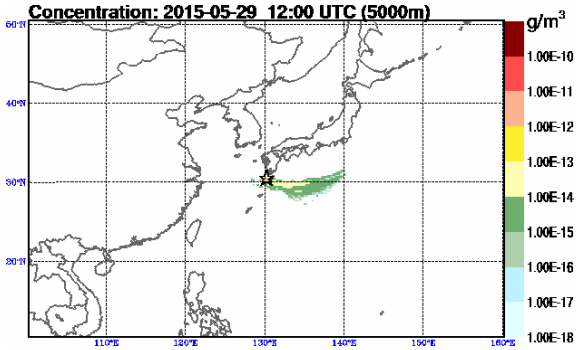
< Tokyo VAAC region >

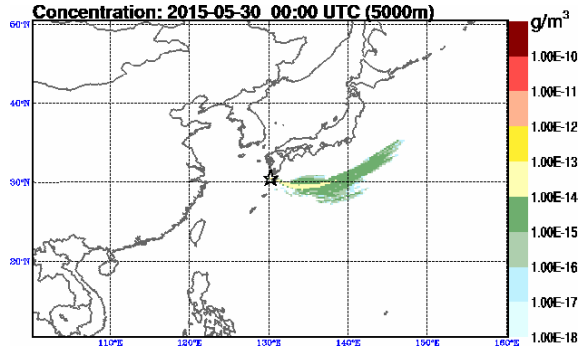




< Satellite Image of Sinmoedake Volcano Eruption('11.1.26) >







< Volcanic Ash Dispersion Forecasting of Guchinoerabusima Volcano Eruption('15.5.29) >

National Earthquake & Volcano Center

Thank you.