

**Sixth Plenary Meeting of UN-GGIM-AP**

**Special Session on  
Geospatial Information for Disaster Response**

**-Case Study on 2016 Kumamoto Earthquake-**

**Part 3  
Emergency Disaster Response Activities**

**9:15am-10:15am, 18<sup>th</sup> October 2017**



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# **The time supposed is 8:00am, 16 April 2016 (Saturday)**

- **GSI re-started response activities, based on the renewed strategy by GSI Director-General**



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# Assistance to other organizations

- GSI provided assistance to ODMHQ and relevant organizations
- Surrounding RSDs deployed their staff members to Kyushu-RSD as well as ODMHQ



**ODMHQ Office**



**ODMHQ Daily Meeting**



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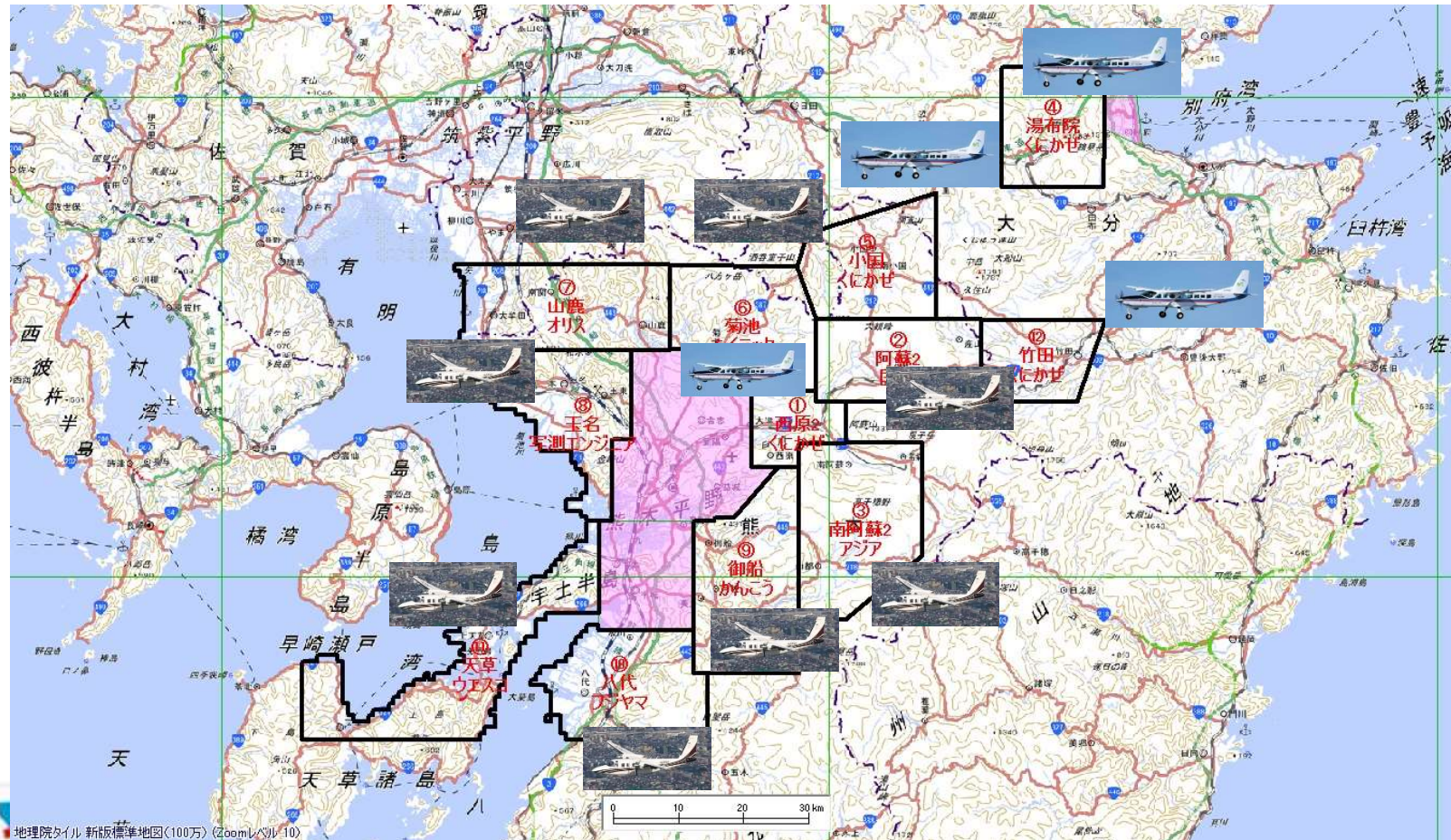
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# Second aerial photo mission

- Expanded Coverage for affected areas by the Mainshock
- GSI and several private companies joined the mission



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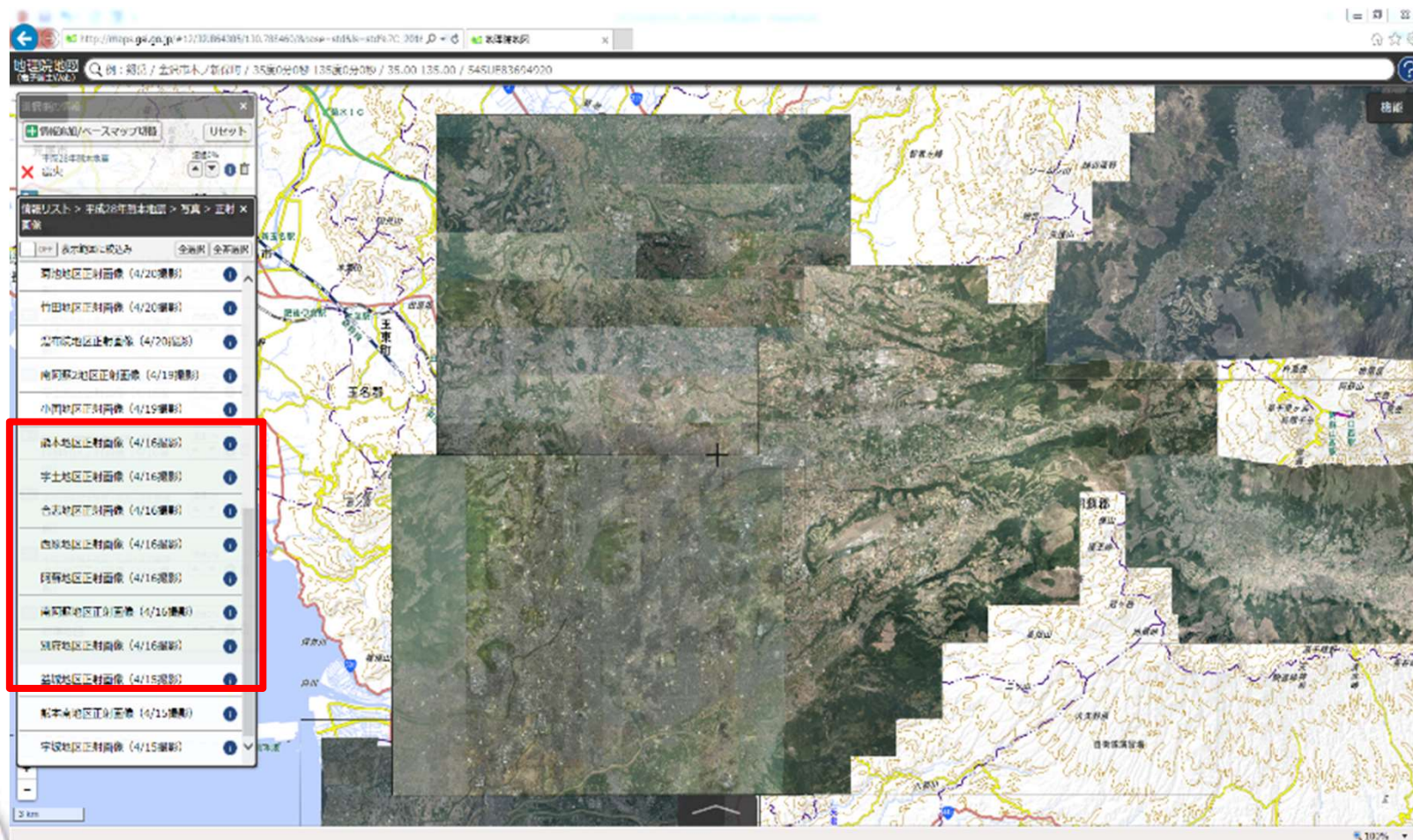
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# Aerial photo provision through “GSI Maps”

- Once taken, photo data were transmitted to GSI and processed
- The photo data was subsequently released through “GSI maps”



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# Landslide mapping by photo interpretation

- Numerous landslides were caused by the Mainshock
- Landslide distribution was interpreted and mapped out



Photo-interpretation works  
at GSI Headquarters office

Start interpretation:	11:10pm 16 April
Draft map:	03:00pm 17 April
1 <sup>st</sup> version release:	12:00pm 18 April



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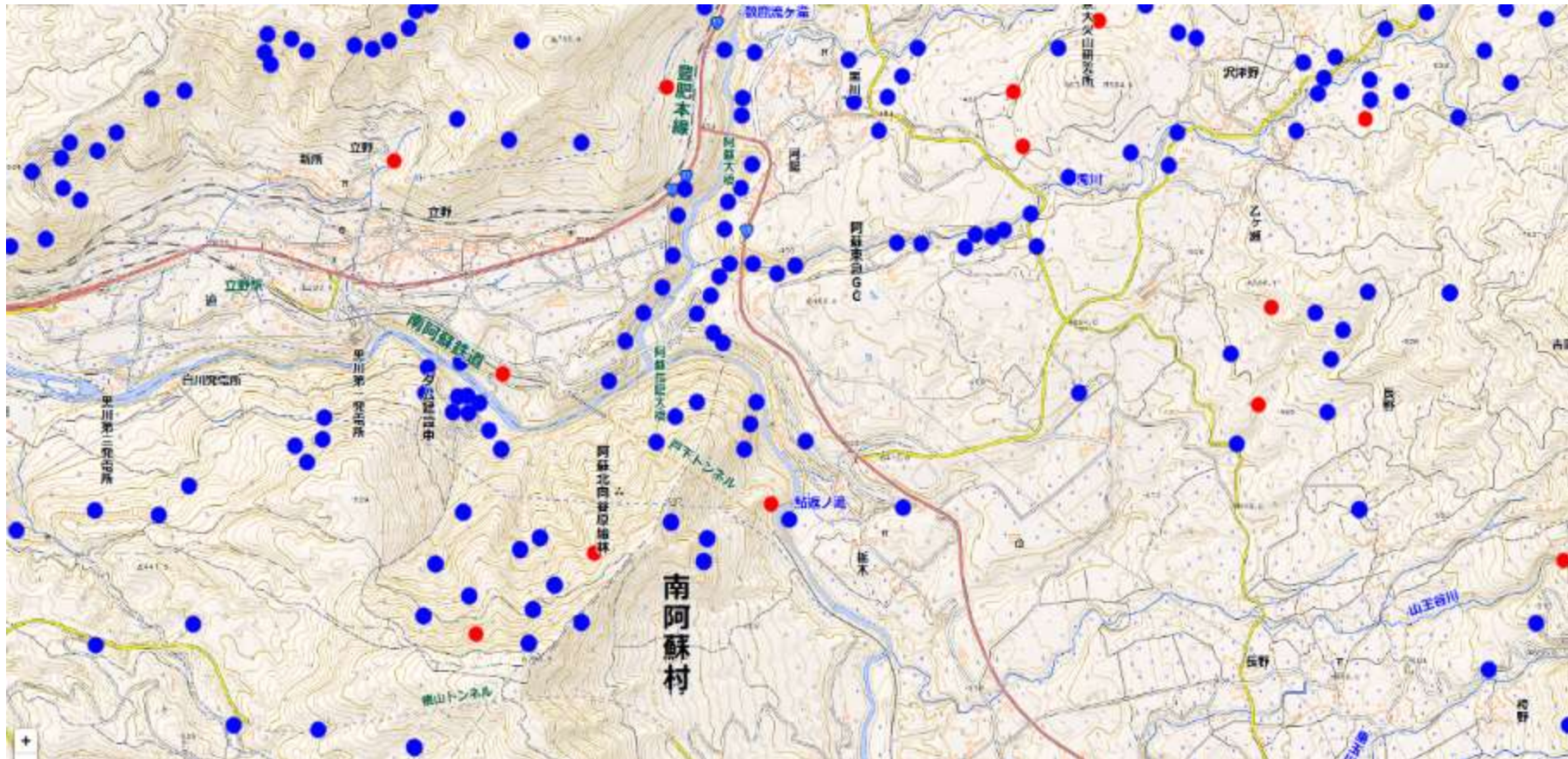
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# Landslide distribution map

- Released for the public, in the midnight, 18 April



- Small landslide
- Large landslide



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# UAV imagery

- GSI sent GSI-LB (Land bird) team members from 15 to 19 April
- They acquired imagery of seriously damaged features, like landslides, emerged faults on the ground.



A big landslide captured by UAV\*

\*UAV: Unmanned Aerial Vehicle



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# UAV images media coverage

- A number of media (TV, newspaper, web-portals) covered UAV imagery taken by GSI

**The Asahi Shimbun**

**The New York Times**



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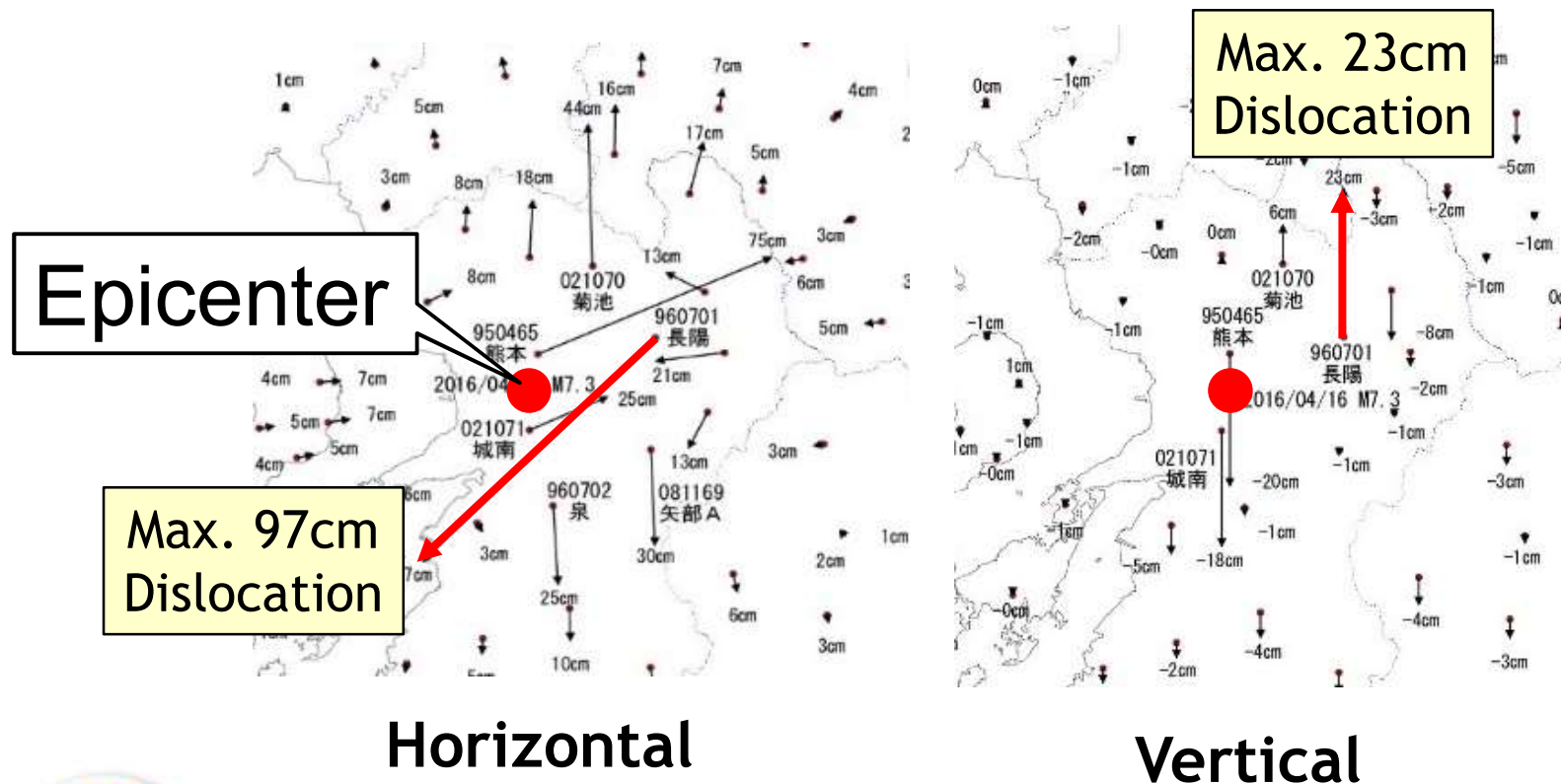
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# Crustal movements of the mainshock

- Much larger crustal movements were observed by the GEONET after the Mainshock



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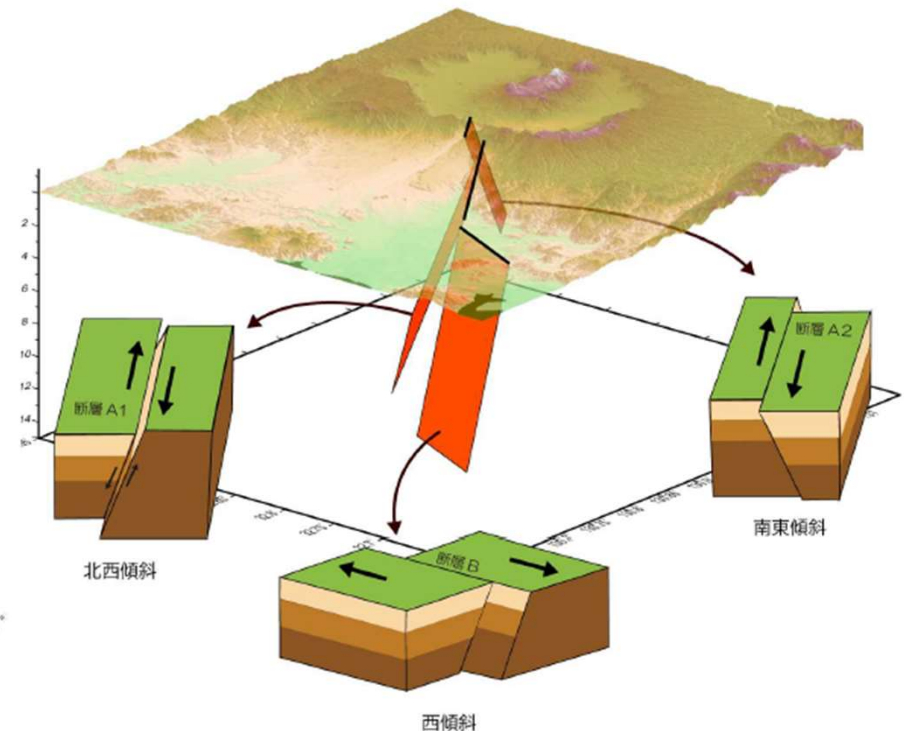
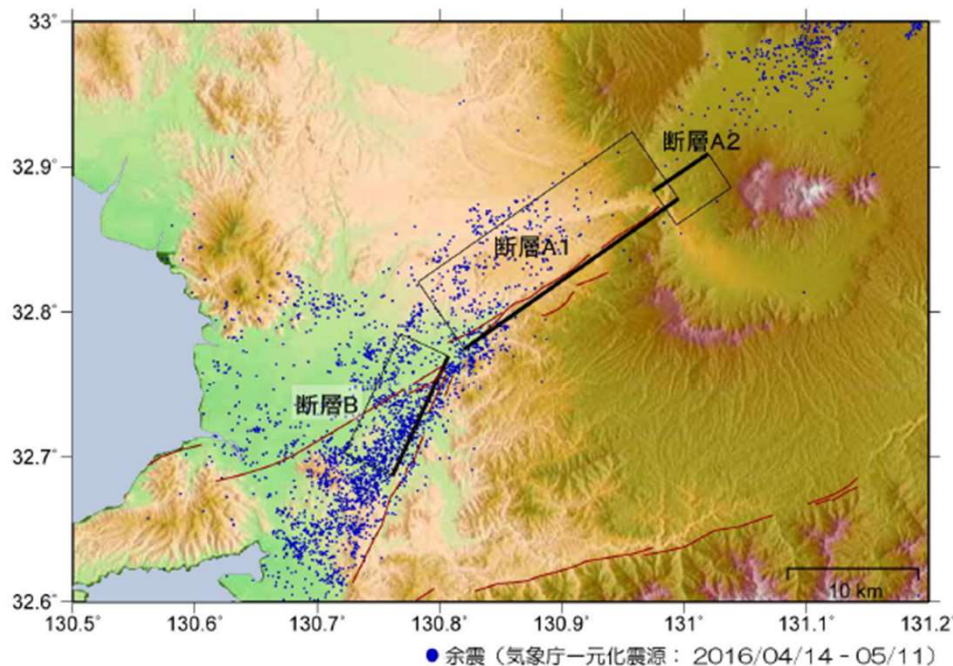
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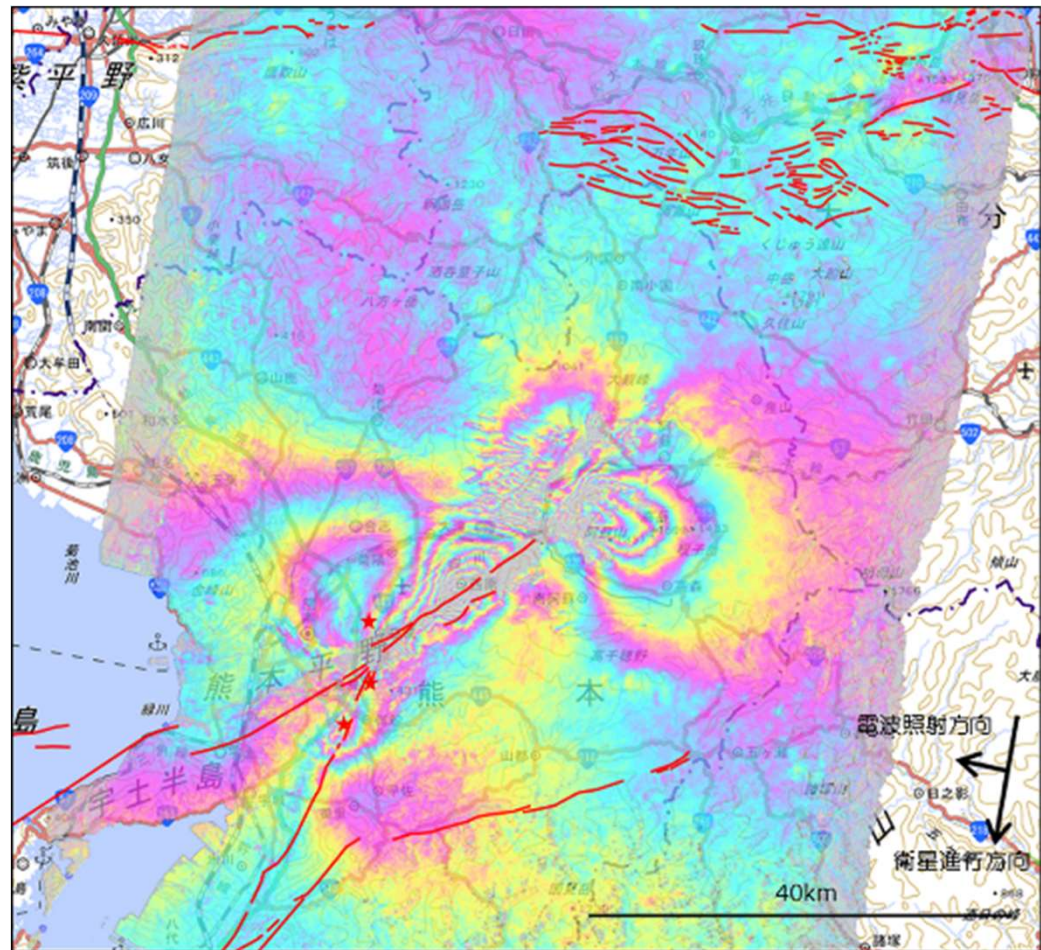


# Fault modeling using CORS data

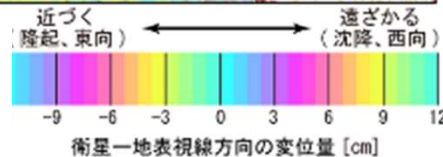
- Three fault slips, totally extending 30 km, were assumed to be compatible with the CORS movement data.



# SAR interferometric analysis



- ★ Epicenters of Earthquakes
- Active Faults



- Spatial distribution of crustal movements caused by the two shocks.
- Revealed by In-SAR analysis, using ALOS-2 radar satellite launched by JAXA\*
- Narrow banded spectral structure indicates large surface dislocation caused by the earthquakes.



\*JAXA: Japan Aerospace Exploration Agency

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# Topics for discussion #3

- How should we adequately catch the geospatial needs of relevant organizations and local residents?
- How can we best provide geospatial information to stakeholders, under the fast changing circumstances at the outset phase of a disaster?



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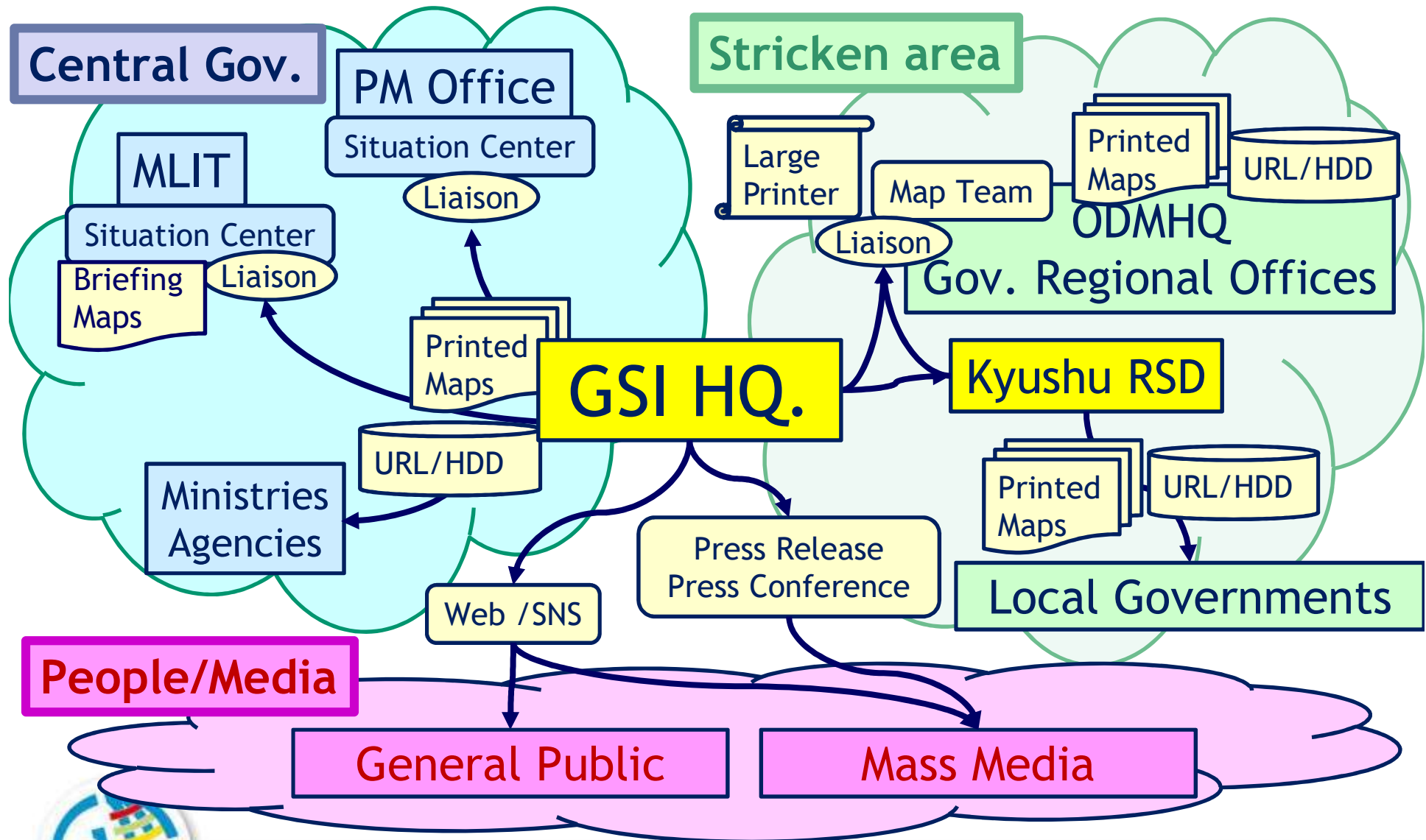
# Meeting the needs of stakeholders

- Providing geospatial information - NGIA's basic mandate
- Finding out stakeholders' needs - crucial for effective disaster response
- Geospatial information provision
  - When: the best timing?
  - What: map? air-photo? interpretation results
  - To whom: government? media? public?
  - Why: objective of data use.
  - How: through liaison, push mail, website.





# Outreach toward stakeholders



# Information provision to ODMHQ

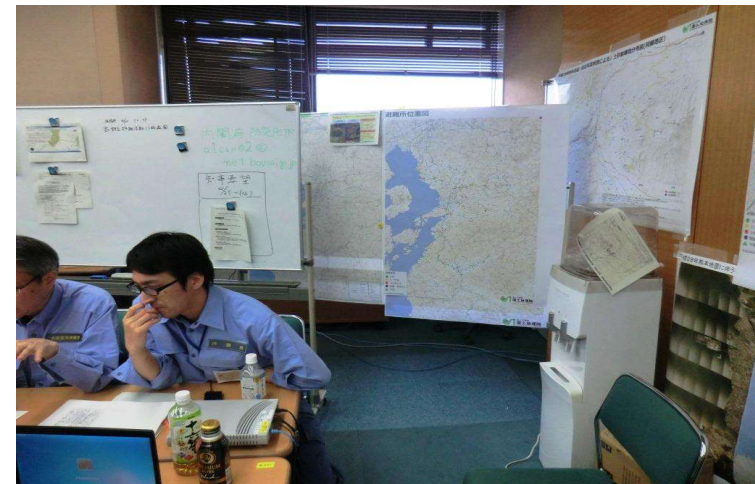


GSI brought a large printer in  
ODMHQ for service  
→ Unique contribution of NGIA

Map provision to  
local governments



Reference wall maps  
at ODMHQ



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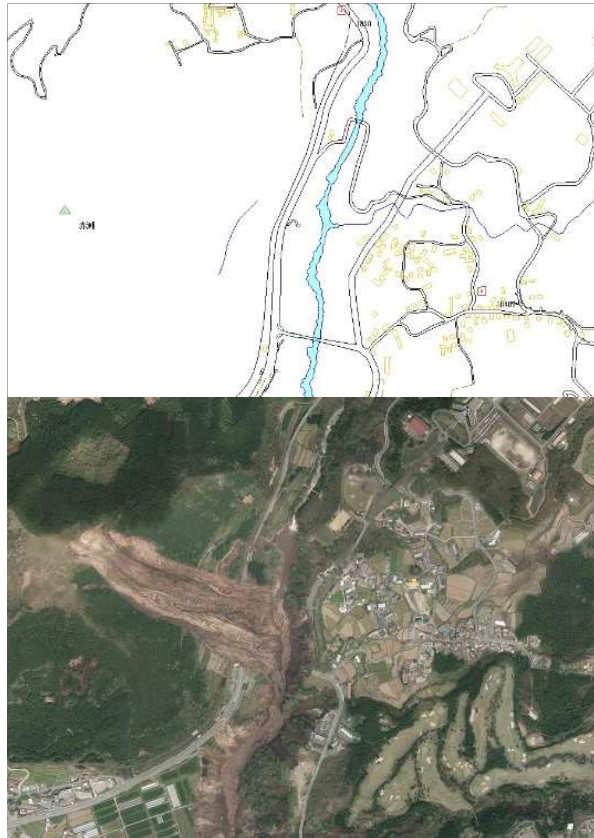
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# Info. provision for rescuing

GSI provided line map data and imagery



Ground Self Defense Force compiled a map-series for the staff for rescuing and searching



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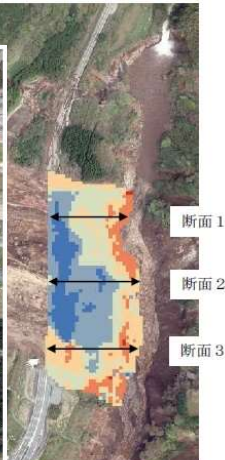
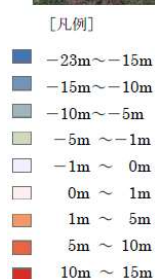
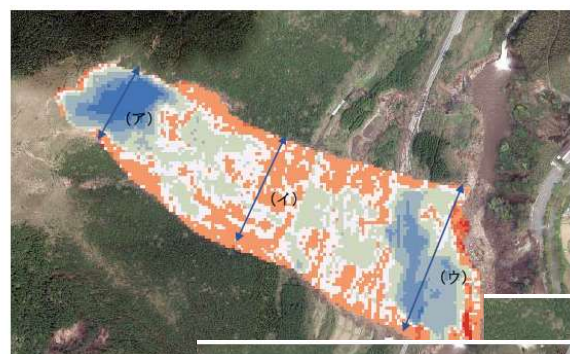
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# Info. provision for searching

GSI estimated the volume of debris of a large landslide

Police used the results for removing debris in search for a missing person



Ref. National Police Agency  
<https://www.npa.go.jp/hakusyo/h28/honbun/html/st600000.html>



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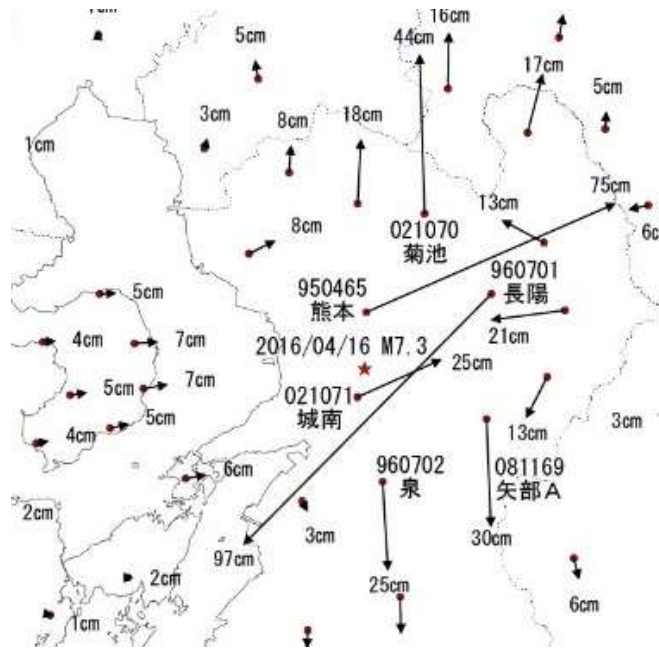
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# Info. provision for analyzing

GSI crustal movement  
results of CORS network



Earthquake Research  
Committee



Meteorological  
Agency



Universities,  
Research  
Institutes



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# Briefing session

An easy-to-understand explanation is crucial for good media coverage



## What's new on GSI Website



熊本地震

阿蘇山、本震で20センチ沈む…中岳火口付近

每日新聞 2016年4月22日 18時15分 (最終更新 4月22日 23時35分)



増価を上げる阿蘇山＝2016年4月16日、本社誌「越後」から梅村直承撮影

[PR]

国土地理院解析

国土地理院は2月2日、熊本地震のマグニチュード(M)7.3の本震で、阿蘇山の中岳火口付近が約20センチ沈んだとの解析結果を発表した。本震を起こした布田川(ふたがわ)断層帯は、阿蘇山西側で途切れているとみられ、地理院の藤原司・総括研究官は「地震が何らかの影響を及ぼしたことは間違いないが、火山活動との関連は分らない」と話している。

宇宙航空研究開発機構（JAXA）の陸域観測技術衛星「だいち2号」の観測データなどを解析したところ、阿蘇山は西側に広がる方向で沈んでおり、火口付近で約20センチ



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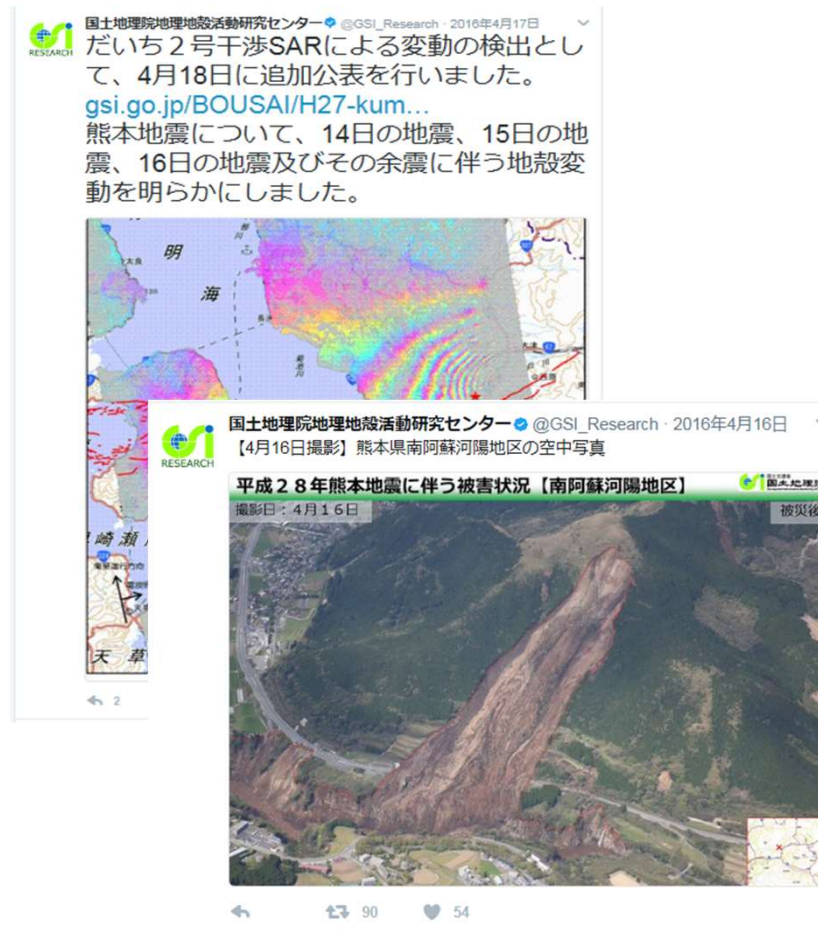
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# Using SNS for reaching the general public

## Youtube



## Twitter



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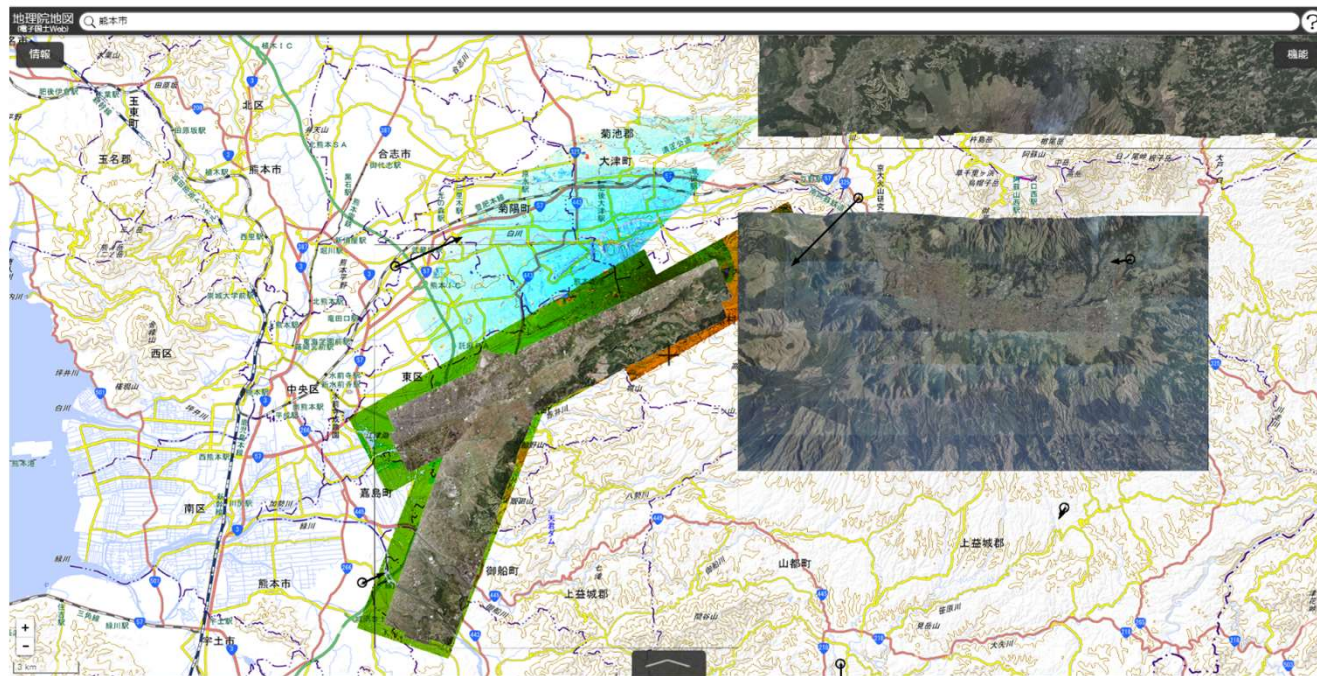
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# All are on “GSI Maps” for all

- The webmap platform can present all kinds of geospatial information, in a multi-layer manner
- The platform can be browsed from professionals to the local people in the stricken areas



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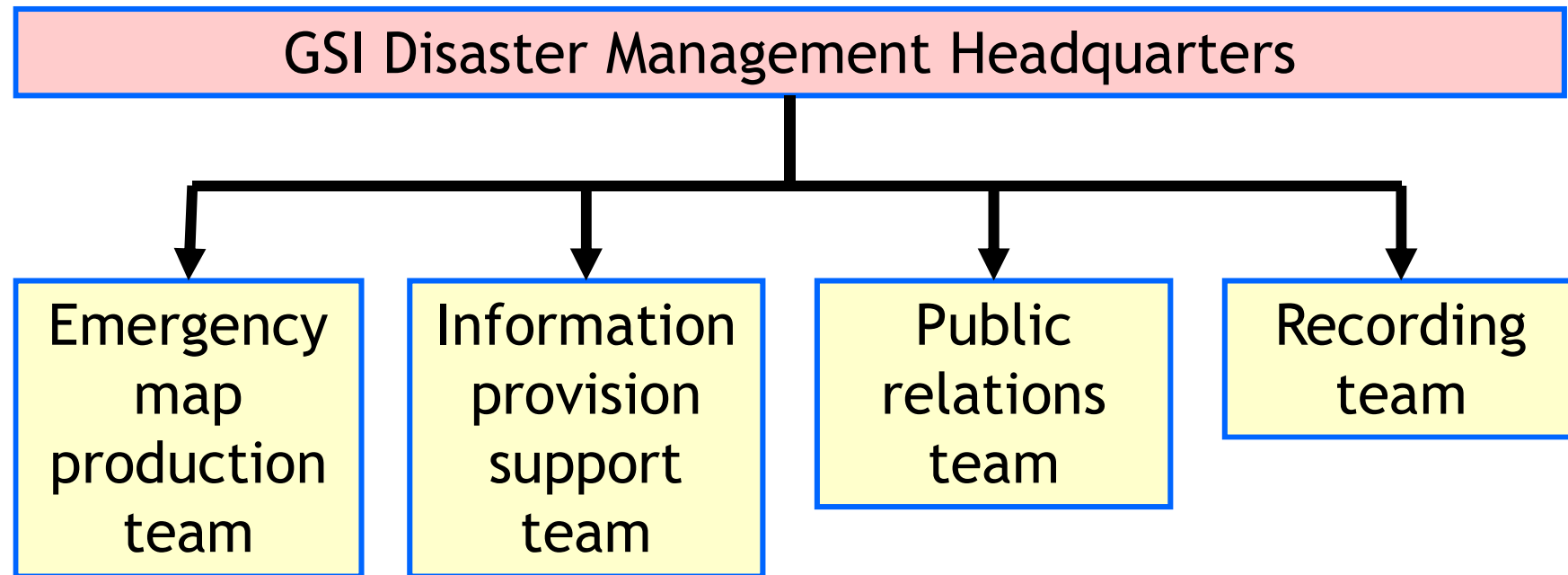
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# Functional teams for info. provision

- GSI DMHQ sets up specific functional teams in case of a large disaster for info. provision and outreach
- The teams conducts cross-cutting tasks



# How GSI responded to emerged geospatial needs in changing situations in Kumamoto

## Two episodes



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# Two rainfalls and numerous aftershocks

- Two rainfalls after the Mainshock
  - 20mm on 17 April
  - 75mm on 21 April
- In addition, many aftershocks occurred in Kumamoto area



# Concerns about further landslides

- Kumamoto area is broadly covered by less-solidified volcanic deposits (ash falls and pyroclastic flows)

## Aso volcano pyroclastic flows

Aso-1	Aso-2	Aso-3	Aso-4
270,000 yrs ago	140,000 yrs ago	120,000 yrs ago	90,000 yrs.ago

**Rainfall and aftershocks may cause further landslides**



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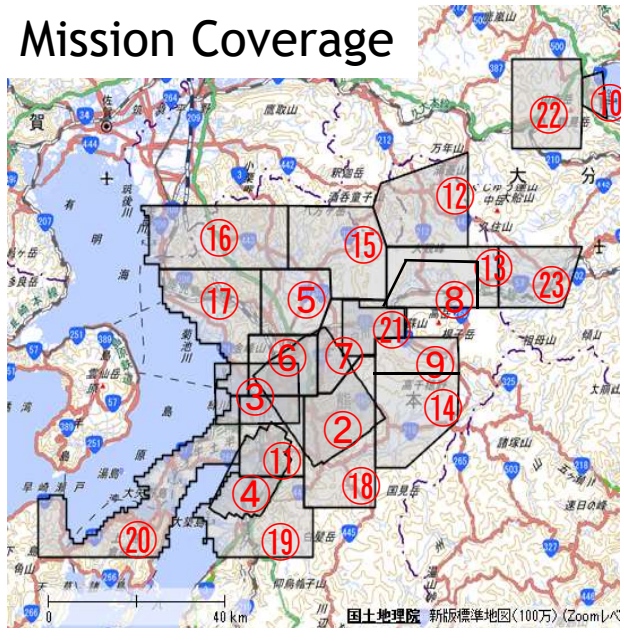
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# Third aerial photo mission

- Expanded mission coverage for detect landslides.
- Both GSI and private companies participated in the mission.
- No large landslides was observed.
- Photos were used for fast disaster victim certificate issuance

Mission Coverage



Special Booth for disaster victim certificate issuance at local government office



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# Situation of evacuating citizens

180,000 peoples stayed in shelters at peak period

Some people had to stay outside overnight or in their cars

- Insufficient goods and harsh environment made people's condition worse
- ODMHQ staff could not grasp the location of shelters, unable to supply goods adequately



# Shelter distribution mapping

- ODMHQ Chief asked GSI to prepare shelter maps on 18 April
- GSI provided first shelter map on 20 April.
- The map greatly helped ODMHQ accessibility to shelters for sufficient support



Legend		
●	Evacuation Center	>100 people
●	Evacuation Center	1-99 people
●	Evacuation Center	no people
●	Evacuation Center	no info
●	Evacuation Center	Closed,etc



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**Emergency disaster response activities were mostly conducted within two weeks after the Mainshock.**

**The time supposed is  
12:00pm, 30 April 2016 (Saturday)  
-Response phase is about to change-**



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