Sixth Plenary Meeting of UN-GGIM-AP

Special Session on Geospatial Information for Disaster Response

-Case Study on 2016 Kumamoto Earthquake-

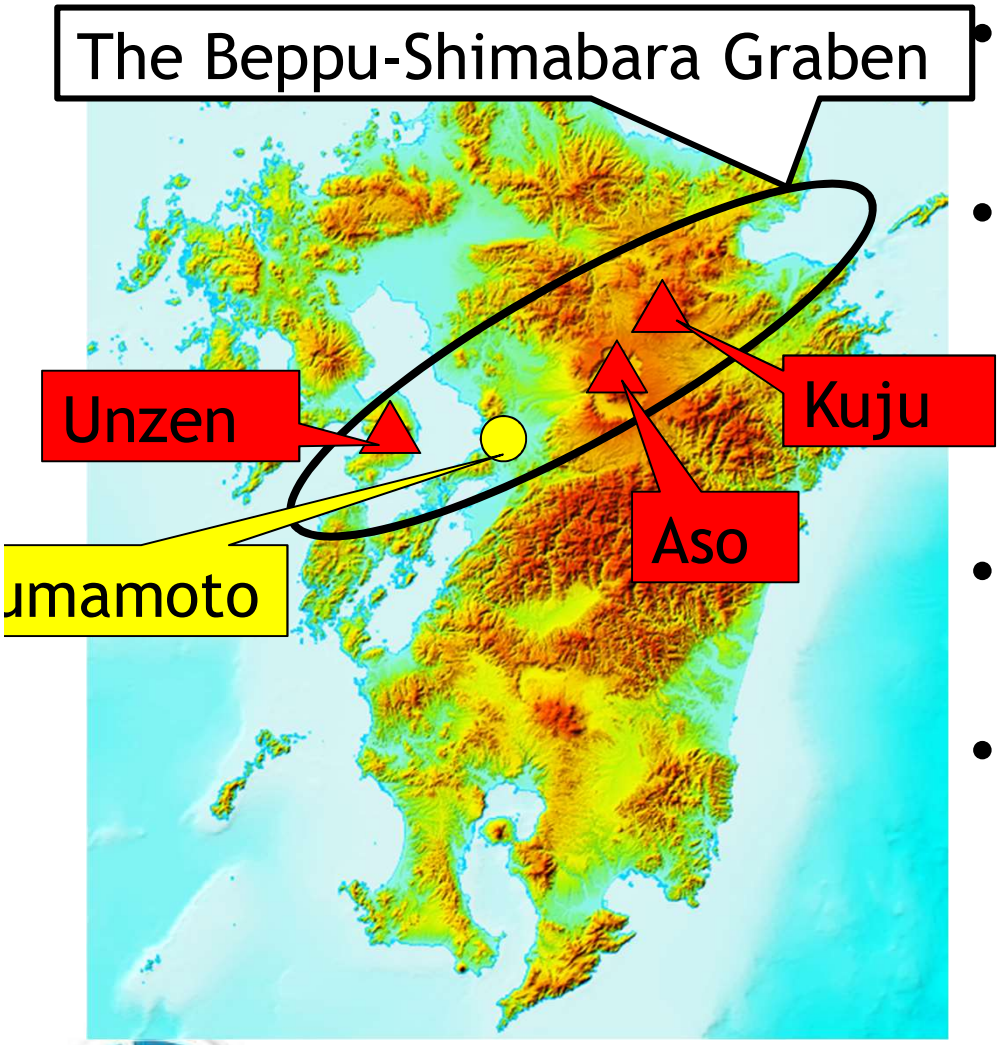
Part 2
Outset of the 2016 Kumamoto Earthquake

4:45pm-5:30pm, 17th October 2017

Geography of Kumamoto Prefecture

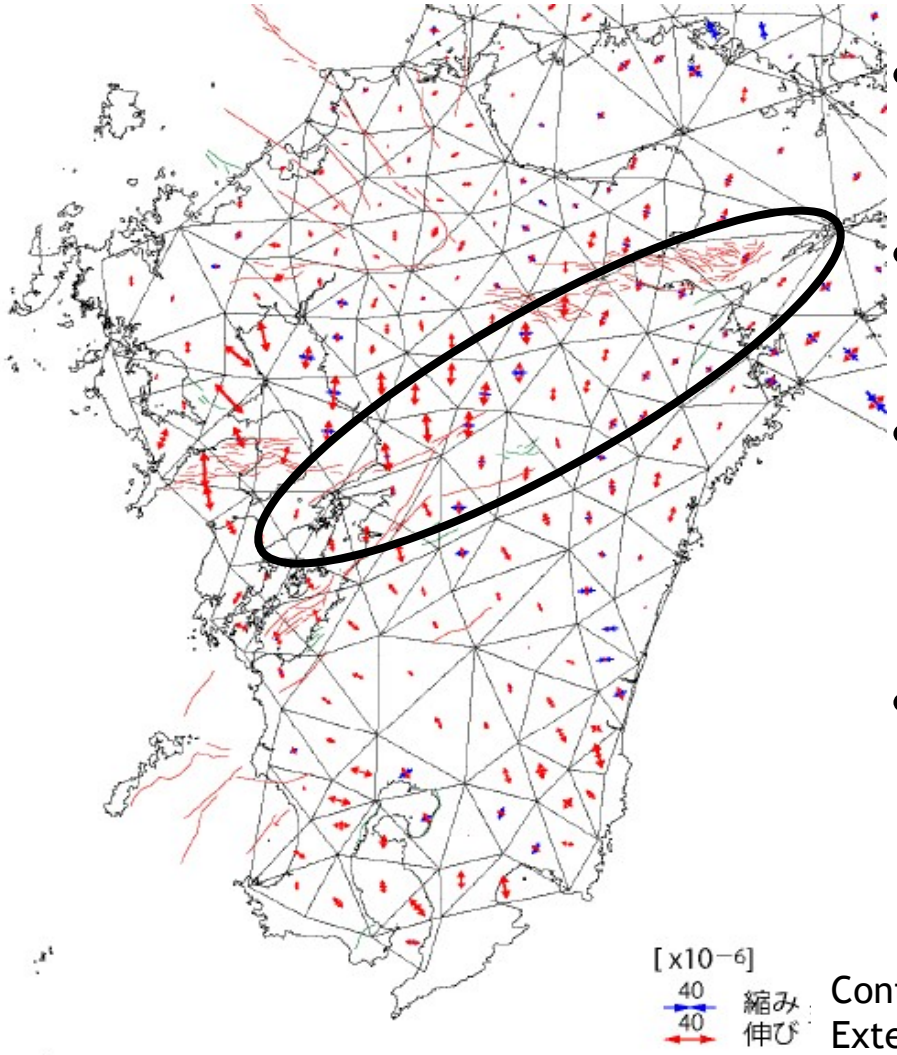
- In Kyushu island
- 900km WSW of Tokyo
- 120km S of Fukuoka
- Population: 1.76 mil.
- Area: 7,400 sq. km
- Capital: Kumamoto city

The Beppu-Shimabara Graben



- Tectonic zone: length 200km, width 20-30km
- Pulling Kyushu island apart, north and south Right-slip and normal faults develop in the zone
- Volcanoes develop: Kuju, Aso and Unzen
- Thick layer of volcanic deposit, topographically high despite the sinking structure

The separating Kyushu

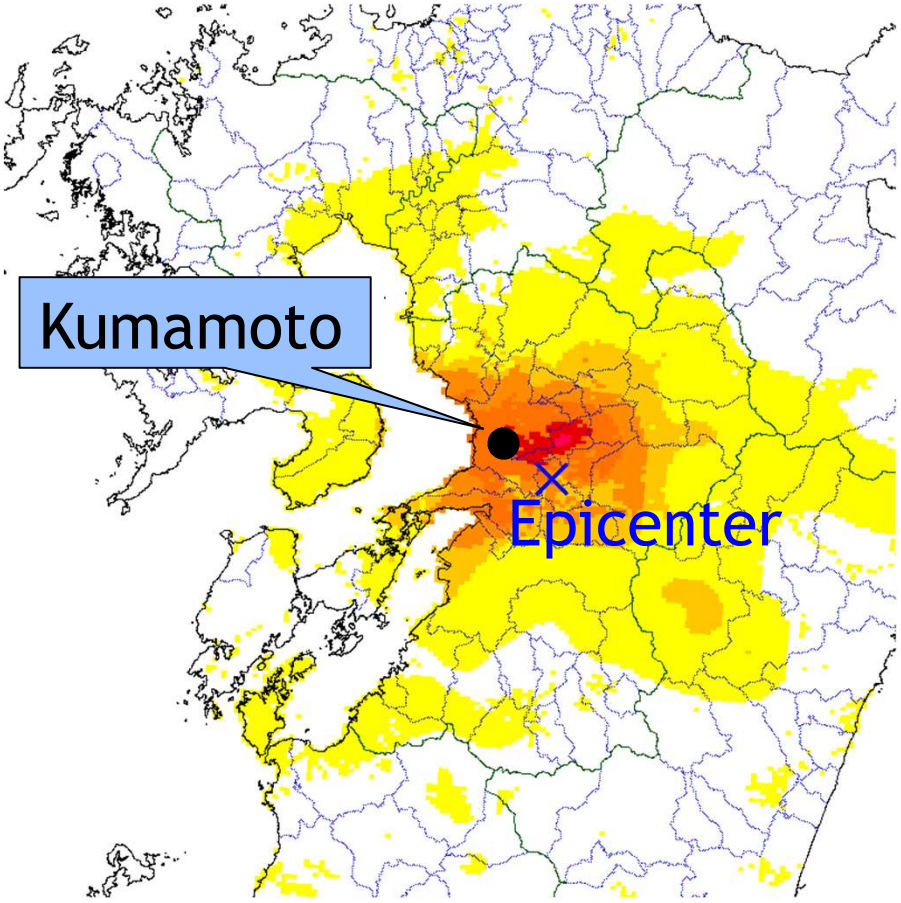


- Horizontal strain distribution map
- Based on geodetic Survey 1883-1994
- Extension Axes (Red Arrows) dominate around the Beppu-Shimabara Graben
- Northern and Southern parts of Kyushu are pulled apart

Ref. The Headquarters For Earthquake Research Promotionhttp://www.jishin.go.jp/main/chousa/13feb_chi_kyushu/k_honbun.pdf

You are now in Kumamoto
The time is supposed to be
9:25pm,14 April 2016 (Thursday)

The first shock came



Ref. Japan Meteorological Agency

- Occurred 9:26pm, 14 April 2016
- Magnitude (Mj): 6.5
- Focal Depth: 11km
- By the movement of the Hinagu Fault
- Terrible shock felt in large parts of Kumamoto Prefecture
- Scale 7 in Mashiki town

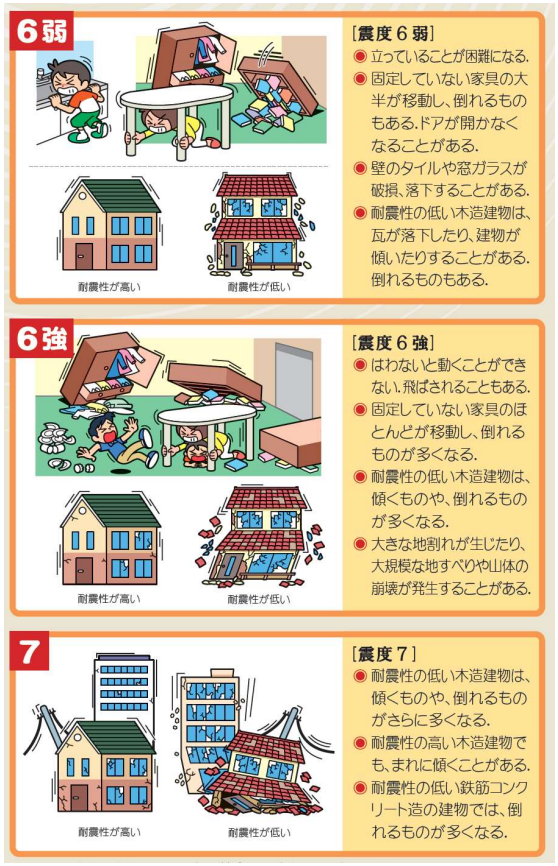
Japanese seismic intensity scale

4 5^- 5^+ 6^- 6^+ 7

Japanese seismic intensity scale

Scale 1,2,3: Mild shake, no damage

Scale 4,5-,5+: Middle shake, small damage may occur



Scale 6-,6+,7: Serious shake, large damage occurs

Ref. Japan Meteorological Agency

Earthquake Early Warning (EEW)

- Issues a warning in several to several tens of second before the arrival of large shock
- Operated by Meteorological Agency, broadcast by various kinds of media

Compulsory broadcast through mobile phones

TV (National Broadcast Corporation): Earthquake warning Screen

Search Engine (Yahoo! Japan): Notice of the earthquake

Sound Ref: http://okoya.seesaa.net/article/164511396.html

Topics for discussion #2

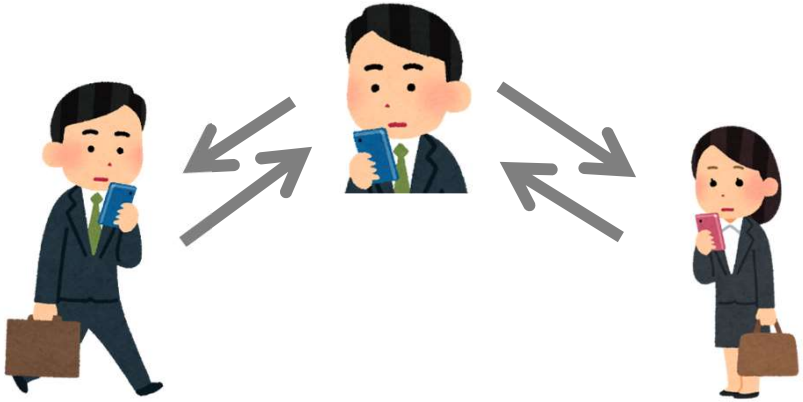
- What kind of initial responses should or could be made by NGIAs immediately after the outset of a disaster?
- For example, how should the employees be informed and summoned to the office, and what kind of responses should they make?
- What kind of decisions should be made by an organization immediately after a disaster?

Starting initial responses

Safety check of GSI staff and family members

- Answer via mobile phone
- Auto collection of results
- All respondents in Kyushu region were safe

Staff availability check “Ten-minutes rule”



- GSI-DRM office sends availability check e-mail message
- Senior officials and related staff need to acknowledge the receipt within 10 minutes.

Starting initial responses

Teleconference (1st GSI DMHQ meeting) 10:15pm 14 April

2nd Headquarters meeting 00:30am 15 April

Initial response (1) : areal photography

- GSI Aircraft was 1,000km away from Kumamoto, unavailable for immediate response
- Private company aircrafts took initial photographs based on the partnership agreement

Vertical Photo Coverage

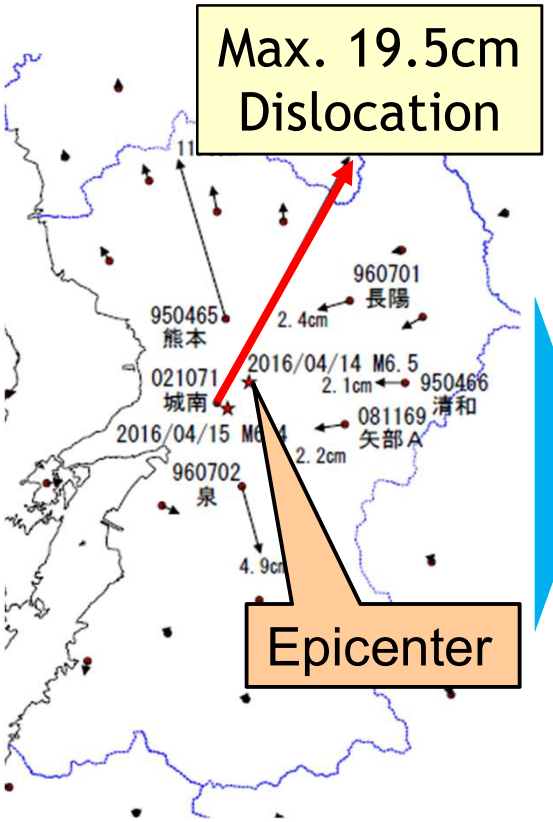
Vertical Photo From 10am 15 April

Oblique Photo From 7am 15 April

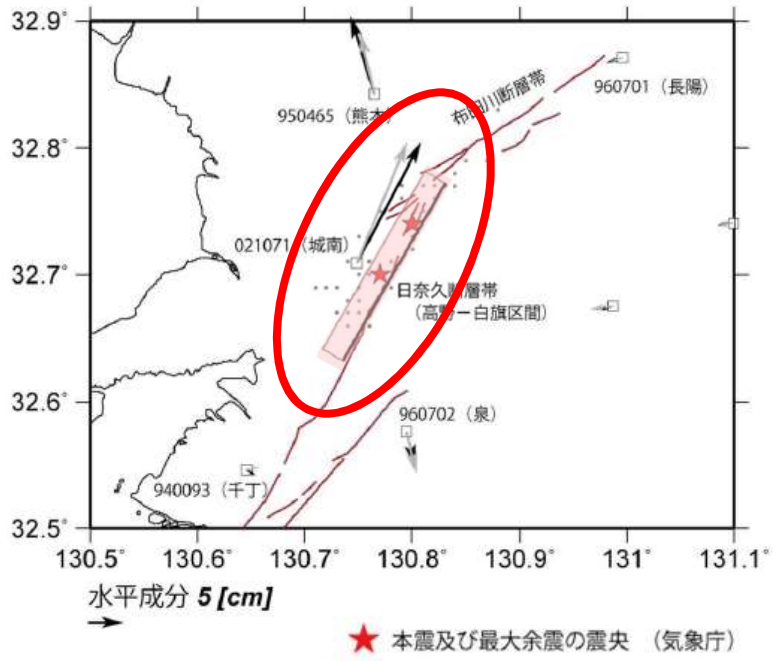
Initial response (2) : crustal movement

- CORS analysis and fault modelling were conducted

Check CORS status
Data acquisition



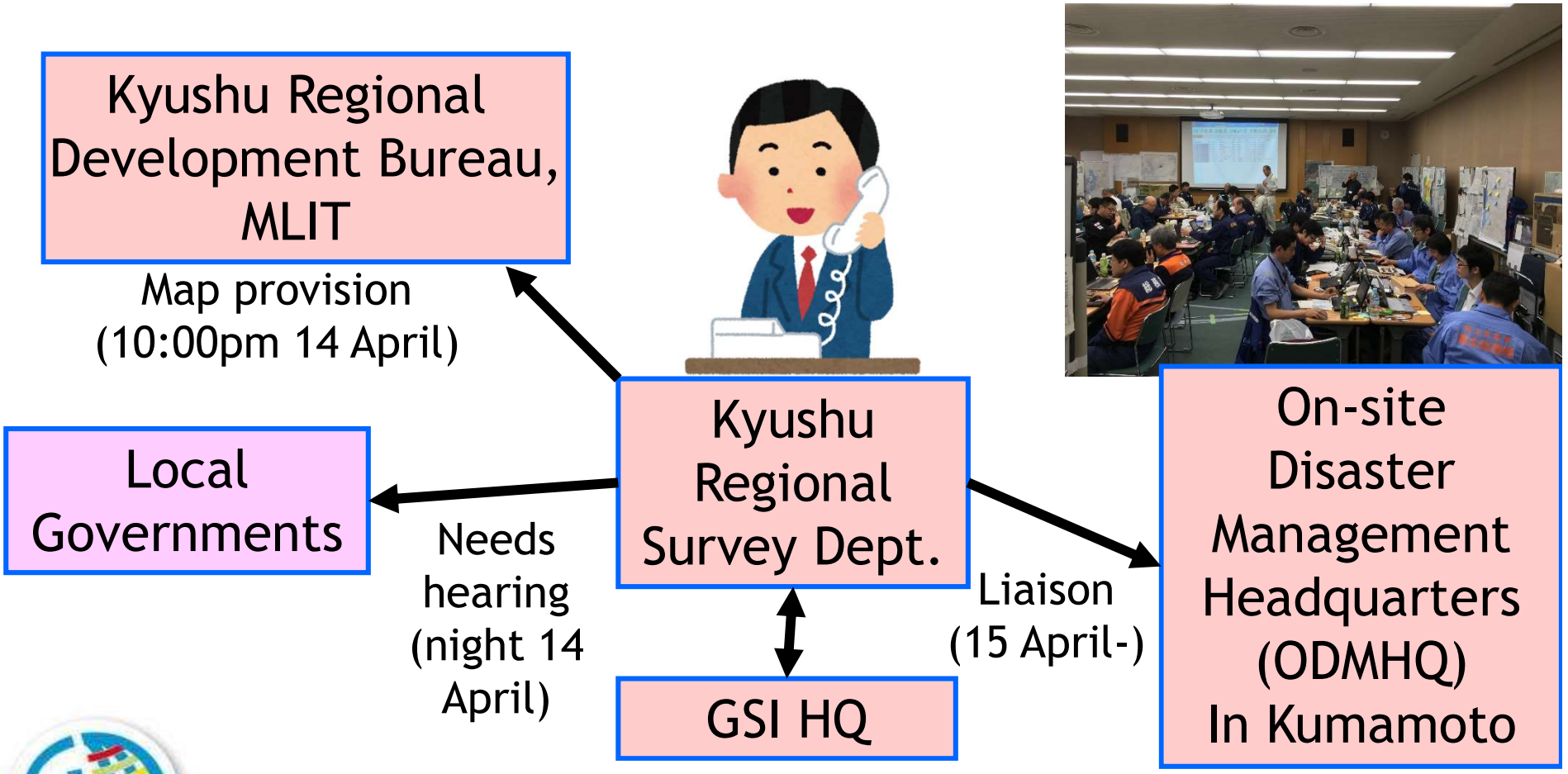
Quick Solution
(Q3 Analysis)
Horizontal



Estimated Fault Model
(Along Hinagu Fault)
Max. slip 60cm

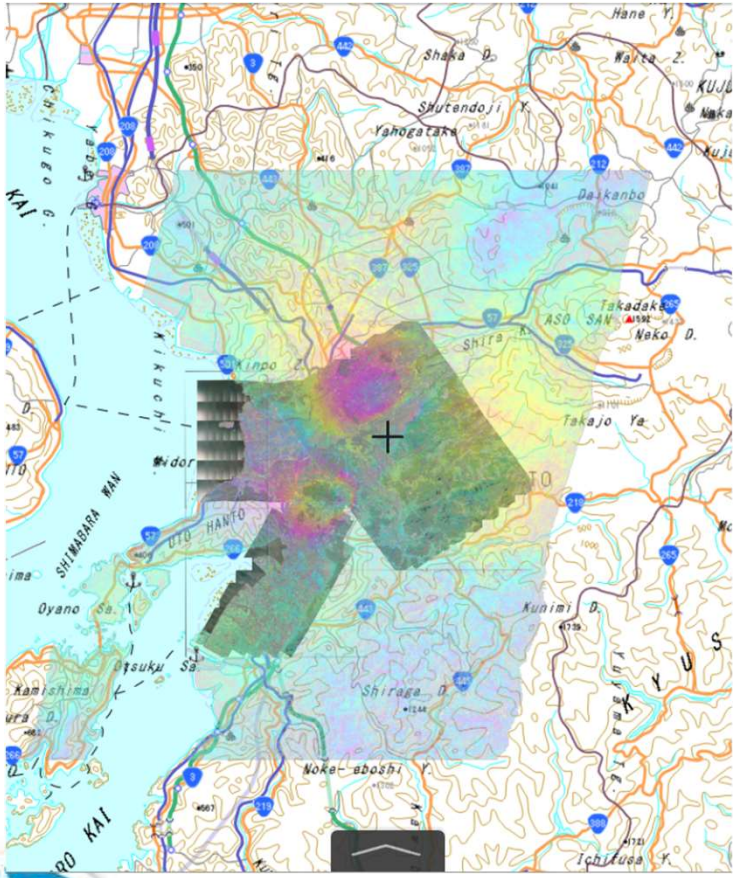
Initial response (3) : channel establishment

- Quick action of Kyushu Regional Survey Dept.



Initial response (4) : information provision

GSI Maps (GSI's webmap platform)

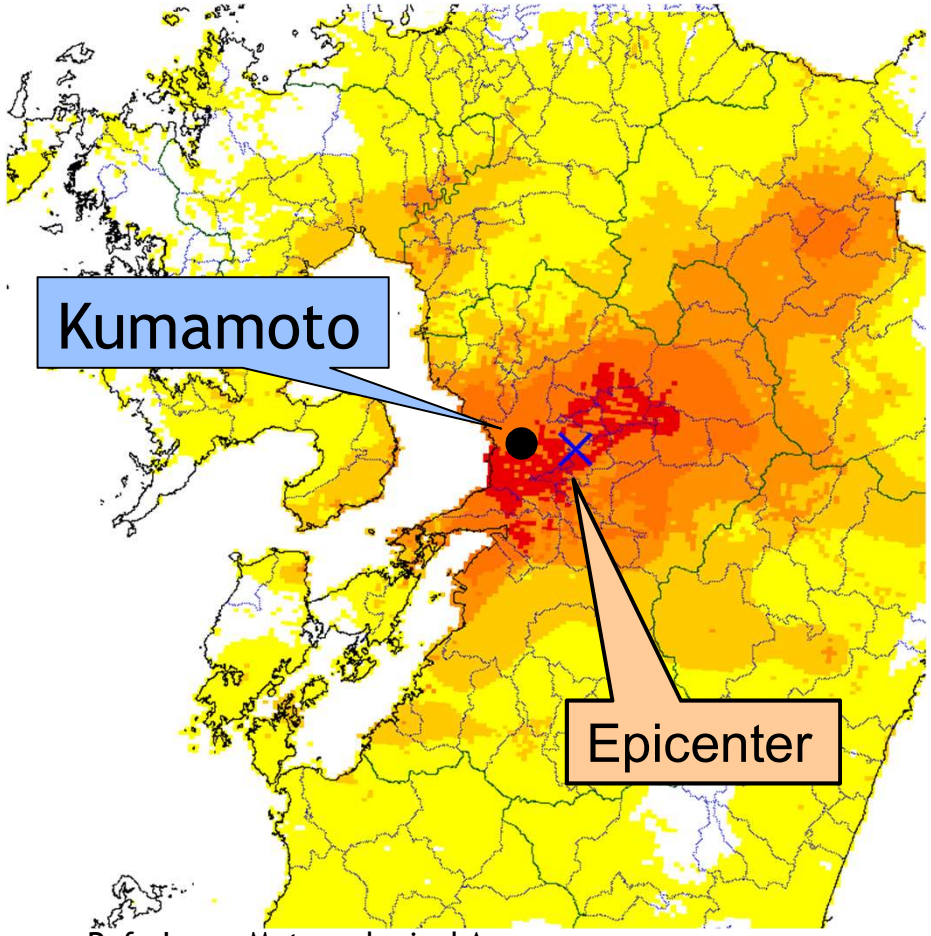


GSI Twitter

At the end of 15 April 2016

- 27 hours after the first shock
- GSI had four Headquarters meetings
- Initial Response seemed to have been set on the right path
- Most staff got back home and were about to sleep

But, the Second Shock Came



Ref. Japan Meteorological Agency

Japanese seismic intensity scale

4 5⁻ 5⁺ 6⁻ 6⁺ 7

- Occurred 1:25am, 16 April 2016
- Magnitude (Mj): 7.3
- Focal depth: 11km
- By the movement of the Hinagu and Futagawa Faults
- Much larger than the first shock
- SI-7: Mashiki town and Nishihara village

Re-Starting Initial Responses

Teleconference
(5th GSI HQ meeting)
2:19am 16 April

6nd Headquarters meeting
6:00am 16 April

Renewing Response Strategy

Ordered by Director-General of GSI

1) Personnel Assignment
2) Information Sharing
3) Aerial Photography
4) Interpretation of aerial photographs
5) CORS data analysis
6) Interferometric SAR data analysis
7) Shooting videos with drones
8) Provision of geospatial information

The time is supposed to be at 7:00am,16 April 2016 (Saturday)

Re-starting Response, based on the renewed strategy