

## SESSION 4: Sharing Knowledge and Good Practices by Regional Experts

# Our Experiences from Japan, Asia and International community



International Disaster Charter

**Shiro Ochi**  
**GIC@AIT, JAXA**

- Framework
  - Sentinel Asia
  - Japanese Case
  - EU/ESA Copernics
- Data
  - GSMAP
  - Himawari
  - JAXA's Satellite Data
  - Other Satellite Data

# Sentinel Asia

## Data Provider Node

CRISP

KARI

GISTDA

NARLabs

ISRO

VAST

JAXA



Annual meeting of  
Joint Project Team

## Disaster Management Organizations

**ADRC**

Member Countries

Natinal/Local  
Gov. Instititue

UN/International  
organizaions

**APRSAF**  
**Sentinel Asia**

## Data Analysis Node

International

GIC/AIT

IWMI, ICIMOD, etc.

S.D., DMC(Sri Lanka)

Gov./Univ.

LAPAN, etc.(Indonesia)

Tokyo Univ., etc.







# APRSAF and Sentinel Asia

ASIA-PACIFIC REGIONAL SPACE AGENCY FORUM


日本語 | English


 **APRSAF**  
ASIA-PACIFIC REGIONAL  
SPACE AGENCY FORUM

 **24TH APRSAF**  
ASIA-PACIFIC REGIONAL  
SPACE AGENCY FORUM  
2017


**APRSAF-24  
in Bengaluru, India**  
November 14 - 17, 2017



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APRSAF News Mail

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Indian Ocean EQ and Tsunami in 2004

Space Applications

Space Technology

Space Environment Utilization

Space Education



# UN International Strategy for Disaster Reduction (UNISDR)

## Sendai Framework for Disaster Risk Reduction 2015 – 2030.

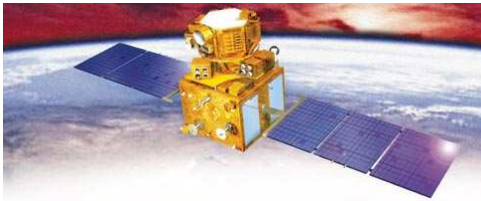
### Action Item for Global and Regional Levels(Article-25)

- (a) To strengthen **disaster risk modelling**, **assessment**, **mapping**, **monitoring** and **multi-hazard early warning systems**.
- (b) To promote and enhance, through international cooperation, **access to** and **use of non-sensitive data and information**, as appropriate, communications and **geospatial and space-based technologies**;

# Data Provider Node (DPN)

## ISRO

RESOURCESAT-2, OCEANSAT-2/OCM  
IMS-1, CARTOSAT-1&2, RISAT-1



## JAXA

ALOS-2



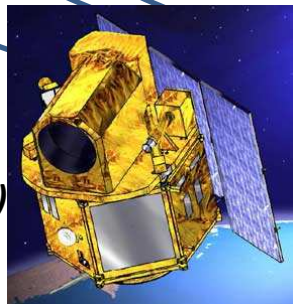
## NARLabs

## Sentinel Asia Collaboration

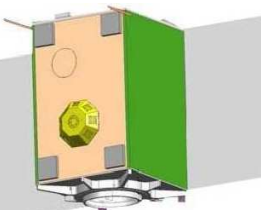
GISTDA



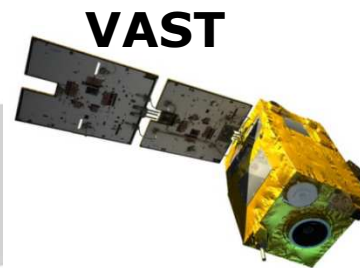
FORMOSAT  
(08/2016 decommissioned)



THEOS



CRISP  
XSAT



VNREDSat

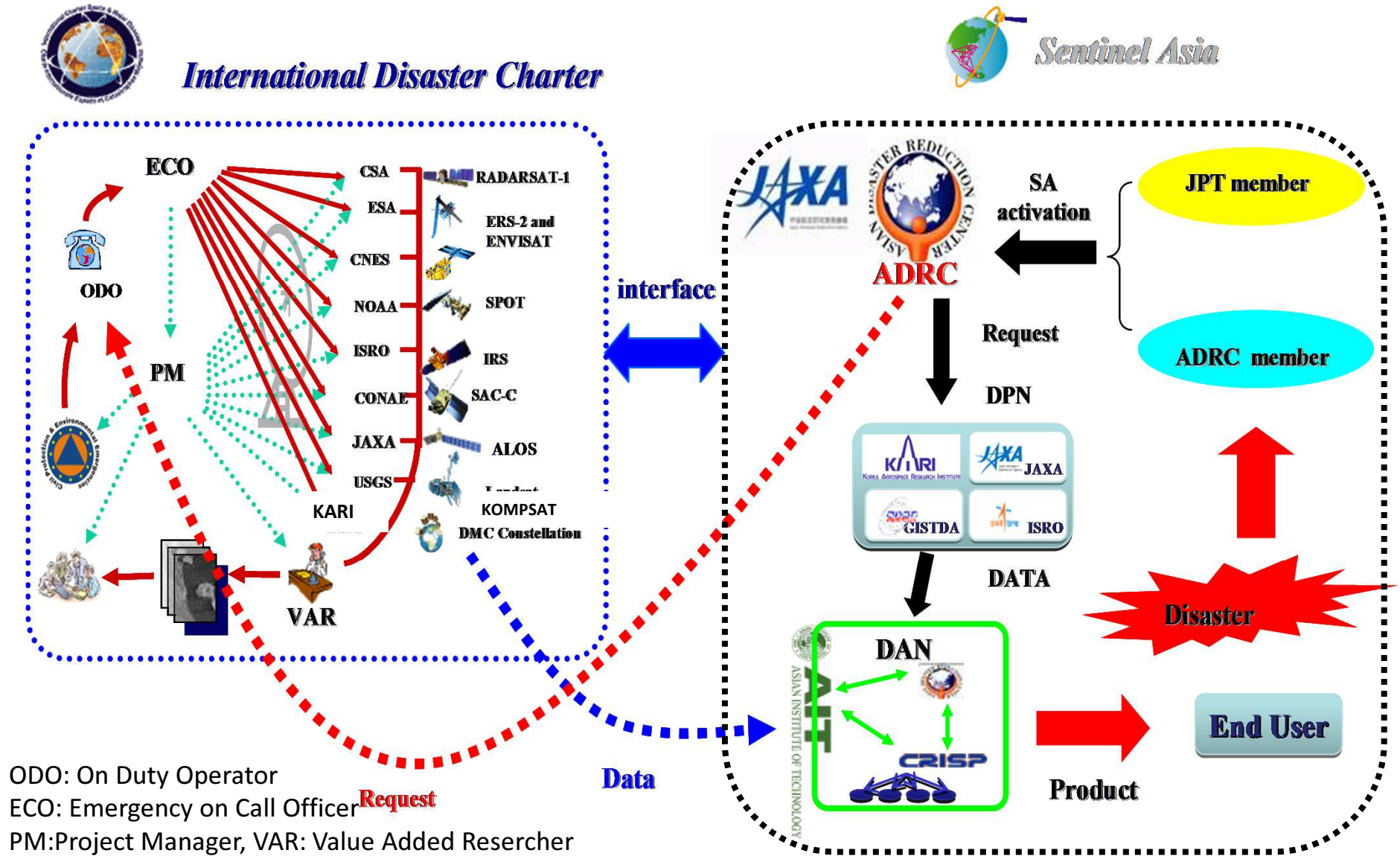


KIBO HDTV-EF

KARI  
KOMPSAT



# Activation Flow for SA and Charter



ODO: On Duty Operator

ECO: Emergency on Call Officer

PM: Project Manager, VAR: Value Added Resercher



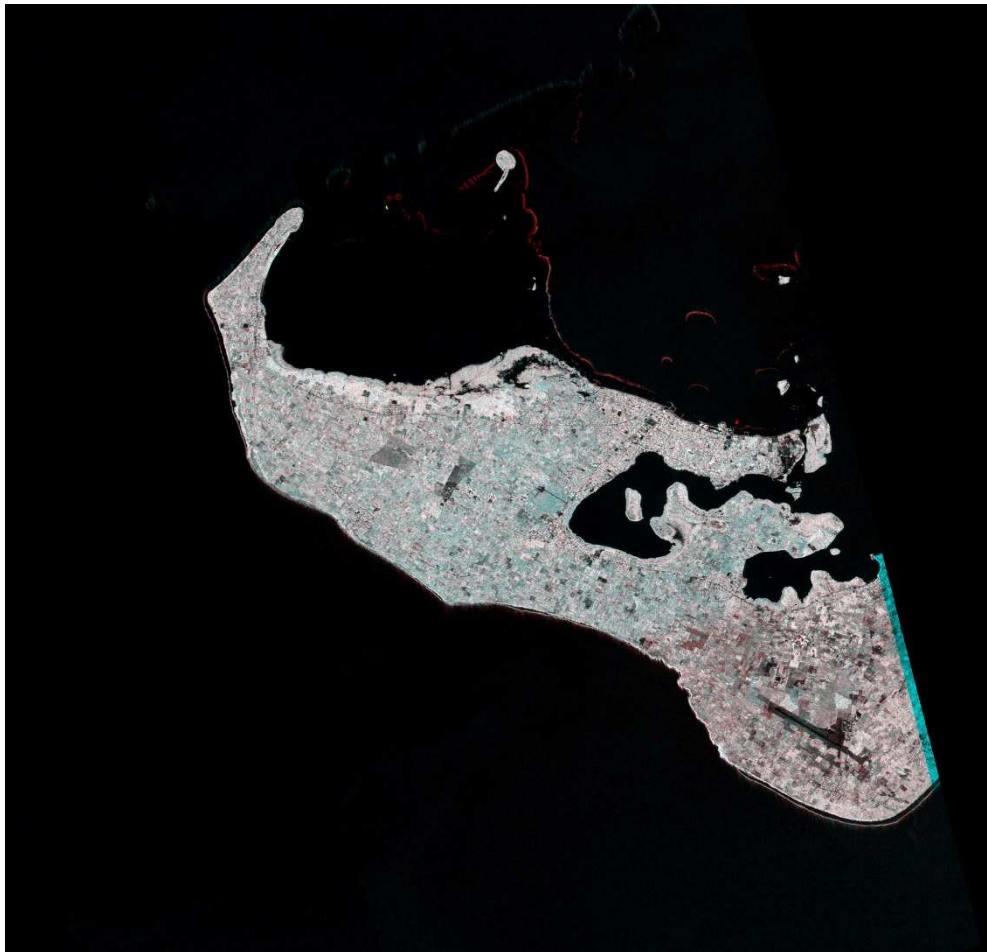
# Sentinel Asia Recent Activations

Emergency Obs. ID	Occurrence Date	Country	Disaster Type	Product	WEB-GIS	Detail	Disaster Inf.	Status
ERSPCA000001	12/Feb/2018	Tonga	Tropical cyclone			<a href="#">link</a>	<a href="#">ADRC</a>	Active
ERKRDM000002	10/Feb/2018	Korea	Earthquake			<a href="#">link</a>	<a href="#">ADRC</a>	Active
ERNARL000021	07/Feb/2018	Taiwan	Earthquake			<a href="#">link</a>	<a href="#">ADRC</a>	Active
ERPGND000001	05/Jan/2018	Papua New Gu	Volcano eruption			<a href="#">link</a>	<a href="#">ADRC</a>	Active
ERPHVS000020	15/Jan/2018	Philippines	Volcano eruption			<a href="#">link</a>	<a href="#">ADRC</a>	Active
ERVNMR000003	25/Dec/2017	Vietnam	Flood			<a href="#">link</a>	<a href="#">ADRC</a>	Active
ERINSR000044	02/Dec/2017	India	Others			<a href="#">link</a>	<a href="#">ADRC</a>	Active
ERIDL000042	21/Nov/2017	Indonesia	Volcano eruption			<a href="#">link</a>	<a href="#">ADRC</a>	Active
ERVNMN000047	19/Nov/2017	Vietnam	Flood			<a href="#">link</a>	<a href="#">ADRC</a>	Active
ERKRDM000001	15/Nov/2017	Korea	Earthquake			<a href="#">link</a>	<a href="#">ADRC</a>	Active

# Tropical Cyclone Gita, Tonga

## 12 February, 2018(activation)

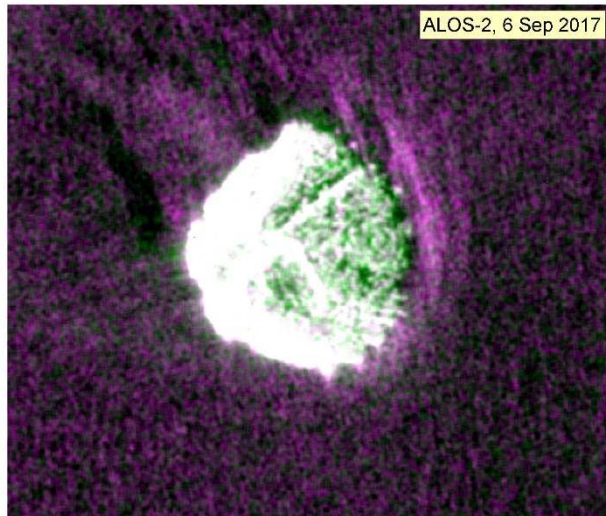
### Taken on 14/Feb/2018 at 12:09(UTC)



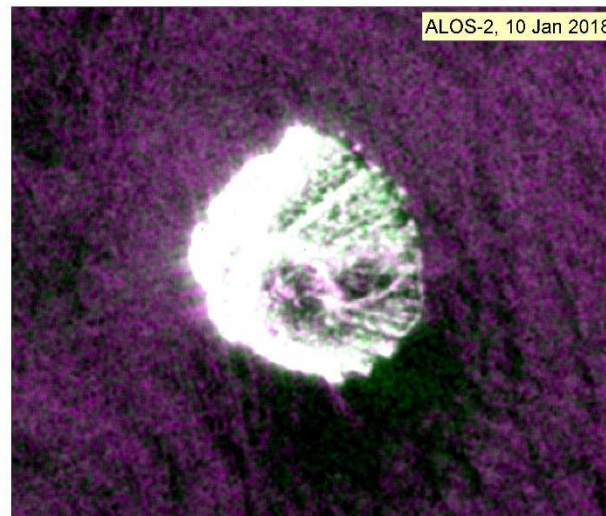
State of Emergency was declared by the Prime Minister of Tonga effective 12 Feb. until 12 March 2018. This is in response to the threat posed by Tropical Cyclone Gita to Tonga.



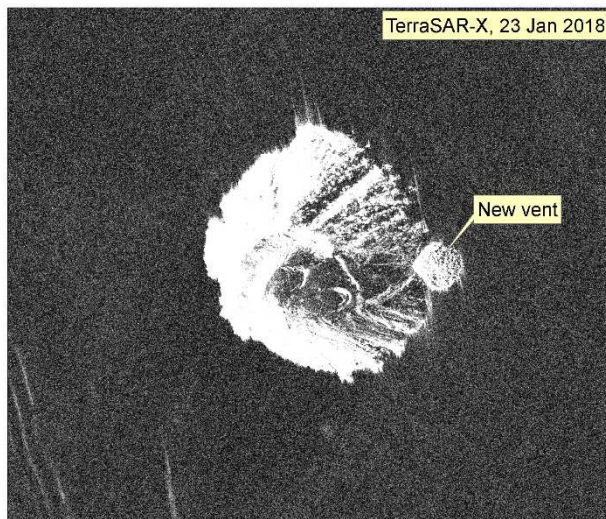
## Kadovar Island Volcanic Eruption, Papua New Guinea



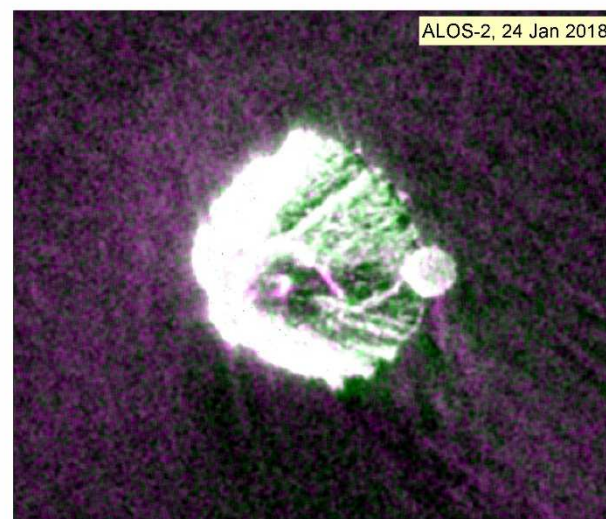
ALOS-2, 6 Sep 2017



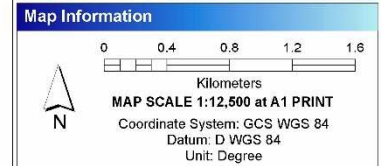
ALOS-2, 10 Jan 2018



TerraSAR-X, 23 Jan 2018



ALOS-2, 24 Jan 2018



### Data Sources

#### Satellite images:

Pre-eruption : ALOS-2, 6 September 2017  
Post-eruption : ALOS-2, 10 and 24 January 2018  
TerraSAR-X, 23 January 2018  
Copyright : © JAXA (2017/2018) -  
TerraSAR-X/TanDEM-X © DLR e.V. 2018,  
Distribution Airbus DS Geo GmbH - All rights reserved.

Service Layer Credits: Sources: Esri, HERE, DeLorme,  
Intermap, increment P Corp., GEBCO, USGS, FAO,

### Description

A dormant volcano in Kadovar Island, Papua New Guinea (PNG) was began to erupt on 5 January 2018. The eruption made the government of PNG had to evacuate around 2000 people to the main island. Based on several time-series images provided by the International Charter "Space and Major Disasters", a new vent possibly appeared in the eastern part of the island. As of 26 January, the Rabaul Volcanology Observatory has indicated that the situation on Kadovar remained dynamic but has settled into a reasonable stable situation with continued steady emission of ash, gas and lava.

Map product made by Geoinformatics Center -  
Asian Institute of Technology, Thailand

*Disclaimer: The accuracy of this product is not validated.*

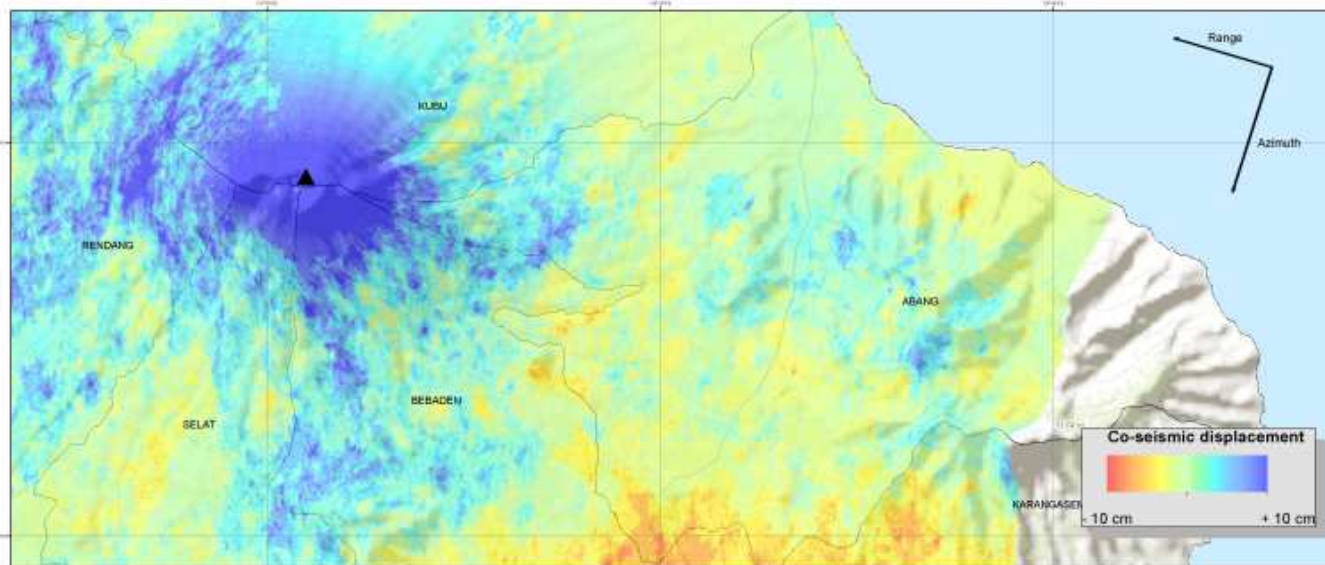
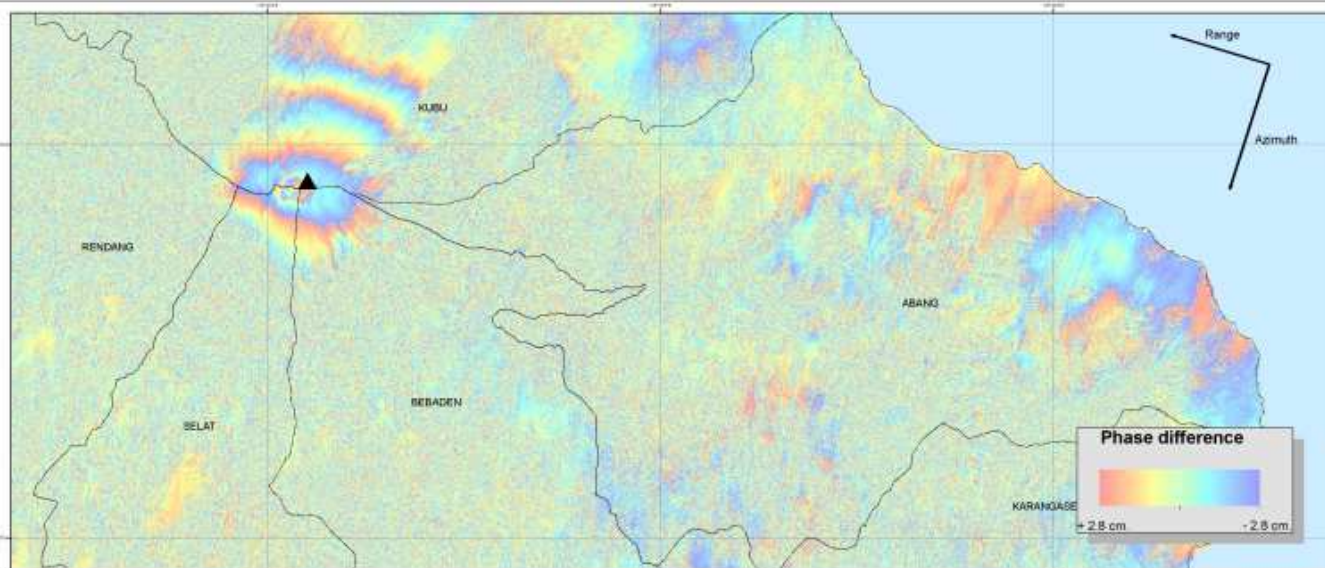
#### Data provider:



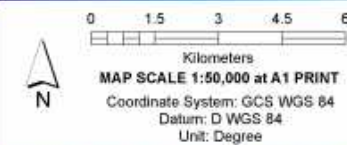
On Friday 5 January 2018, one of the volcanic erupted and forced for the evacuation of 691 inhabitants from the island. Livelihood of many people were affected. The displaced people are now relocated to an island 13 km away from the volcano. The Government of Papua New Guinea is now planning for permanent resettlement of the displaced people with other people from the nearby islands.



# Interferogram and Co-seismic Displacement in Mt. Agung, Indonesia



## Map Information



## Legend

- ▲ Mt. Agung
- District Boundary

## Data Sources

Satellite image:  
Pre-disaster: Sentinel-1 (Desc.), 27 October 2017  
Post-disaster: Sentinel-1 (Desc.), 20 November 2017  
Copyright: © ESA (2017) - All rights reserved.

GIS data:  
Administrative boundary © BIG, 2017

Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA

## Description

The map was derived from InSAR analysis using Sentinel-1 IW. The interferogram detects co-seismic displacement centered in Mt. Agung. The (+) sign means an increase of height toward the satellite (uplift) and (-) sign means a decrease (subsidence).

Map product made by GIC-AIT (v1.0).

Disclaimer: The accuracy of this product is not validated.

Data provider:





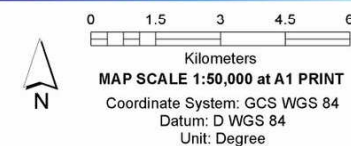
# Coherence Change Detection of Pre- and Post-Eruption of Mt. Agung, Indonesia



Geonformatics Center - AIT



## Map Information



## Legend

- ▲ Mt. Agung
- District Boundary

## Coherence value



## Data Sources

Satellite image:  
Pre-eruption: Sentinel-1 (Desc.),  
5 and 17 November 2017  
Post-eruption : Sentinel-1 (Desc.),  
17 and 29 November 2017  
Copyright : © ESA (2017) - All rights reserved.

GIS data:  
Administrative boundary © BIG, 2017  
Service Layer Credits: Sources: Esri, HERE, DeLorme,  
Intermap, increment P Corp., GEBCO, USGS, FAO,

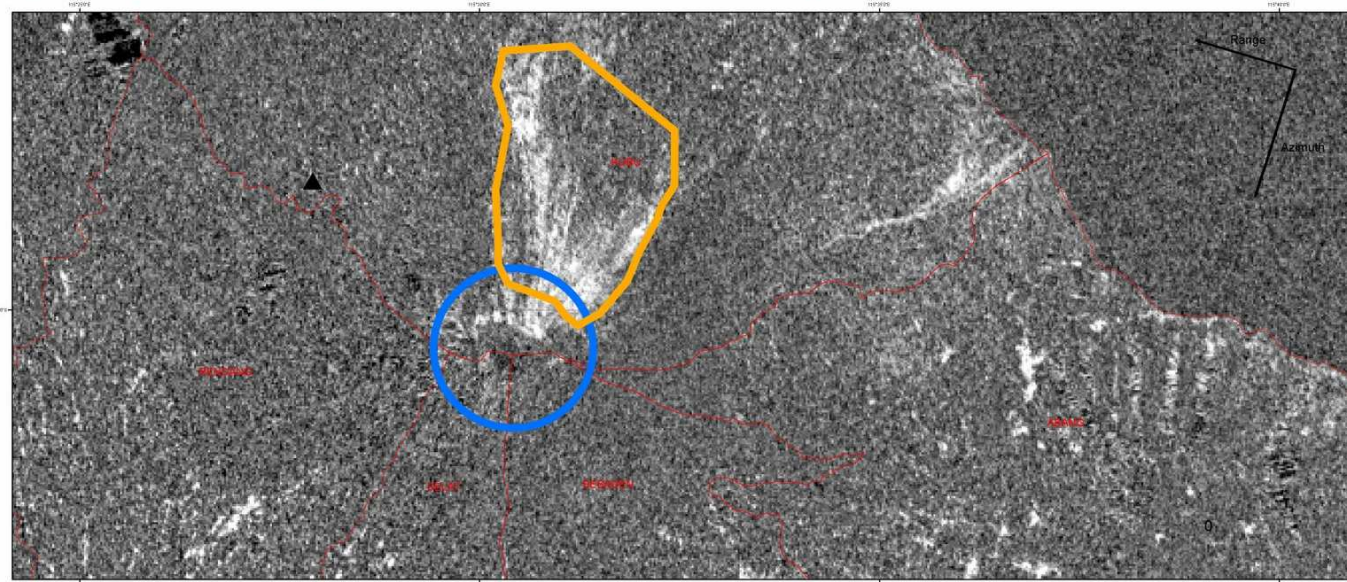
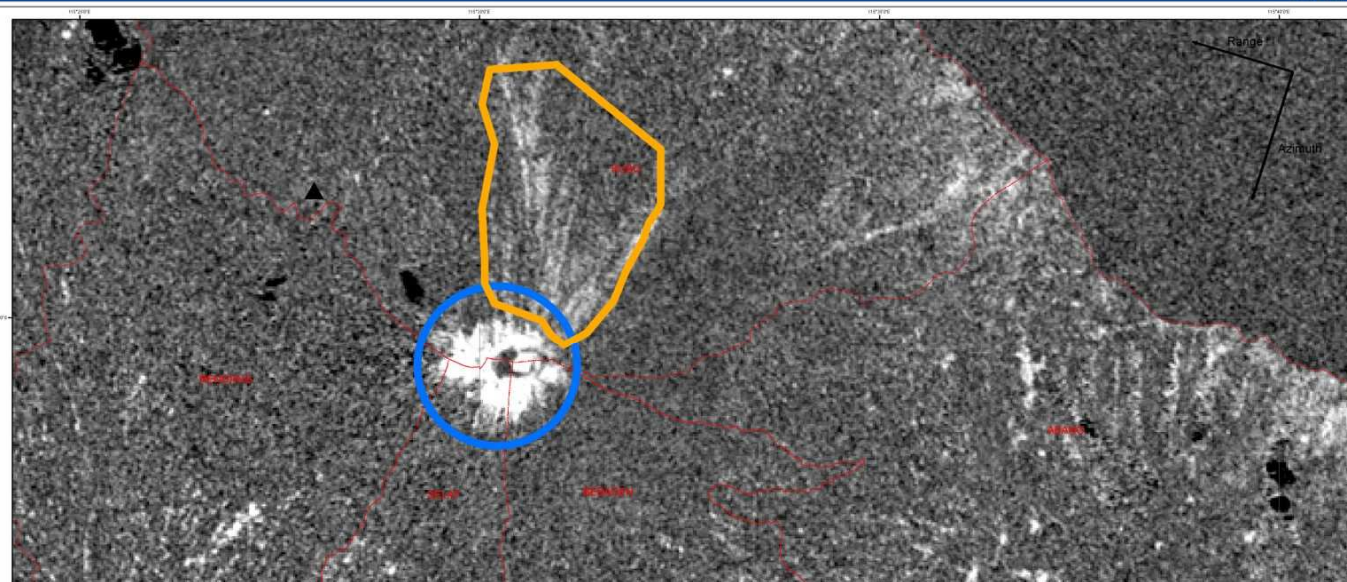
## Description

There are areas with significant changes of coherence, (1) surrounding the crater, (2) NNE part of the crater. In surrounding the crater, the coherence value is decreased due to volcanic ash or lava deposit. In NNE part, scarce vegetation in the area became more open, which increased the coherence value.

Map product made by GIC-AIT (v1.0).

Disclaimer: The accuracy of this product is not validated.

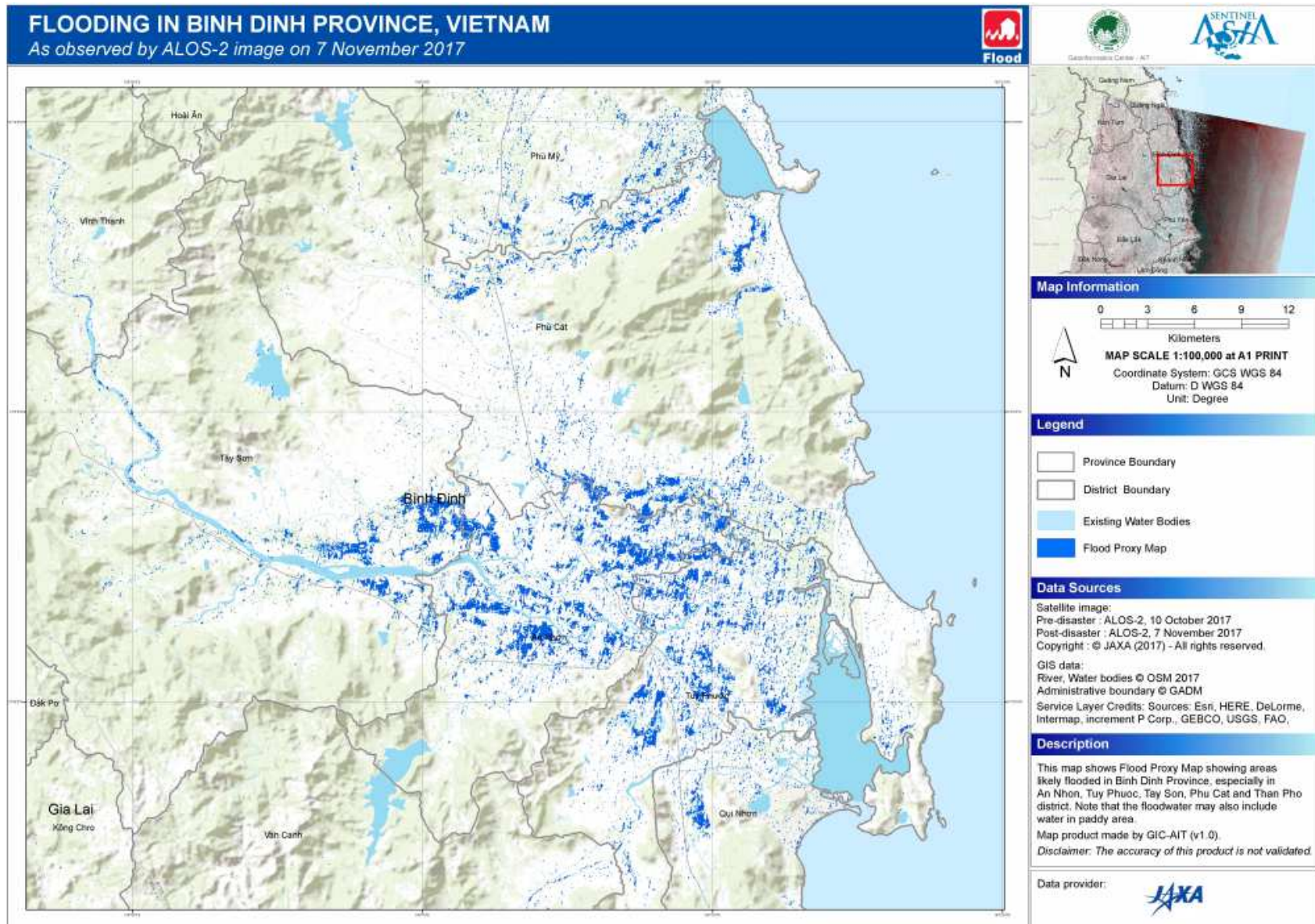
Data provider:





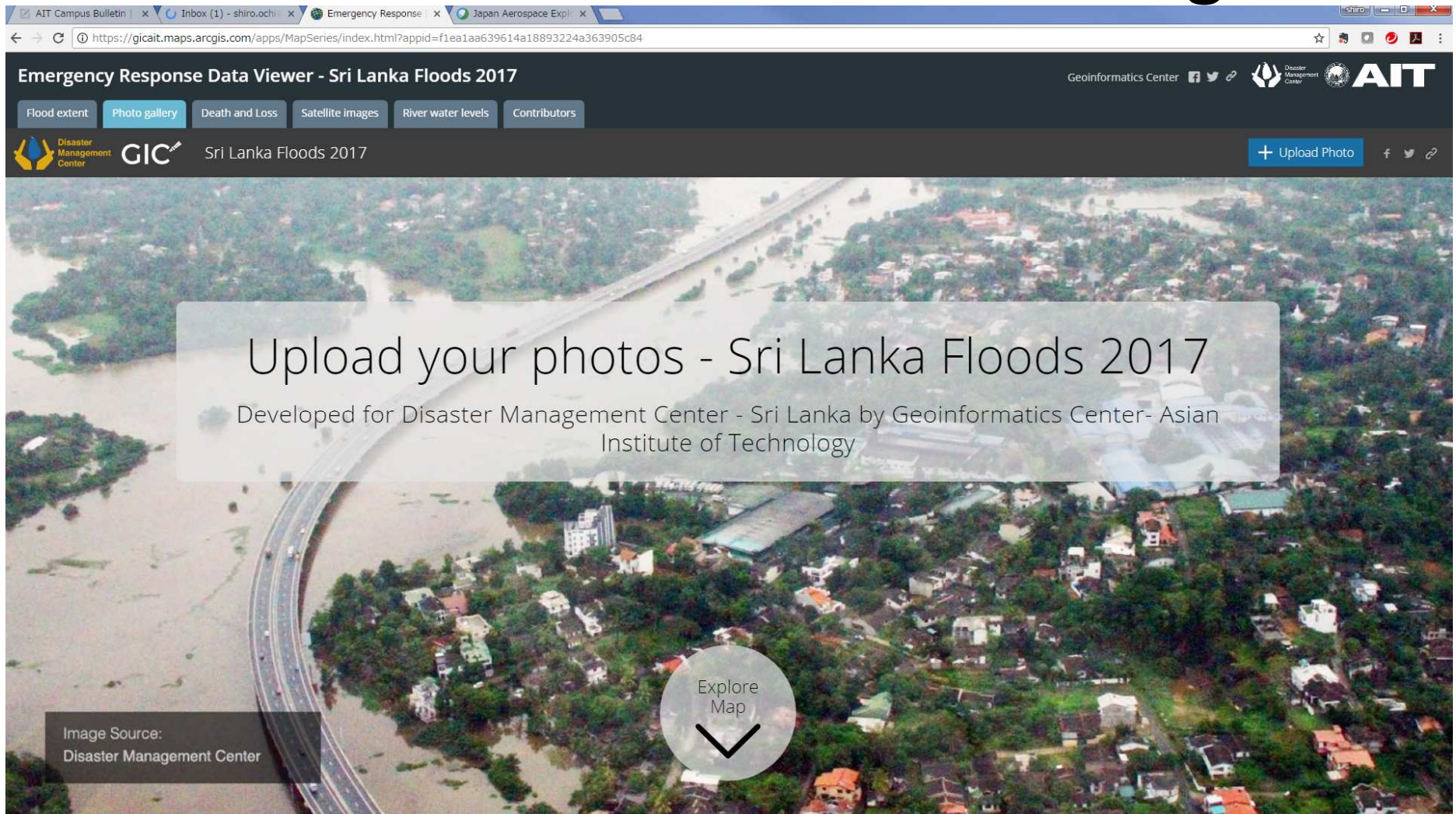
# Value Added Product(VAP)

## Flood on Nov.04, 2017 in Binh Dinh Prov., Vietnam



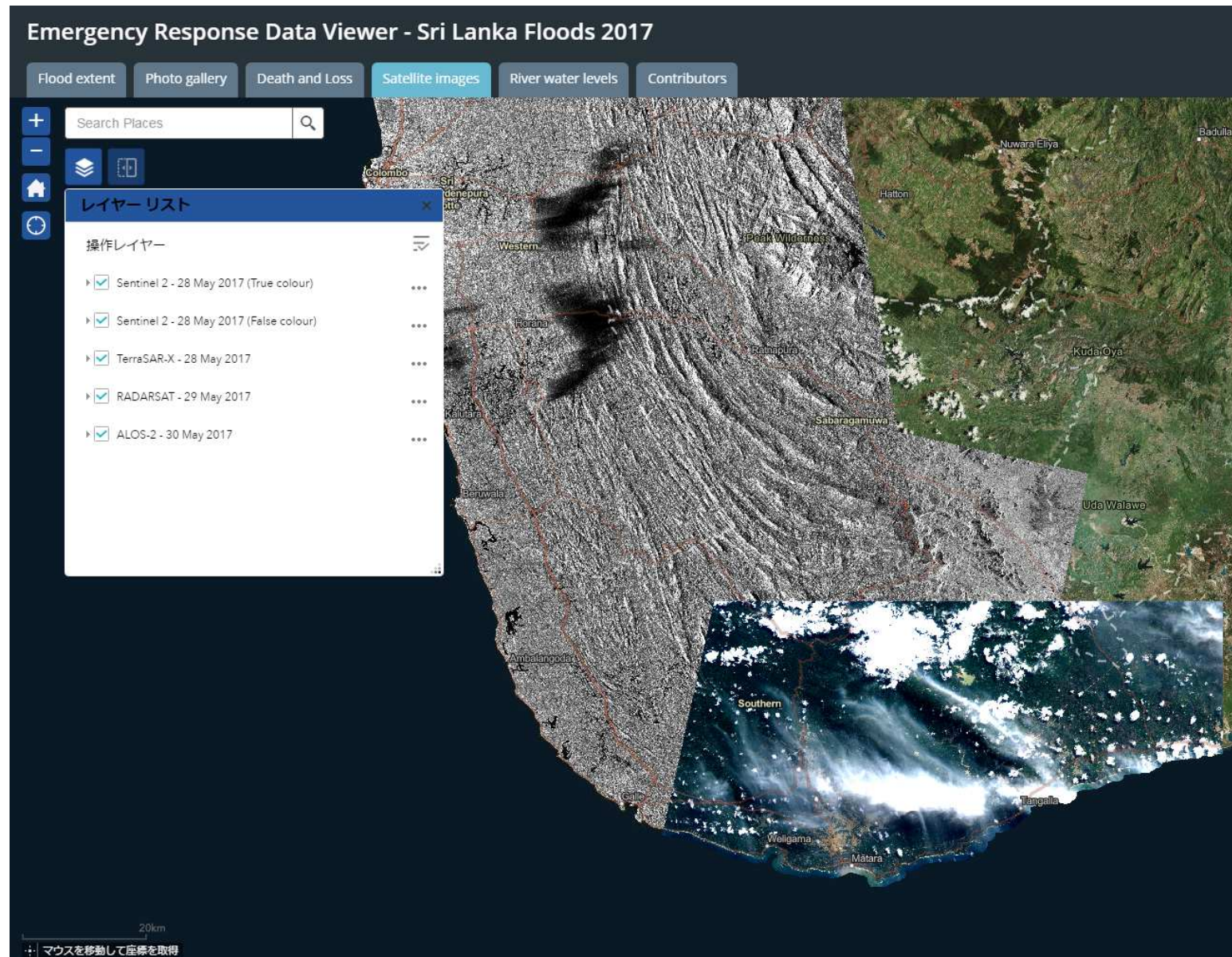


# Development of Platform for data and information sharing



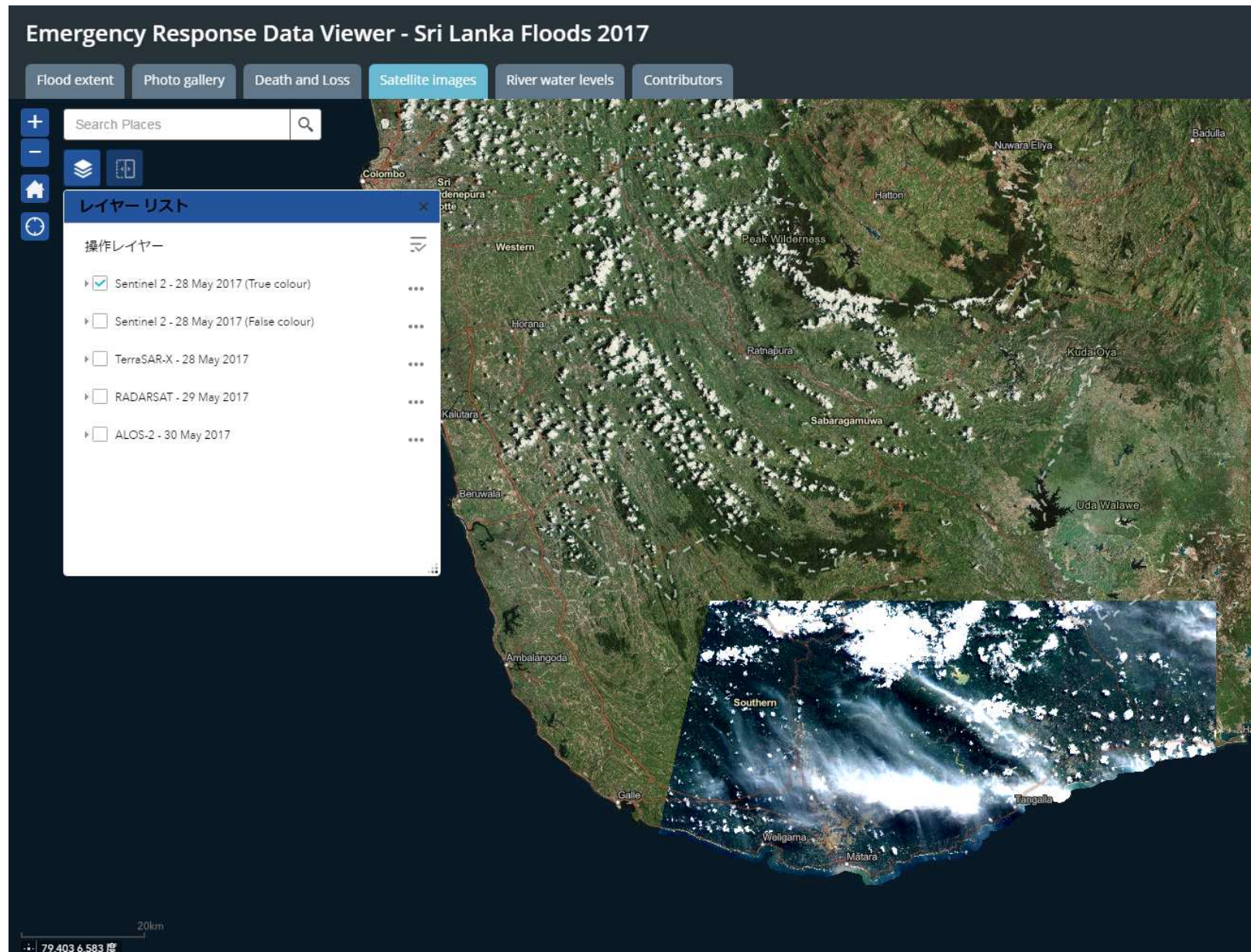


# Satellite Data View



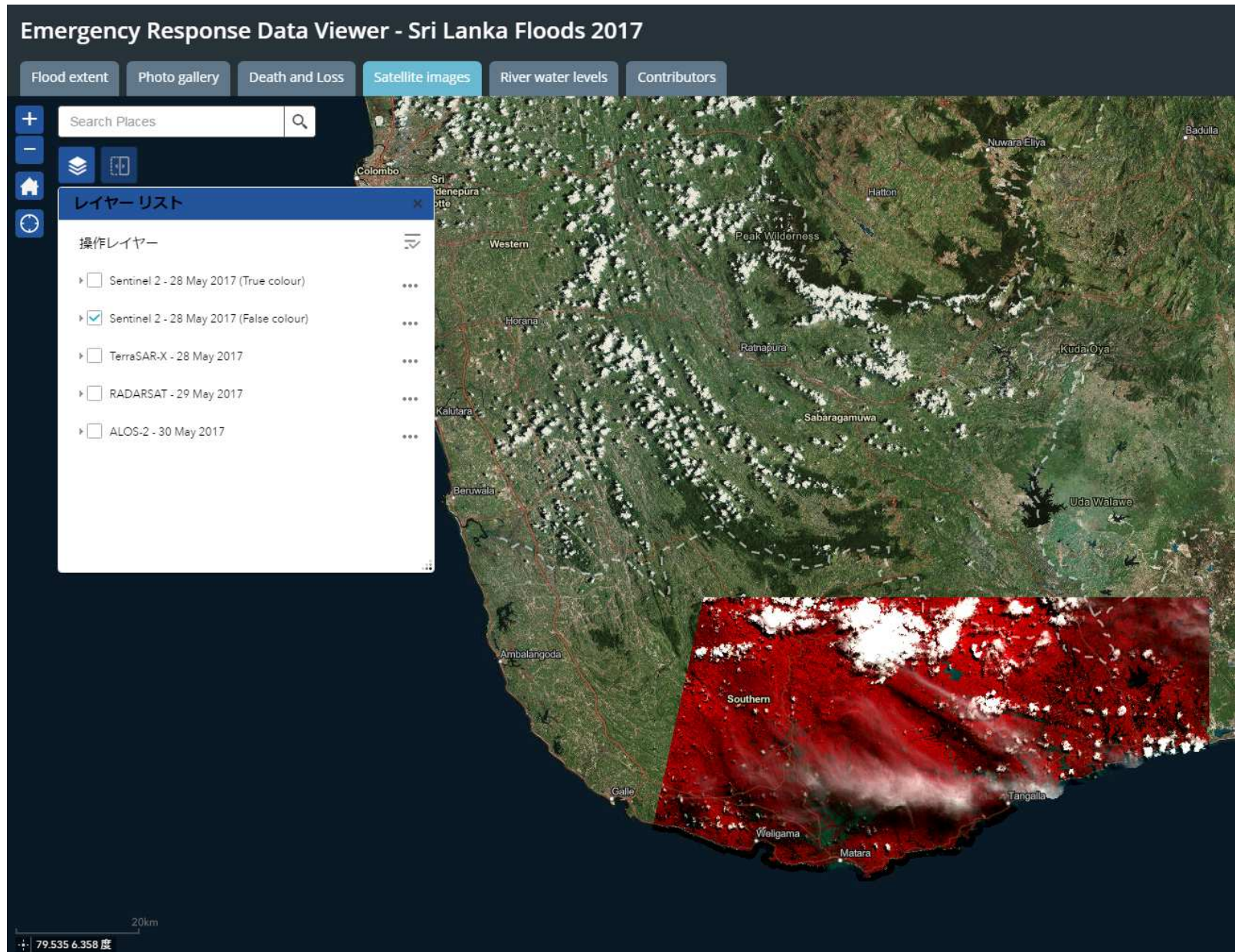


# Sentinel-2(OPT, ESA, free)



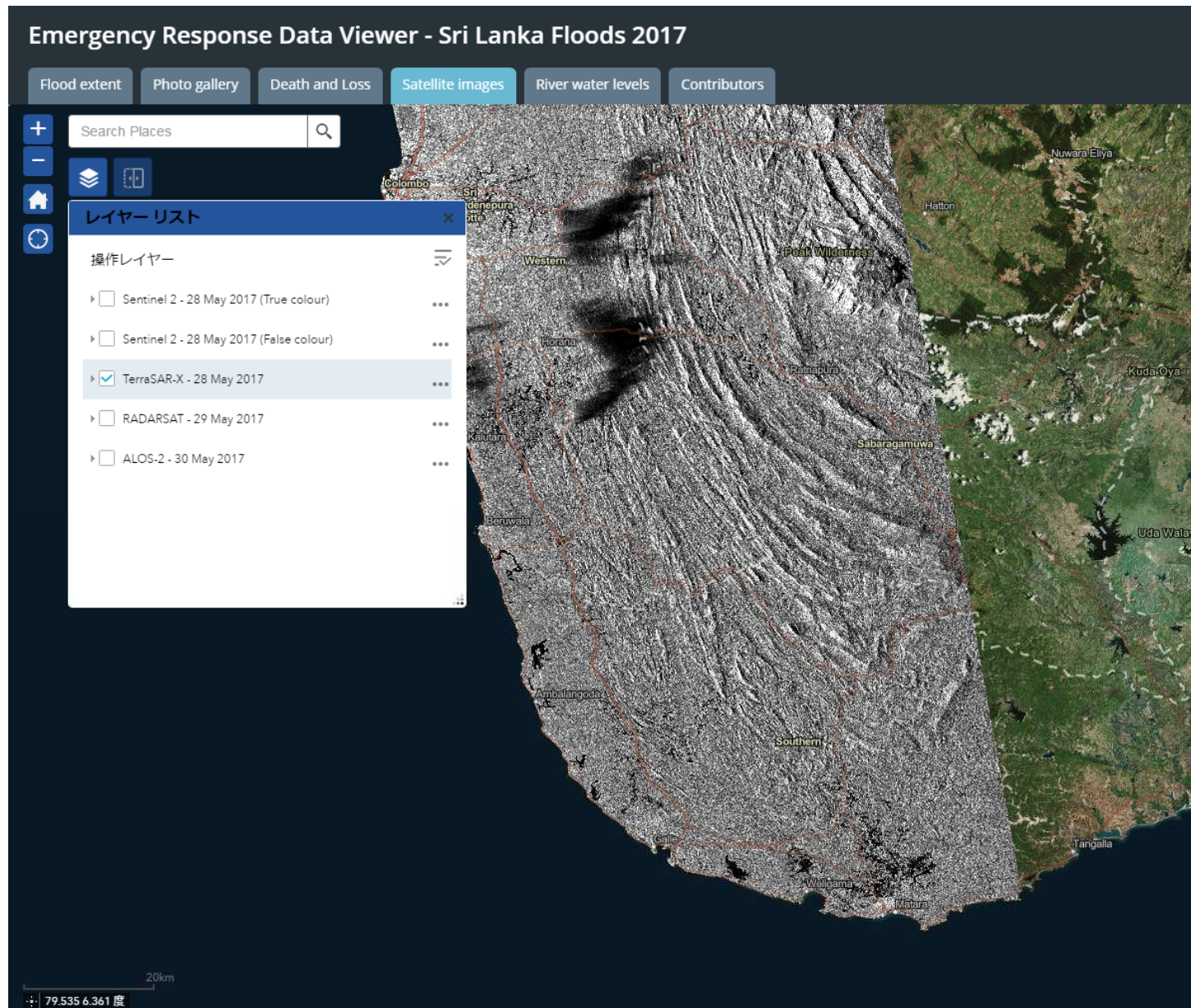


# Sentinel-2 Data(OPT, ESA, free)



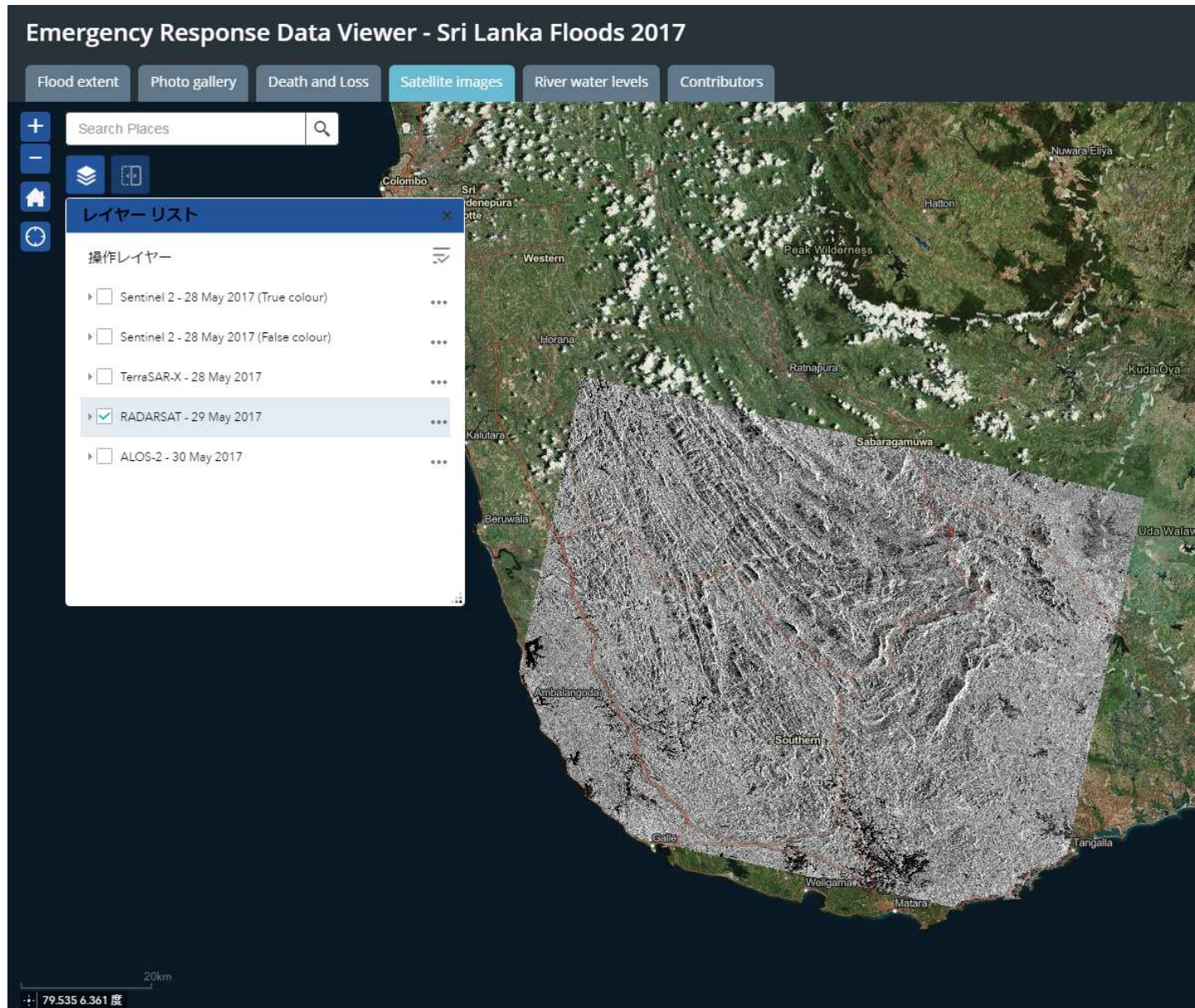


# TerraSAR-X(SAR, DLR) via Charter



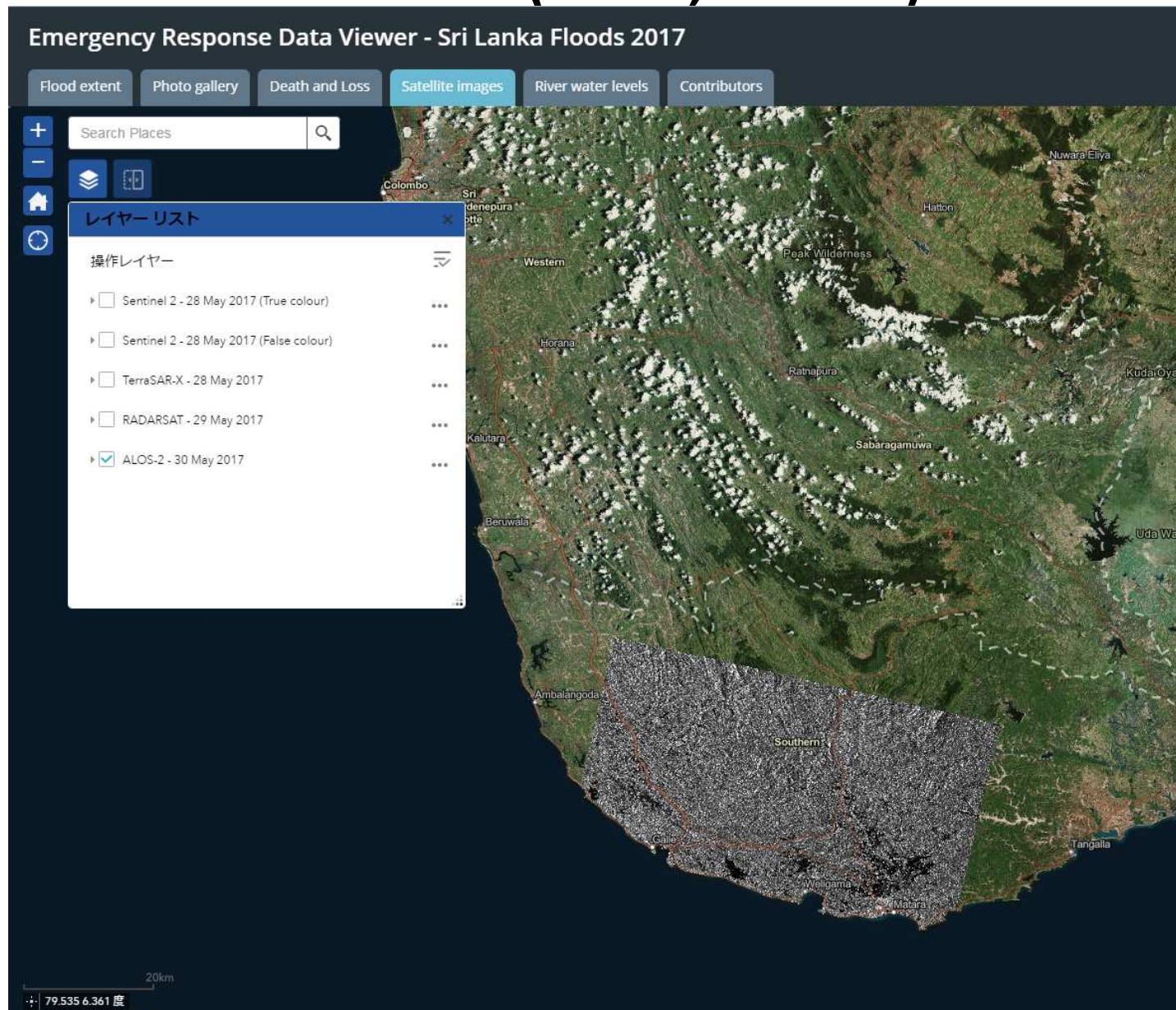


# RADARSAT(SAR, CSA) via Charter



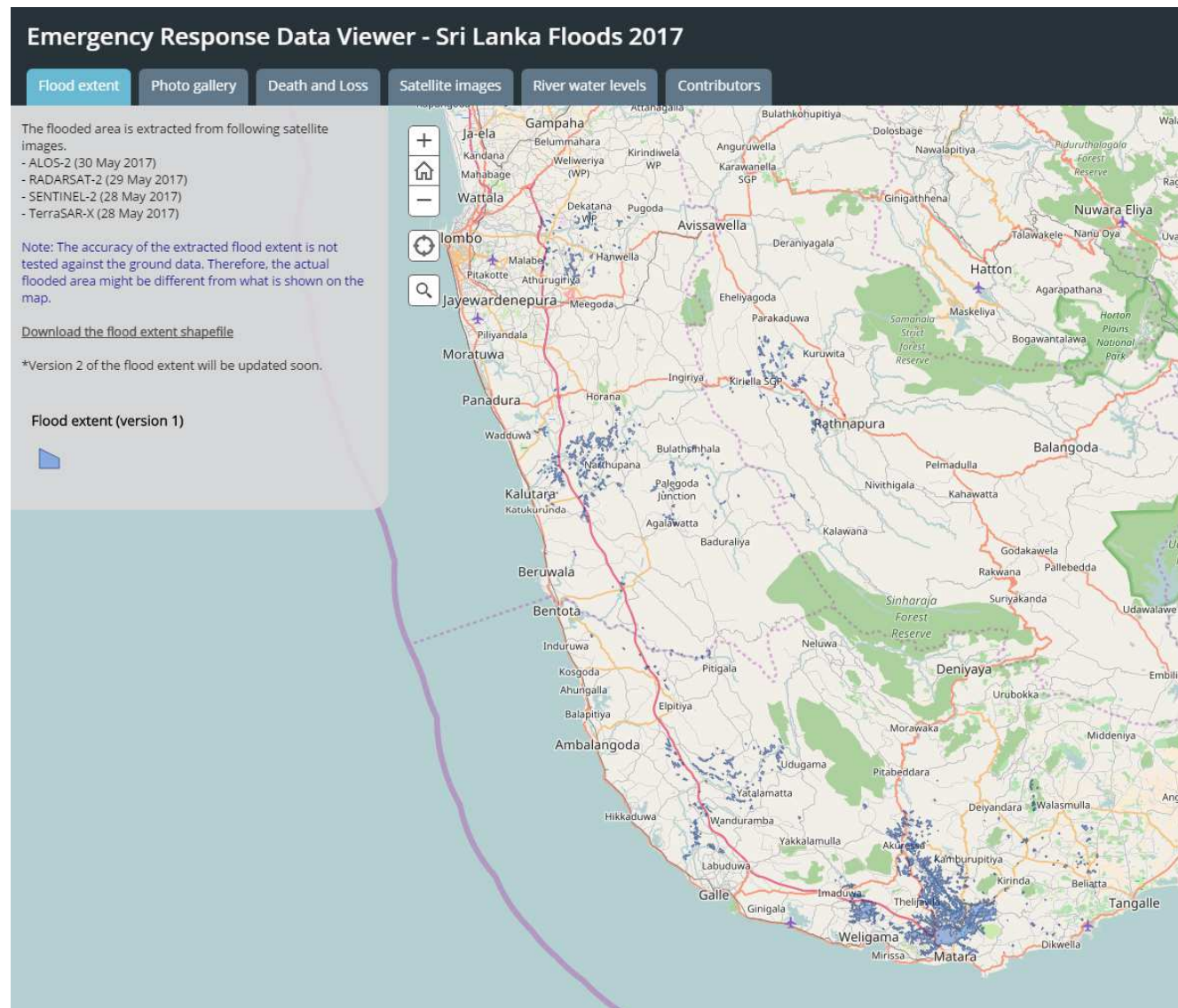


# ALOS-2(SAR, JAXA)

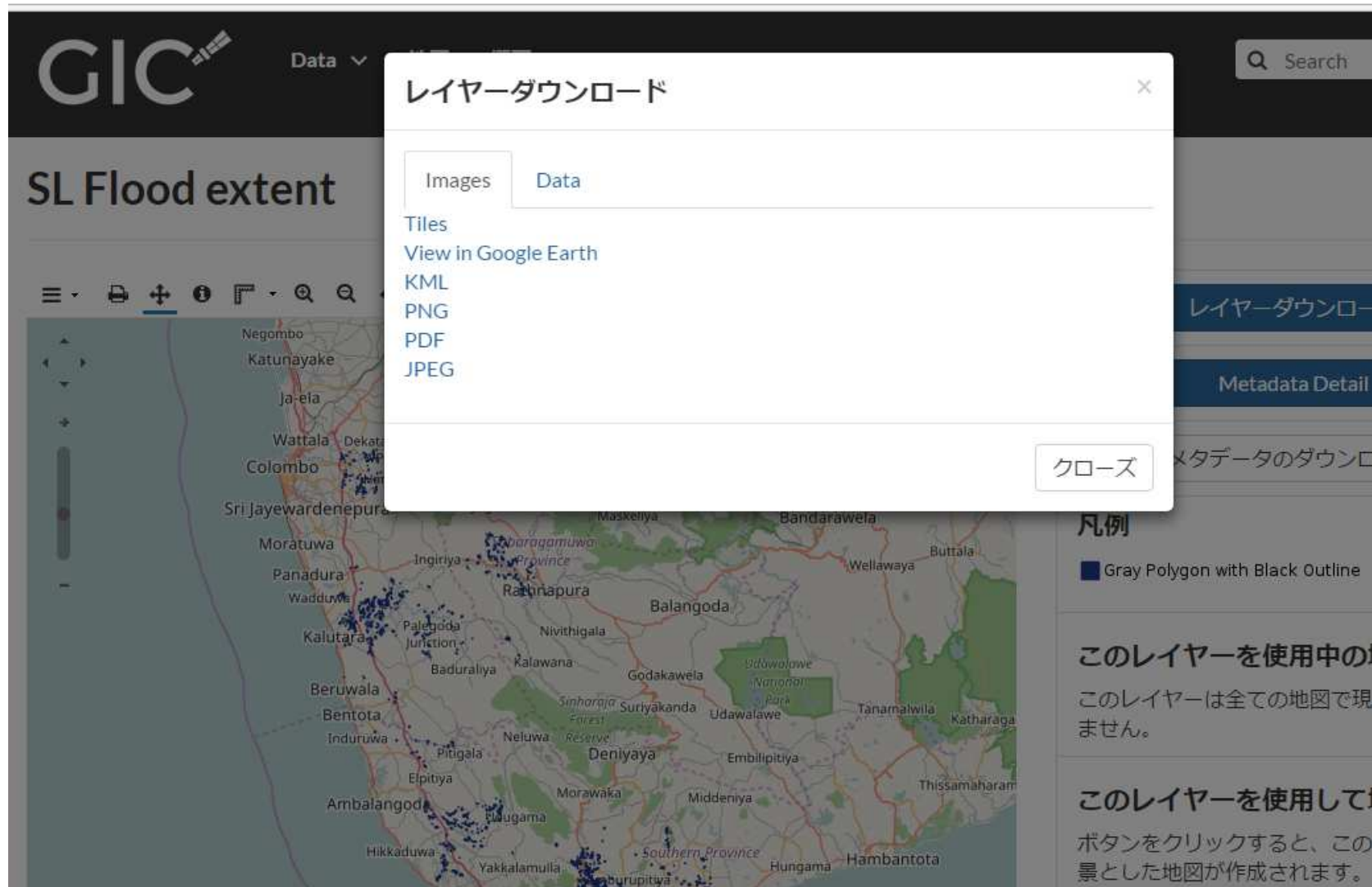




# Maps available on ARC GIS Online System

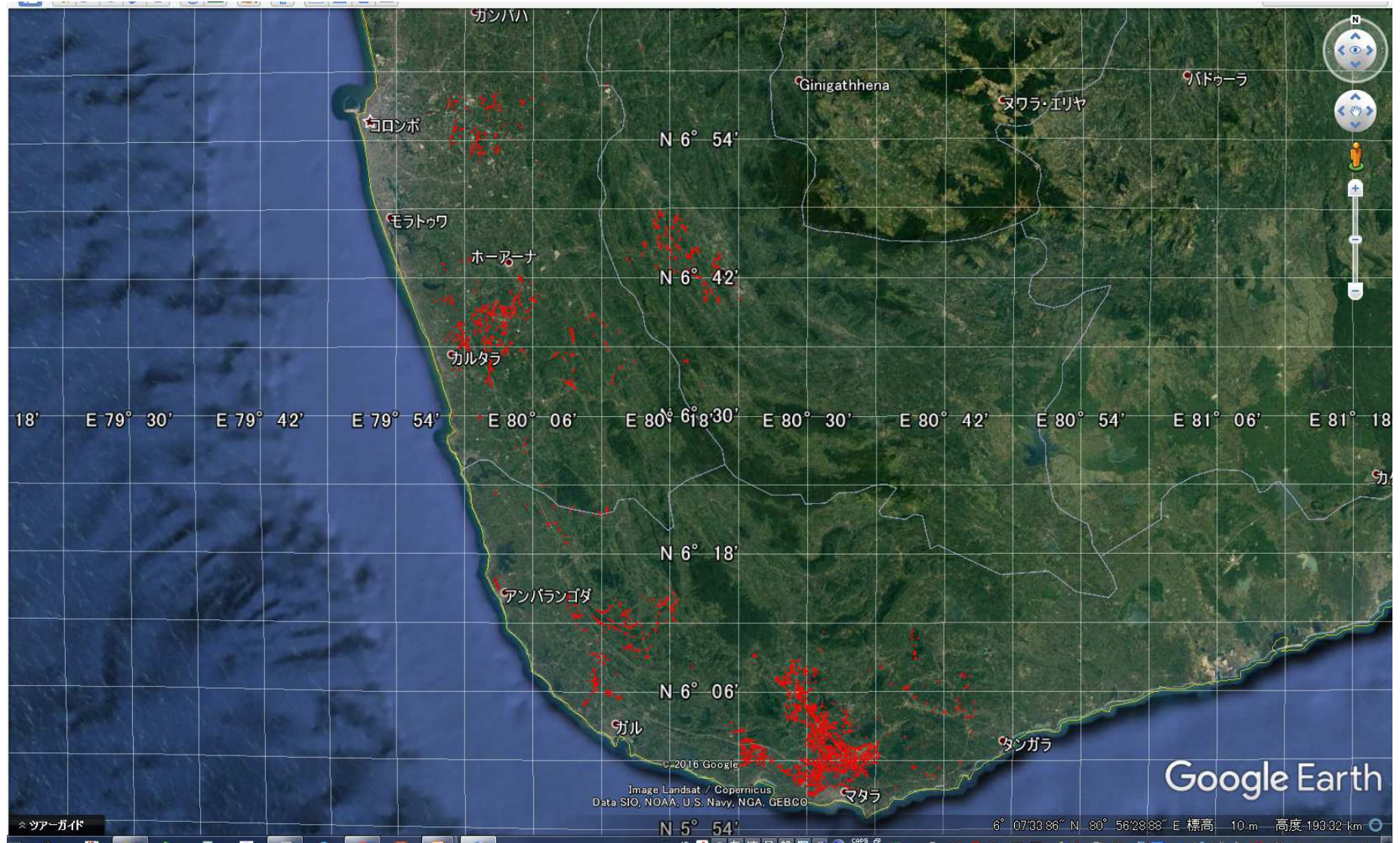


# VAP available with KML, PNG, PDF, JPG format



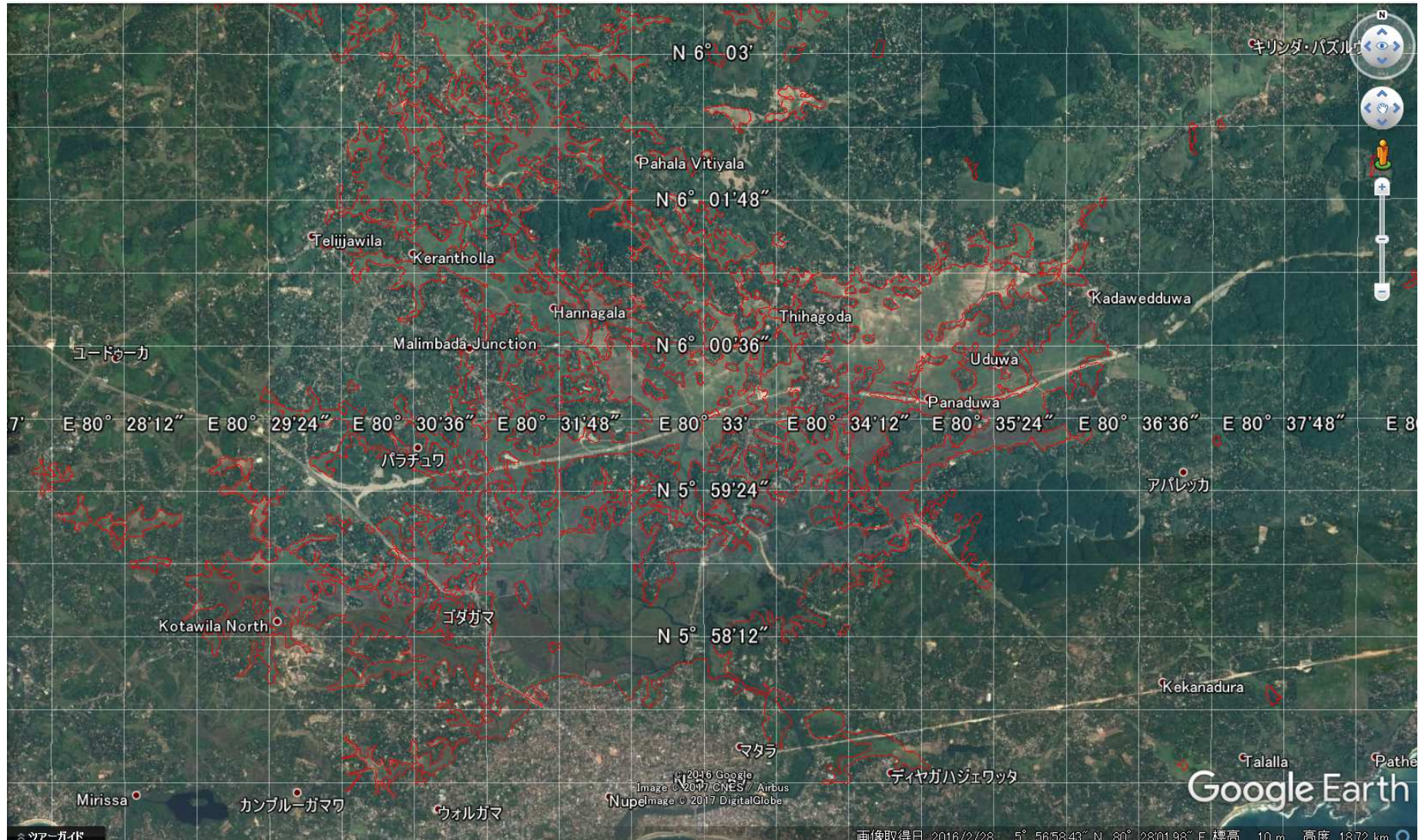


# Flood map on Google Earth by KML data



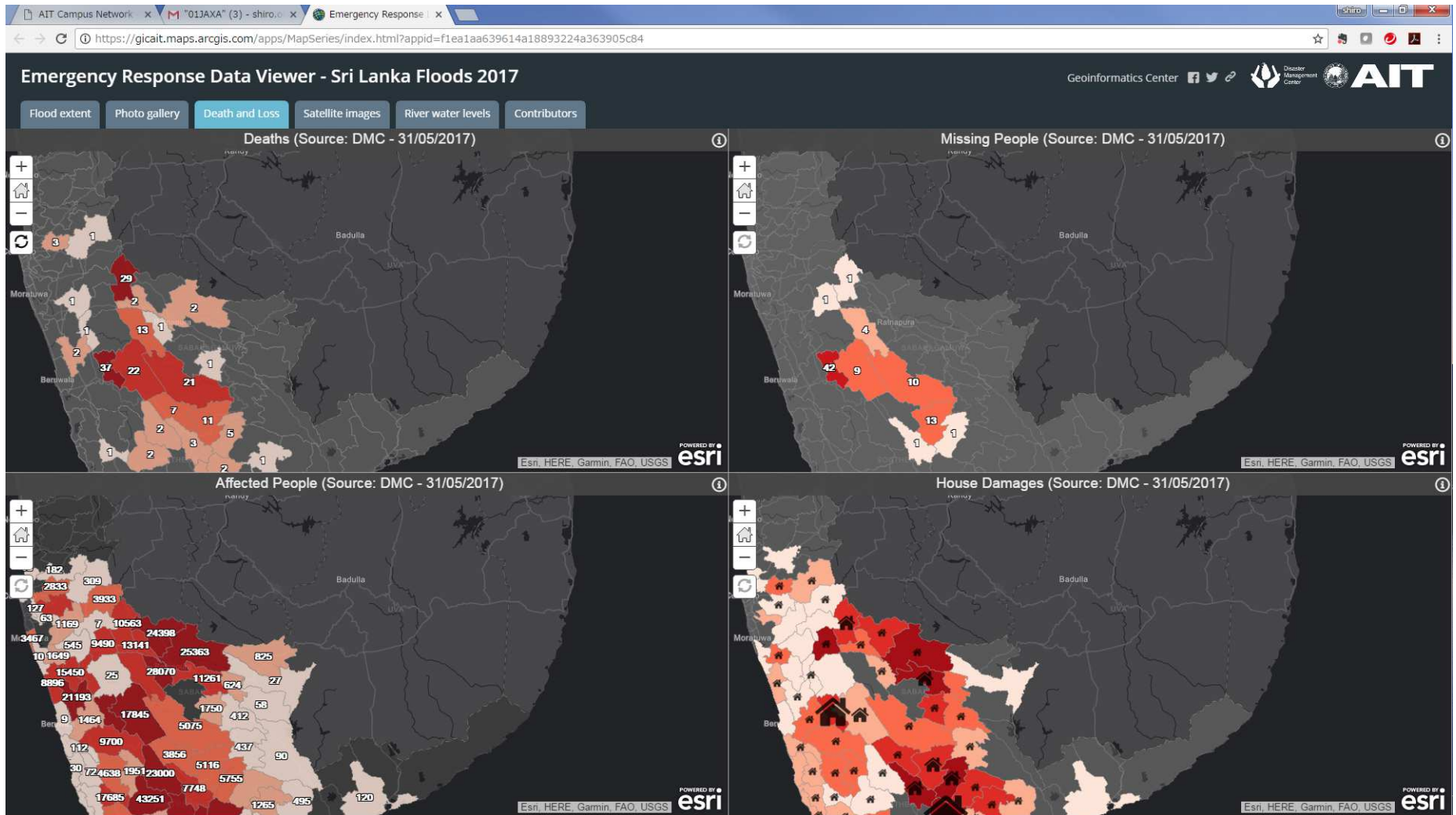


# VAP on Google Earth

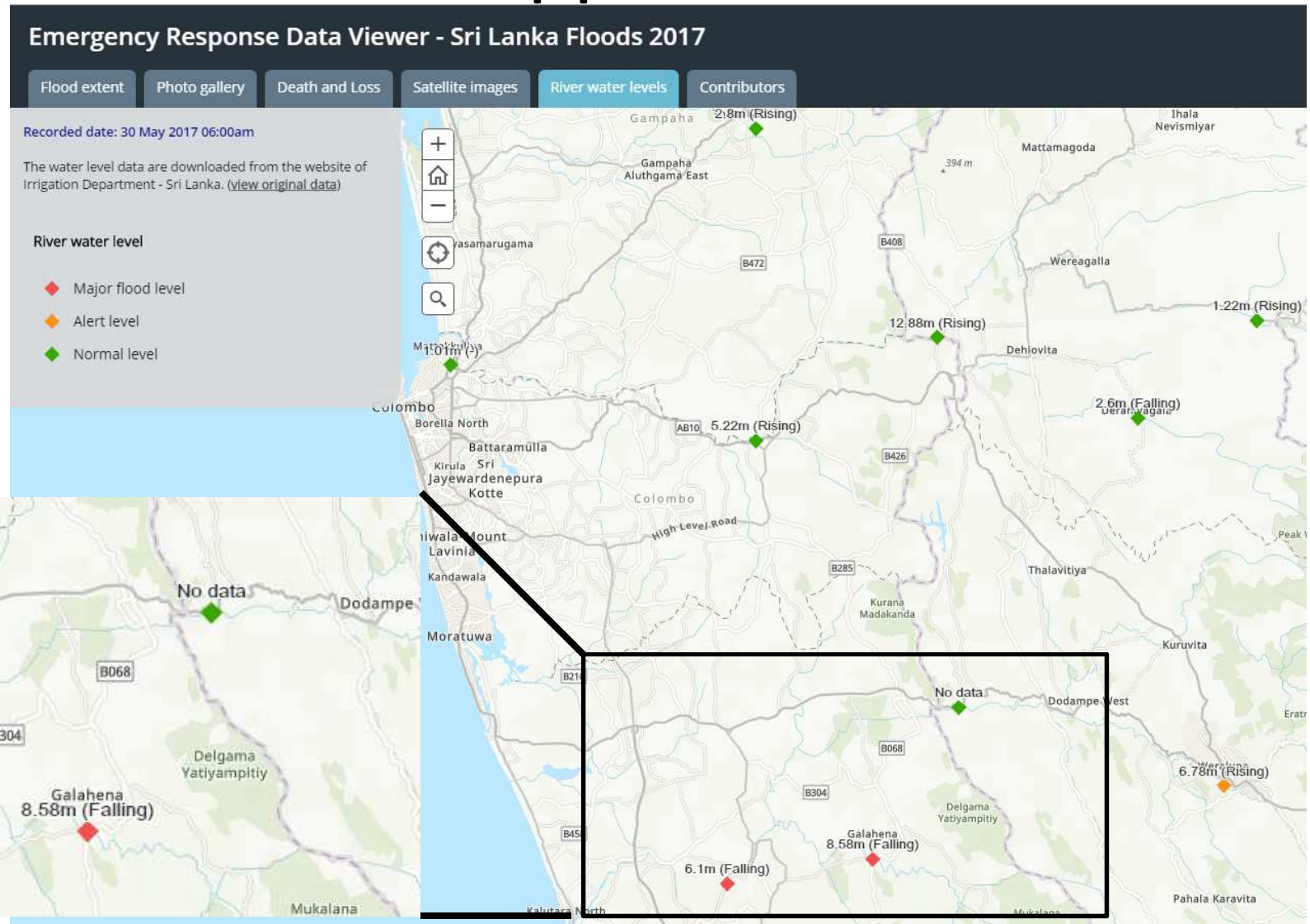




# Disaster Statistics from DMO

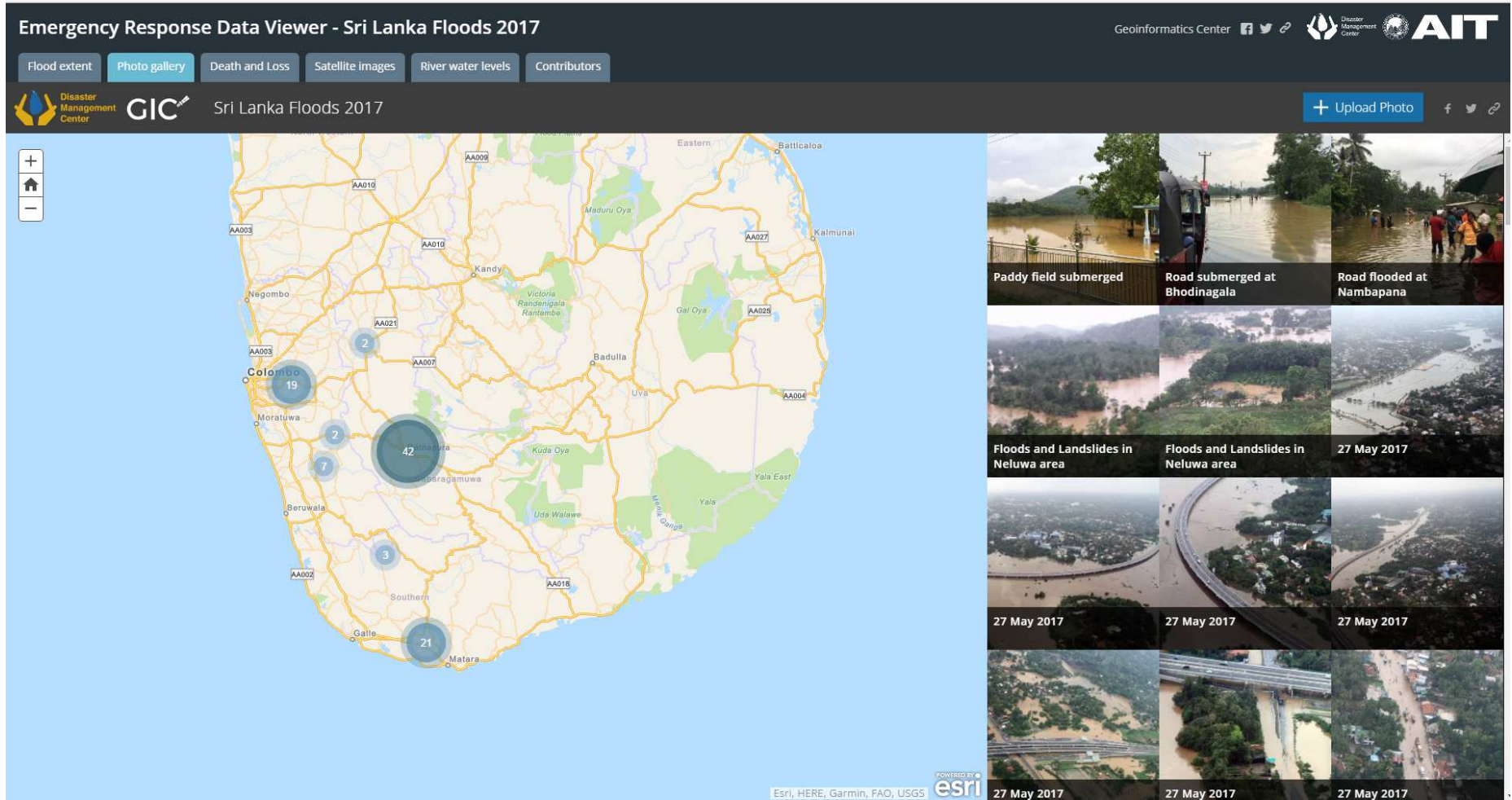


# Hydrological Data by Irrigation Dpt. Mapped

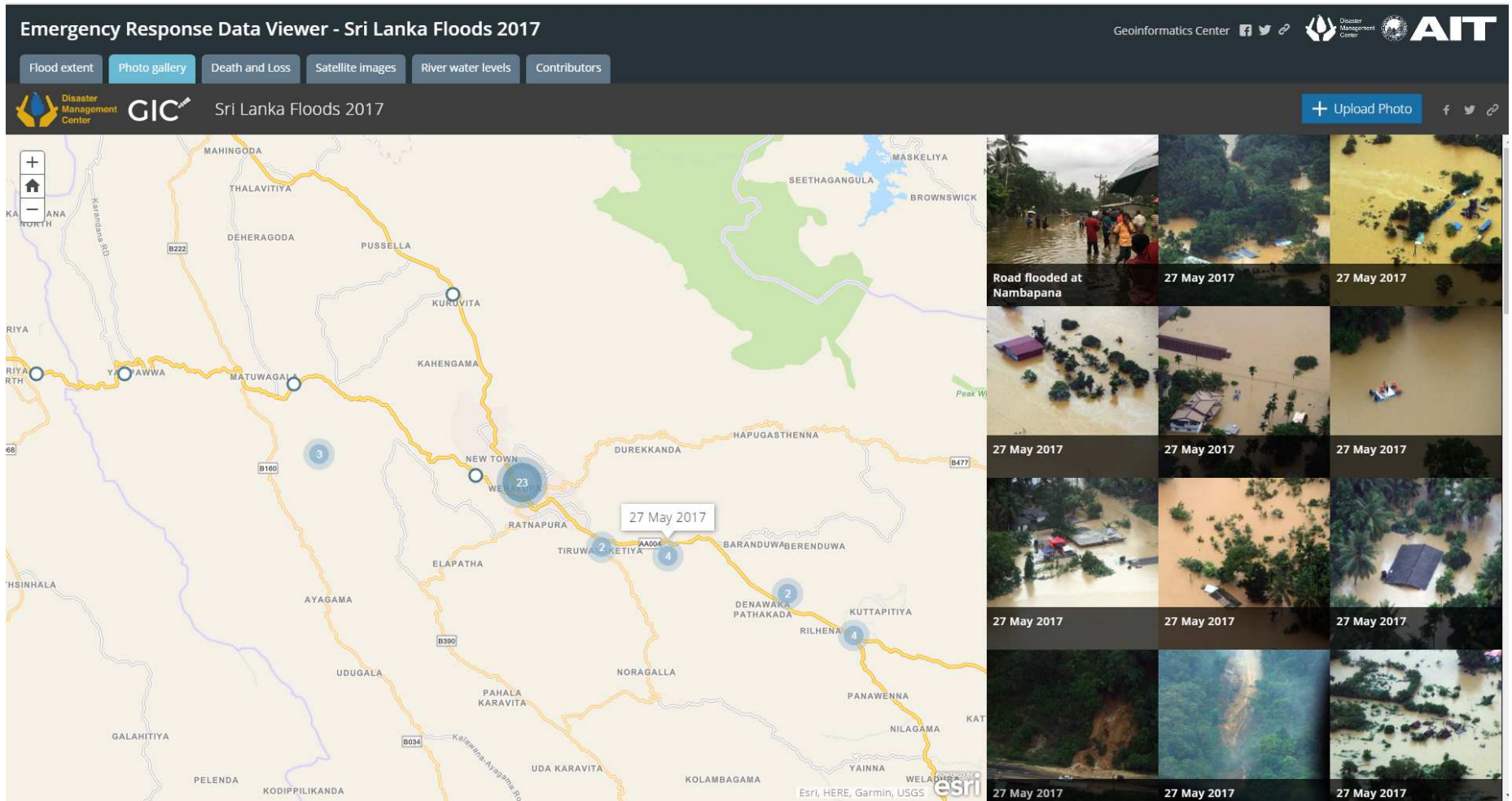




# Filed Photos uploaded by local people and shared








# Filed Photos uploaded by local people and shared










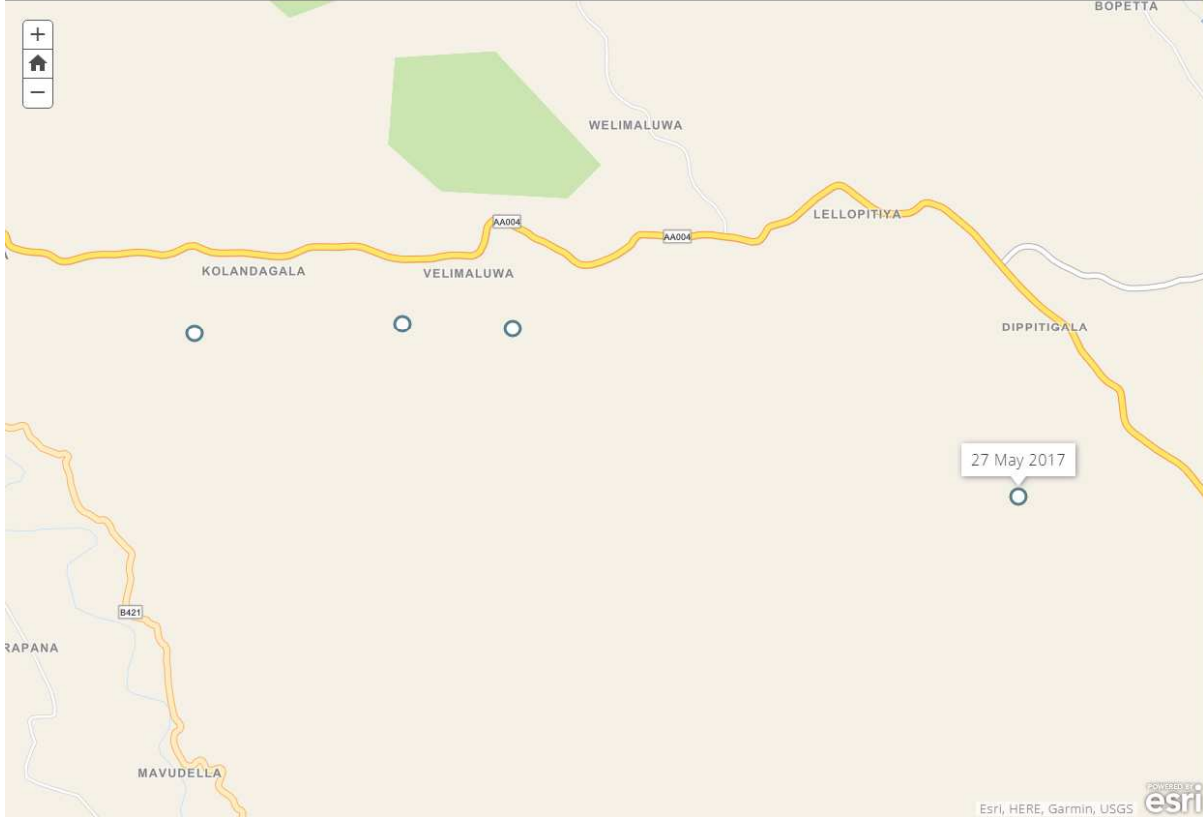
# Filed Photos uploaded by local people and shared

**Emergency Response Data Viewer - Sri Lanka Floods 2017**

Geoinformatics Center     

[Flood extent](#) [Photo gallery](#) [Death and Loss](#) [Satellite images](#) [River water levels](#) [Contributors](#)

  Sri Lanka Floods 2017 [+ Upload Photo](#)   




27 May 2017

27 May 2017

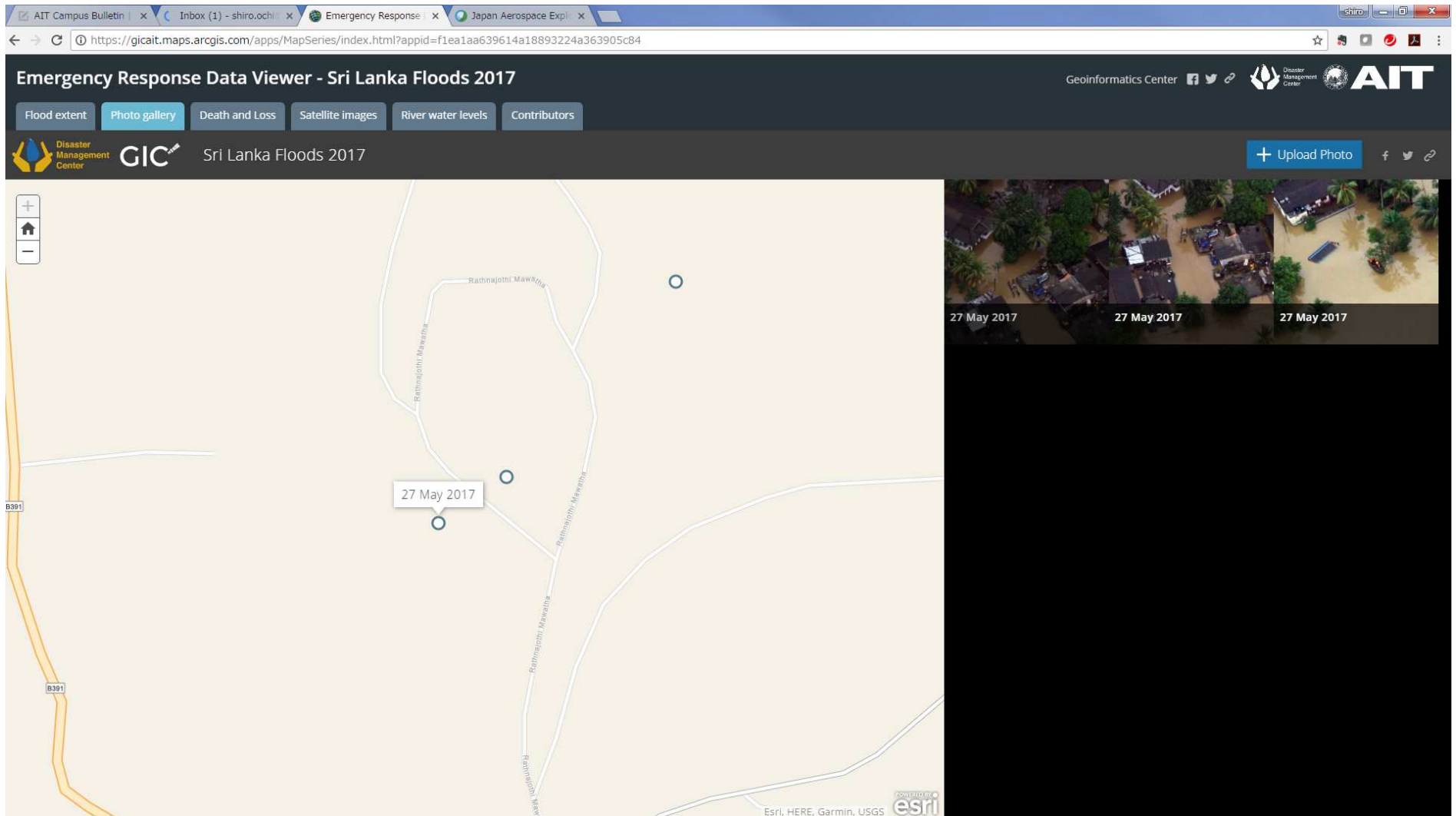
27 May 2017

27 May 2017

27 May 2017

Esri, HERE, Garmin, USGS 

# Filed Photos uploaded by local people and shared

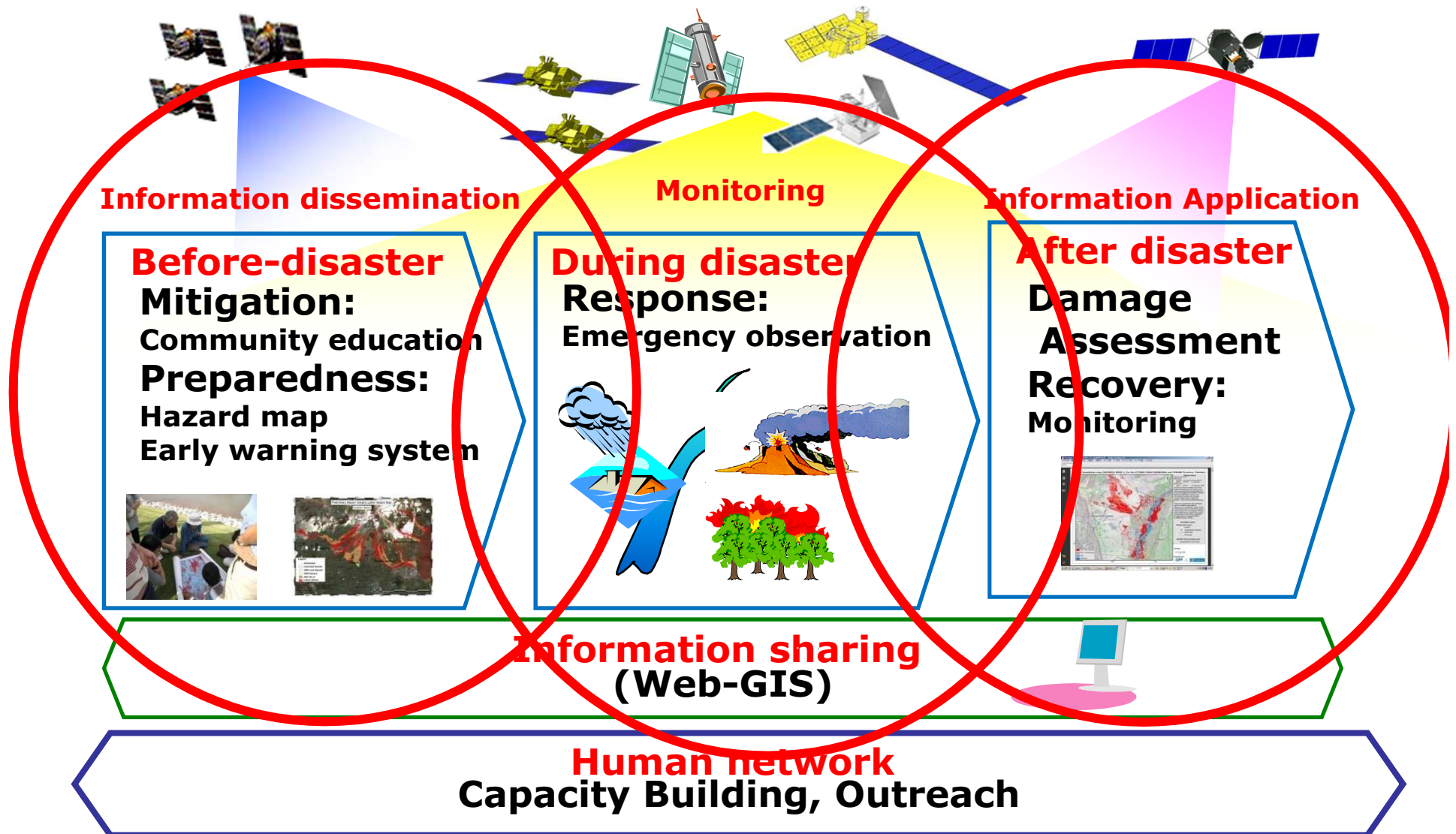




# Challenges in Sentinel Asia

- Government official framework for emergency response is necessary to utilize the VAP efficiently.
- Quick response is more important than accuracy for many cases. Timeline to generate and deliver the VAP should be clear.
- Early warning is expected in the framework of Sentinel Asia Step-3.

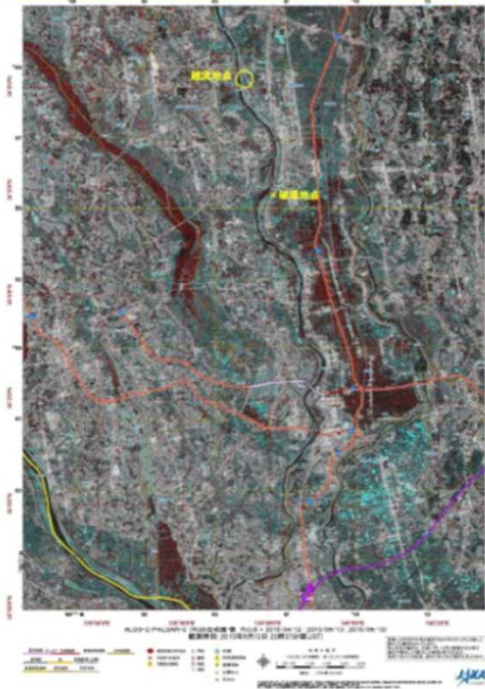
# Sentinel Asia



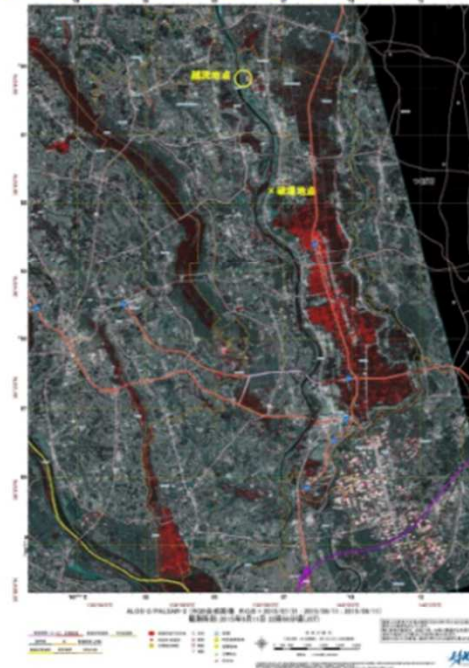


# Lessons from Japan

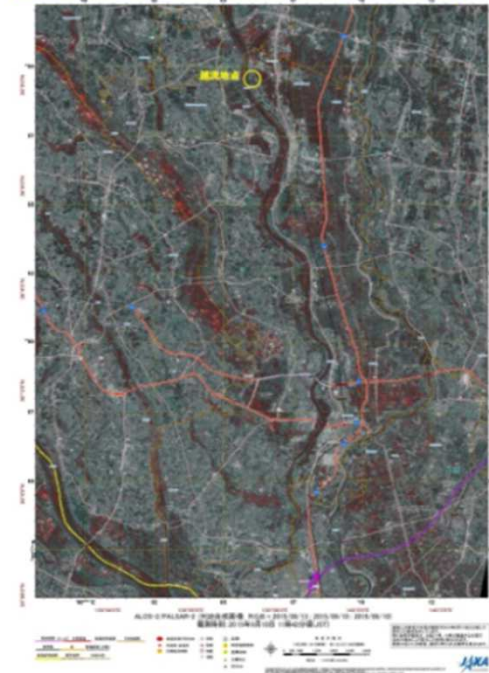
SAR衛星(ALOS-2)による浸水域の把握 9月13日(日)23:37観測



SAR衛星(ALOS-2)による浸水域の把握 9月11日(金)22:56観測



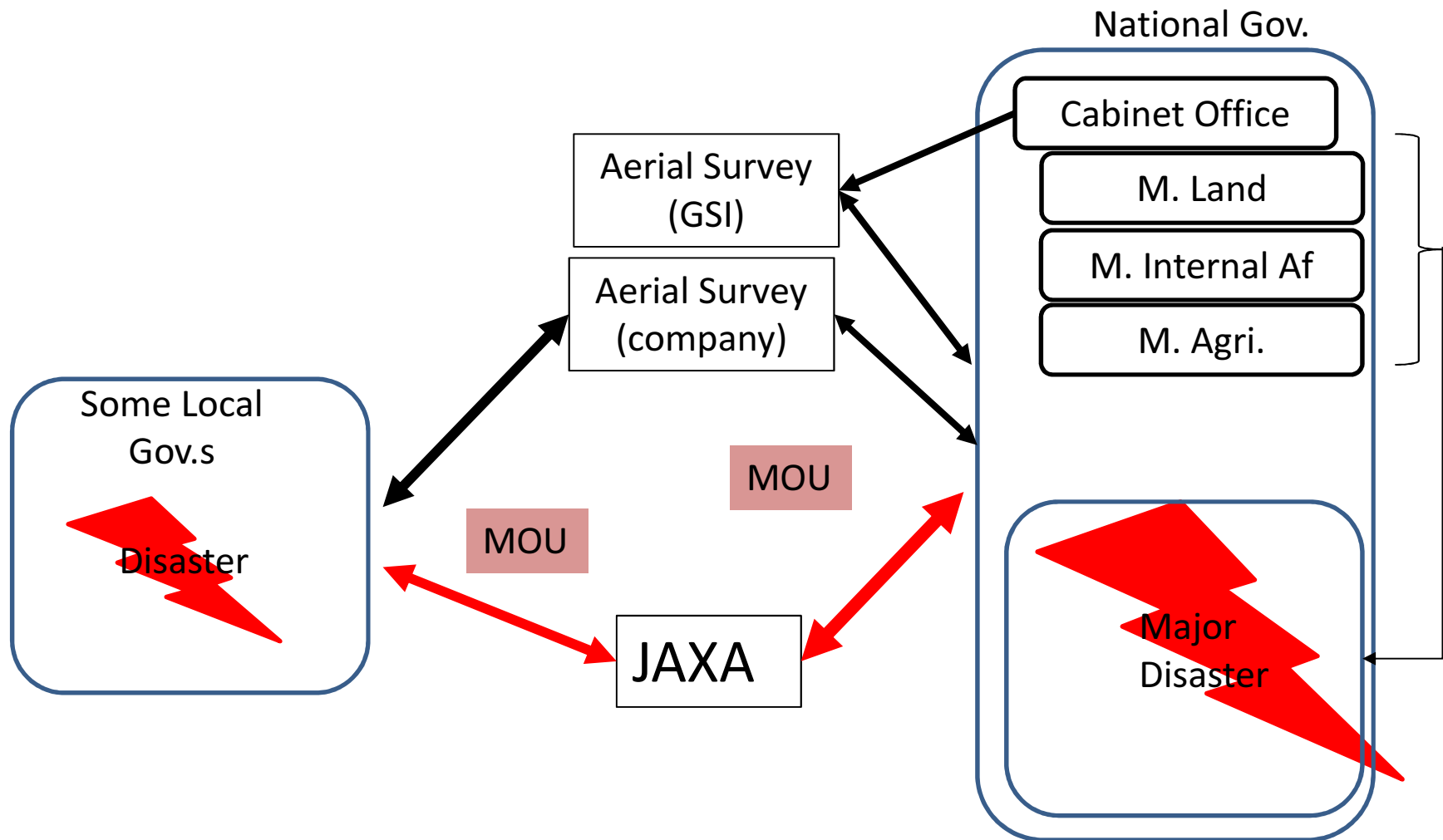
SAR衛星(ALOS-2)による浸水域の把握 9月10日(木)11:42観測



Flood in Joso city, Ibaraki, Japan, September, 2015

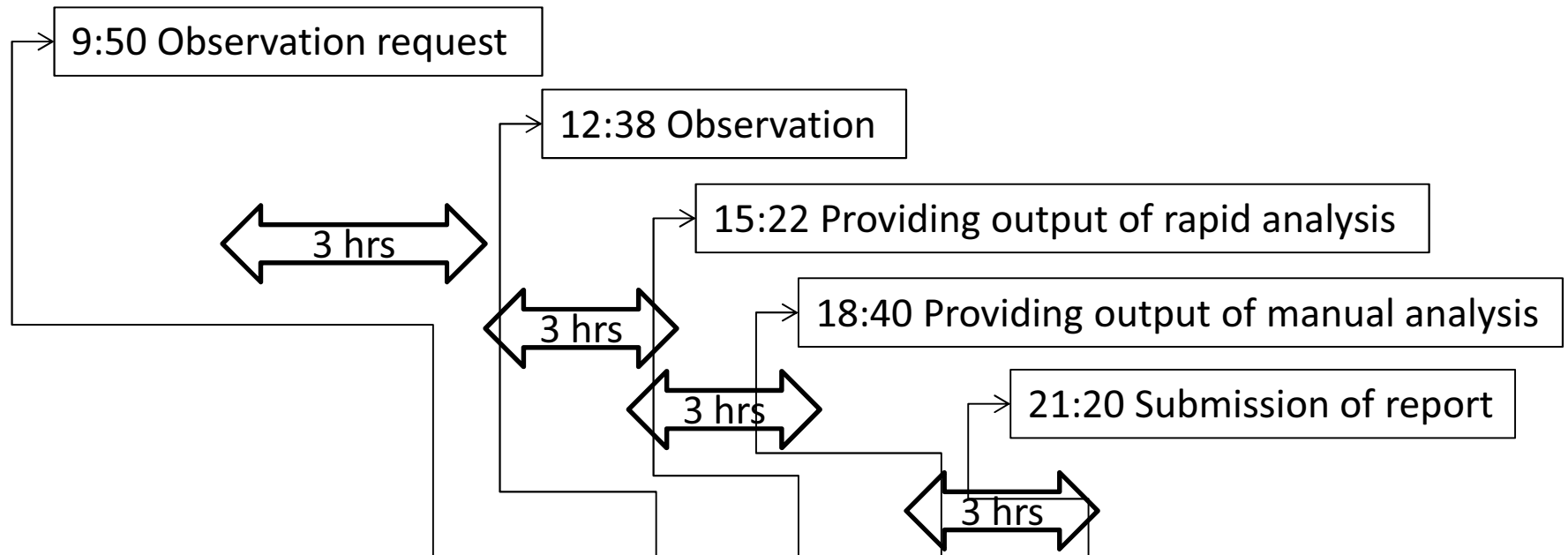
September 10 11:42 → September 11 22:56 → September 13 23:37

# JAXA's Responsibility for Emergency Response in Japan



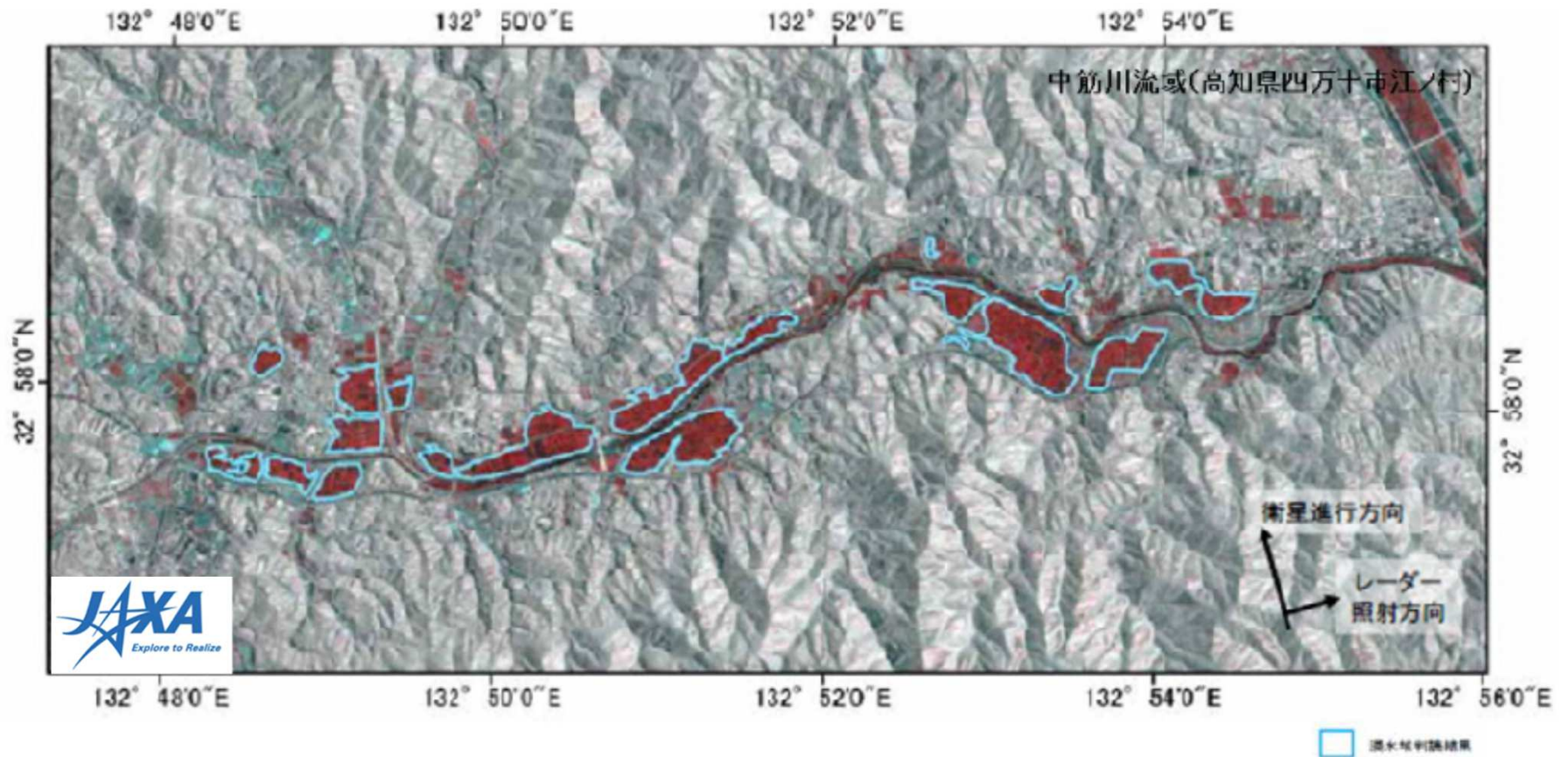


# Timeline for Data(VAP) providing case-A



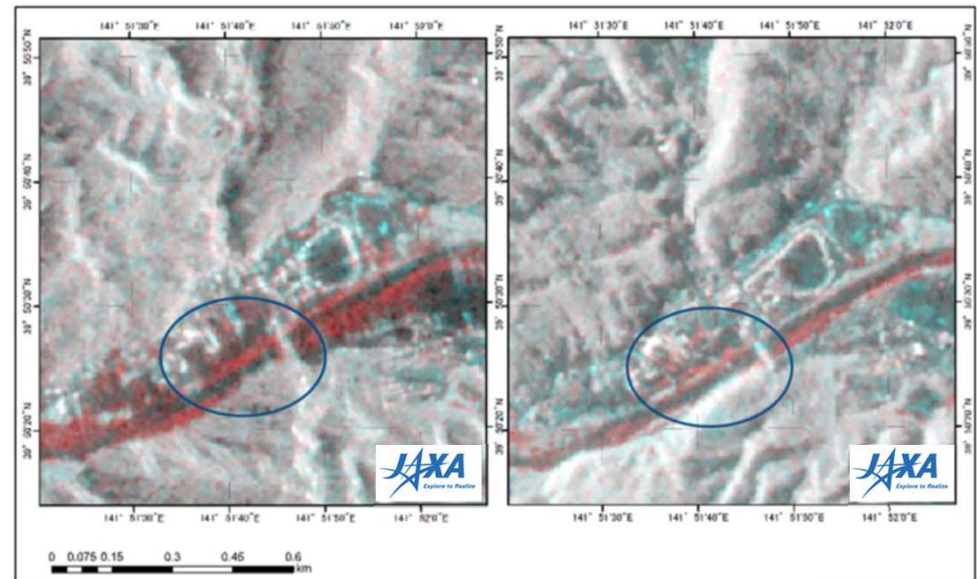
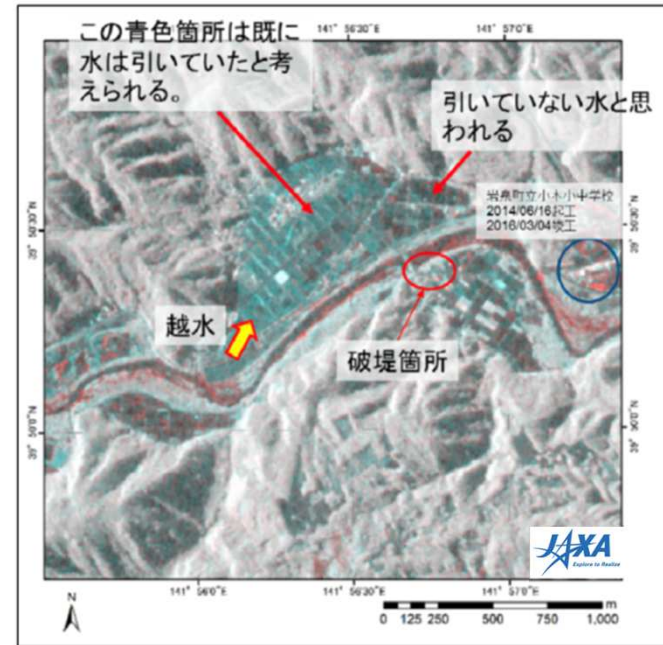
	9月20日(火)				9月21日(水)			
	0-6	6-12	12-18	18-24	0-6	6-12	12-18	18-24
JAXA (ALOS-2)		9:50 受付 10:20 計画 11:57 タイムライン連絡 12:38 観測	15:22 速報図	18:40 マニュアル判読	21:20 レポート提供			
徳島県		観測要請 確認 受領	受領	受領	受領			
徳島県の 災害対策	4:12 県下全域に大雨・洪水・爆風警報	8:30 災害対策警戒本部体制	12:00 避難指示					

# Rapid analysis mapping

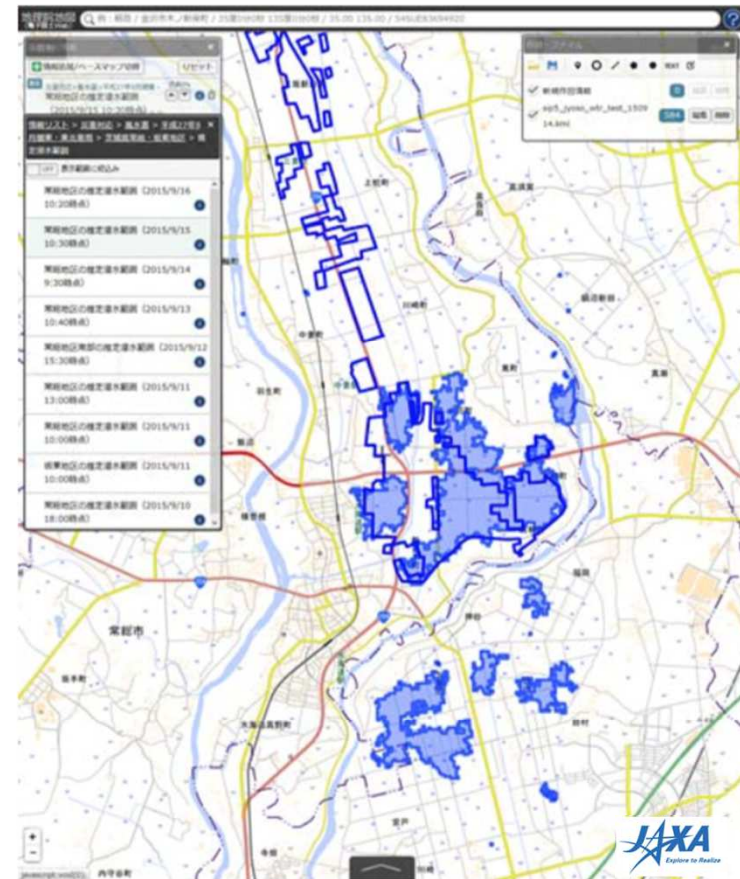
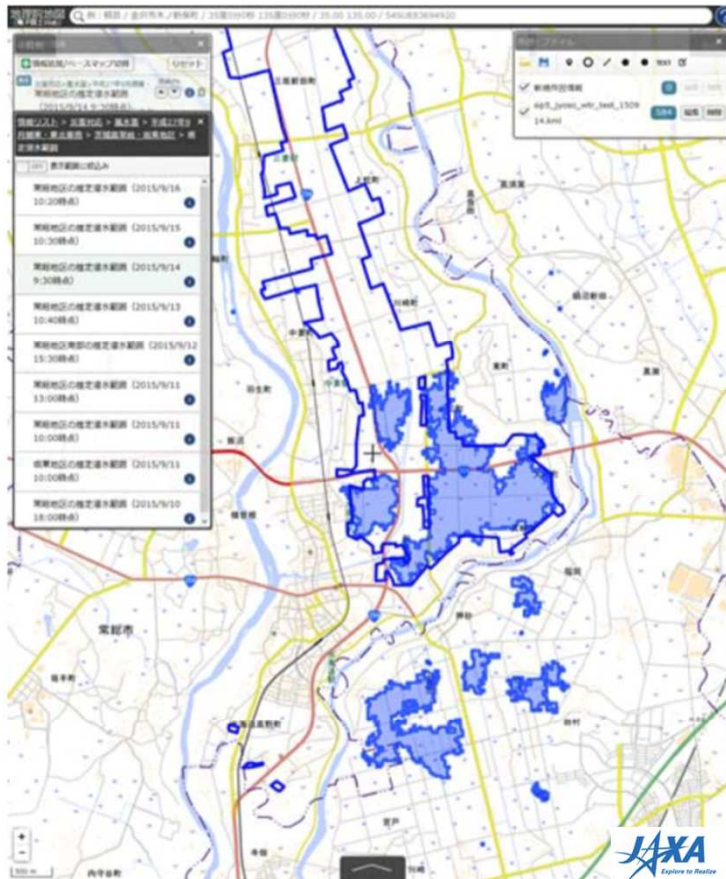




# Manual Interpretation of flood map



# Evaluation using Aerial Photo Image Interpretation



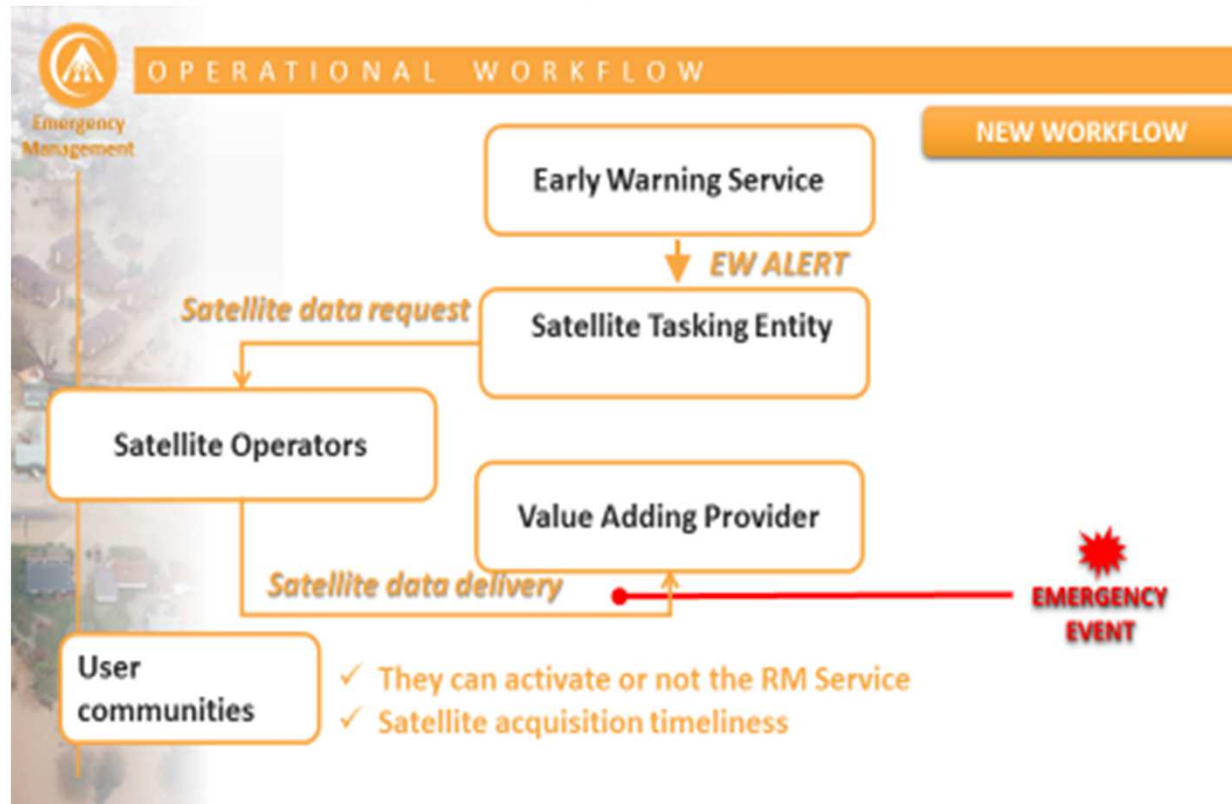




# Rapid Mapping and Early Warning Systems

The proposition:

**EARLY WARNING SYSTEM INFORMATION CAN HELP TO REDUCE THE TIME LAG BETWEEN AN EVENT AND DATA ACQUISITION**





# Rapid Mapping and Early Warning Systems , ESA and France





# Available Data from JAXA, etc. for Disaster Monitoring and Early Warning

- Precipitation(GSMAP)
- Nimbus, SST(Himawari)
- Flood Extent(ALOS-2, other SAR data)
- Land Deformation(ALOS-2/InSAR analysis)
- Damage Assessment(OPT VHR Sat. Data)
- Wildfire(Himawari, MODIS)
- Vegetation(MODIS, GCOM-C)
- Air Pollution(MODIS, Himawari)

# JAXA's Satellite for Earth Observation

**GCOM-W1**  
(2013-)



**GPM**  
(2014-)



**ALOS-2**  
(2014-)



**Himawari-8**  
(2014-)

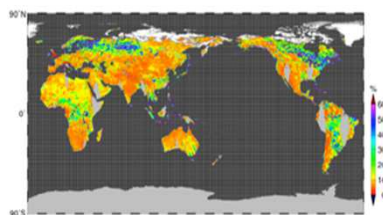


**GCOM-C**  
(2017)

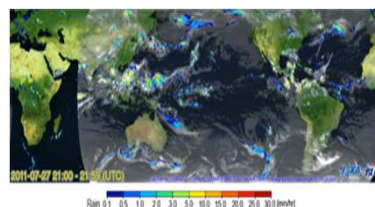


+ Other Satellites

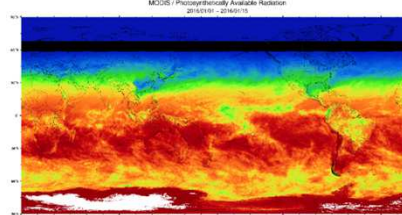
## Agriculture-Related Products



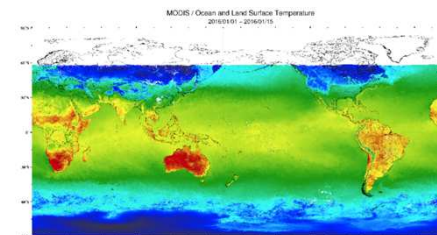
Soil Moisture



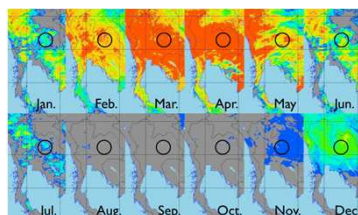
Precipitation



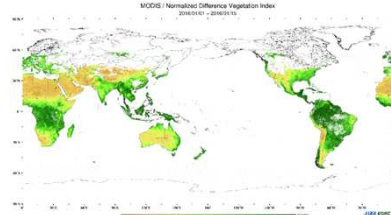
Solar Radiation (PAR)



Land Surface Temperature



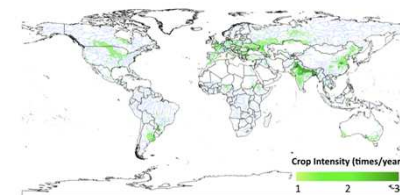
Drought Index



Vegetation Index



Planted Area



Crop Calendar

etc.

## Agriculture-related Services

Statistics

Early Warning

Damage Asses.

Farming



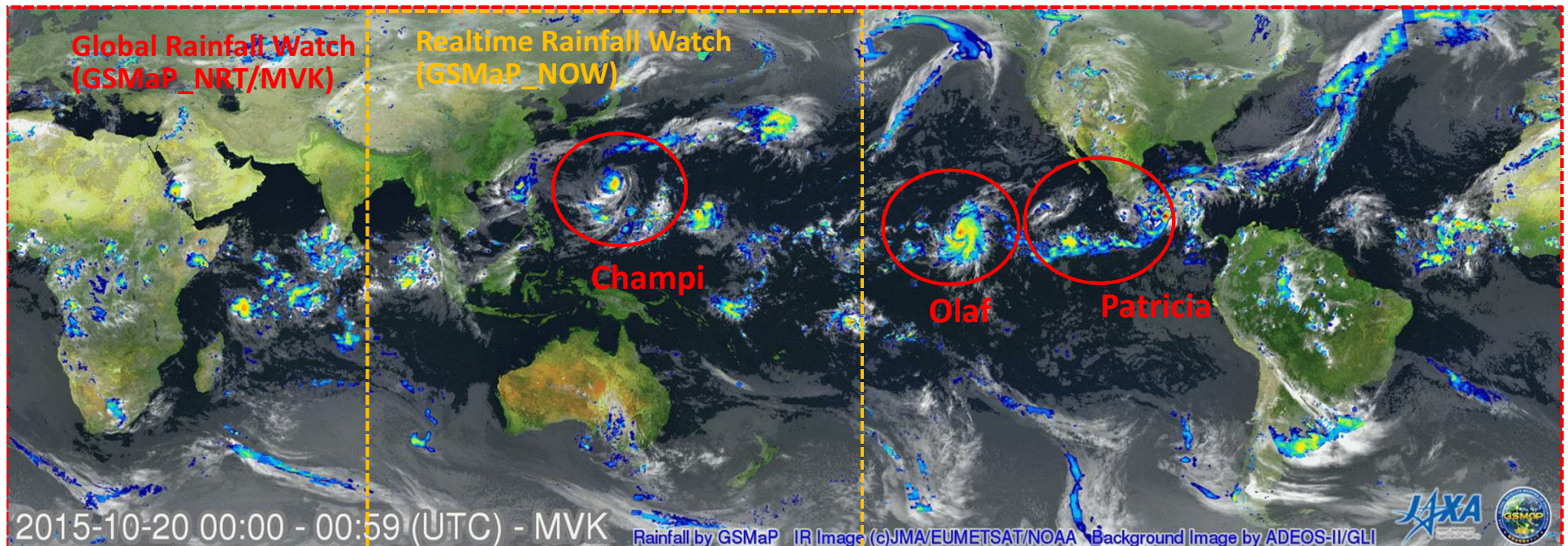
# Assessment Sources for “Asia Rice”(GEOGLAM)

- “Current Condition” and “Anomaly” information
- Twice a month(every 15 days).

Parameters	Interval	Spatial Resolution	Data Period (anomaly calc.)	Satellite Data Source	Satellite Data Source (Future)
<b>Precipitation</b>	Cumulative (15-day)	10 km	2002- (2009-2014)	GSMaP (GCOM-W1, GPM, Himawari etc.)	
<b>Solar Radiation</b>	15-day Average	5 km	2007- (2009-2014)	MODIS	GCOM-C
<b>Land Surface Temperature</b>	15-day Average	5 km	2002- (2009-2014)	MODIS	GCOM-C
<b>Soil Moisture</b>	15-day Average	50 km	2002- (2009-2014)	AMSR-E, AMSR-2	
<b>Drought Index</b>	15th /31[30]th day of month	10 km	2003- (2009-2014)	GSMaP, MTSAT	
<b>Vegetation Index</b>	15th /31[30]th day of month	5 km	2009- (2009-2014)	MODIS	GCOM-C

# GSMaP: Global Satellite Mapping of Precipitation

## Satellite Data Integration for Hourly Global Rainfall Monitor



GSMaP (Global) observed Hurricane Patricia and Olaf, and Typhoon Champi: 20-24 Oct. 2015, hourly animation

- **Rapidly changing precipitation phenomena need frequent observations.**
- **Global rainfall map merging GPM Core Observatory, polar orbiting microwave radiometer/sounders, and geostationary infrared radiometers.**

JAXA Global Rainfall Watch (4-hr delay) : <http://sharaku.eorc.jaxa.jp/GSMaP>  
JAXA Realtime Rainfall Watch (Himawari-area): [http://sharaku.eorc.jaxa.jp/GSMaP\\_NOW](http://sharaku.eorc.jaxa.jp/GSMaP_NOW)



# JAXA Himawari Monitor

P-Tree System

[User Registration](#)[User Guide](#)

日本語 Last Update: 08 Nov 2017 00:52:35 UTC

Date: 2017 / 11 / 8 0 : 20~29 UTC Search

-1day -1hour -10min Latest Image +10min +1hour +1day

10 min

## Layer Menu

### Overlay:

- Coastline (1:50m)
- Coastline (1:10m)
- Latitude/Longitude
- Major River

### JAXA Products:

- Sea Surface Temperature
- Sea Surface Temperature (Night Mode)
- Aerosol Optical Thickness
- Short Wave Radiation
- Chlorophyll-a
- Wild Fire
- Photovoltaic Power
- Cloud Optical Thickness
- Cloud Type (ISCCP)

RGB (Himawari)

Layer Opacity Control

Full Screen

## What's New

Nov/01/'17

NEW

Due to the system maintenance, all services of the JAXA Himawari Monitor (Web, FTP, and user registration) will be unavailable during the following period.

Date:  
Nov. 15, 2017,  
0:00 - 7:00(UTC)

The products during this period will be uploaded after the processing is completed.

Apr/19/'17

Due to the machine trouble on April 18, Some Himawari products are unavailable.

RGB:JAXA/EORC | Coastline:Natural Earth



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[What's New](#) [Contact Us](#)


# Himawari-8/9 Data Size

Area	Band	Res.(km)	Image	File size	Sub-total	Total
Full	3	0.5	22000x22000	923MB	923MB	2.3G/10min
	1,2,4	1	11000x11000	230MB	690MB	13.8G/hr
	5-16(12)	2	5500x5500	57MB	684MB	331G/day 120T/year
Japan	3 1,2,4 5-16(12)		6000x4800	55MB		137MB/10min 822MB/hr 19GB/day

- Satellite Data is becoming huge.
- Difficult to deliver the raw data to local users individually.
- Cloud Service is expected.




# http://www.diasjp.net/en/



Data Integration and Analysis System Program

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### DIAS Data and Applications


DIAS provides various applications for earth observation data analysis to contribute to the advancement of weather forecasting research and disaster-prevention measures.


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26  
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Topics

New paper published: Design and Implementation of a Training Course on Big Data Use in Water Management


New paper titled 'Design and Implementation of a Training Course on Big Data Use in Water Management' was published in the Data Science Journal. This paper discusses the lesson learned from our 2-y...

14  
SEP


Timeline

New paper published: DIAS Contributing to Climate Change Analysis and Disaster Risk Reduction

Testimonials



We have entered the period of Big Data, which recognizes the importance of data as evidence. Our construction of databases for Earth observations goes back over 30 years. The time has come for the true value of these observations to trigger social innovation.



**Masaru Kitsuregawa**  
Professor, Institute of Industrial Science, The University of Tokyo; Director General, National Institute of Informatics

# Conclusion

- Framework/Action Plan are necessary between agencies in a situation of disaster emergent response.
- Remote Sensing and GIS application are useful not only for Disaster Monitoring but also Early Warning Systems.
- More frequent disaster monitoring may be possible by international collaboration with space agencies in the world.