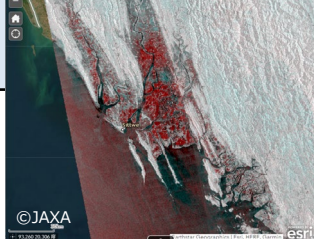

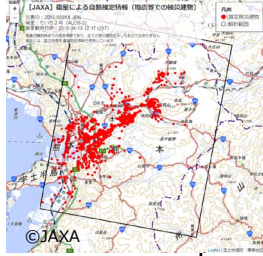


Automatic Analysis method

September 18th, 2023
8th Joint Project Team Meeting
Jakarta, Indonesia

Japan Aerospace Exploration Agency (JAXA)
Yuki TAKAKURA

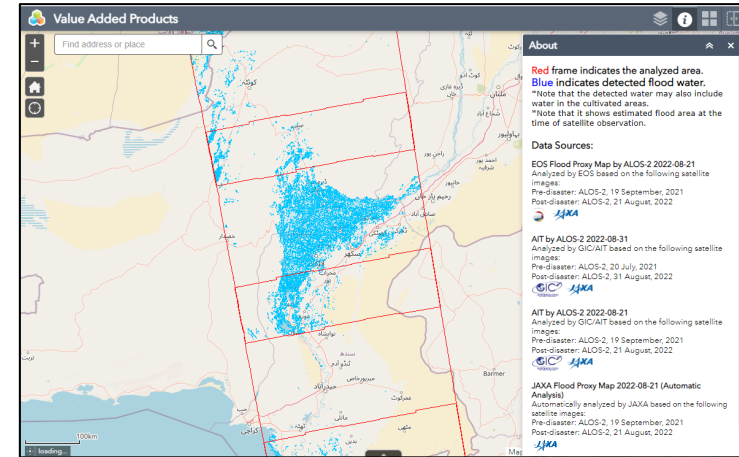
Information we can provide to users	Process	Time (from observation to end of processing)
<p>RGB composite image (★)</p>  <p><Flooding> Location of the flood extent (★)</p>	Auto	2 hour
<p><Flooding></p> <ul style="list-style-type: none"> - Location of the flood extent (★) (SM3 mode only) - Area of flood by each municipality (Japan only) - Number of flooded buildings by each municipality (Japan only) 	Auto	2.5 hour (Japan) 0.5 hour (Other)
<p><Earthquakes> (Japan only)</p> <ul style="list-style-type: none"> - Location of damaged-buildings - Number of damaged-buildings by each municipality 		

(★) Information currently provided by JAXA to Sentinel Asia

Information we can provide to users	Process	Time (from observation to end of processing)
<p><Flooding> - Location of the flood extent (Under verification)</p> <p><Landslide> - Location of the landslide extent (Under verification)</p>	Auto	2 hour

SAR imagery

JAXA has developed a system to automatically detect the flood extent using JAXA's ALOS-2 data for Sentinel Asia.



Flood in Pakistan on 17 August, 2022

➤ **Benefit:**

When an EOR is activated and observations are made by ALOS-2, JAXA can now quickly provide extracted flood-area information as well as ALOS-2 observation imagery.

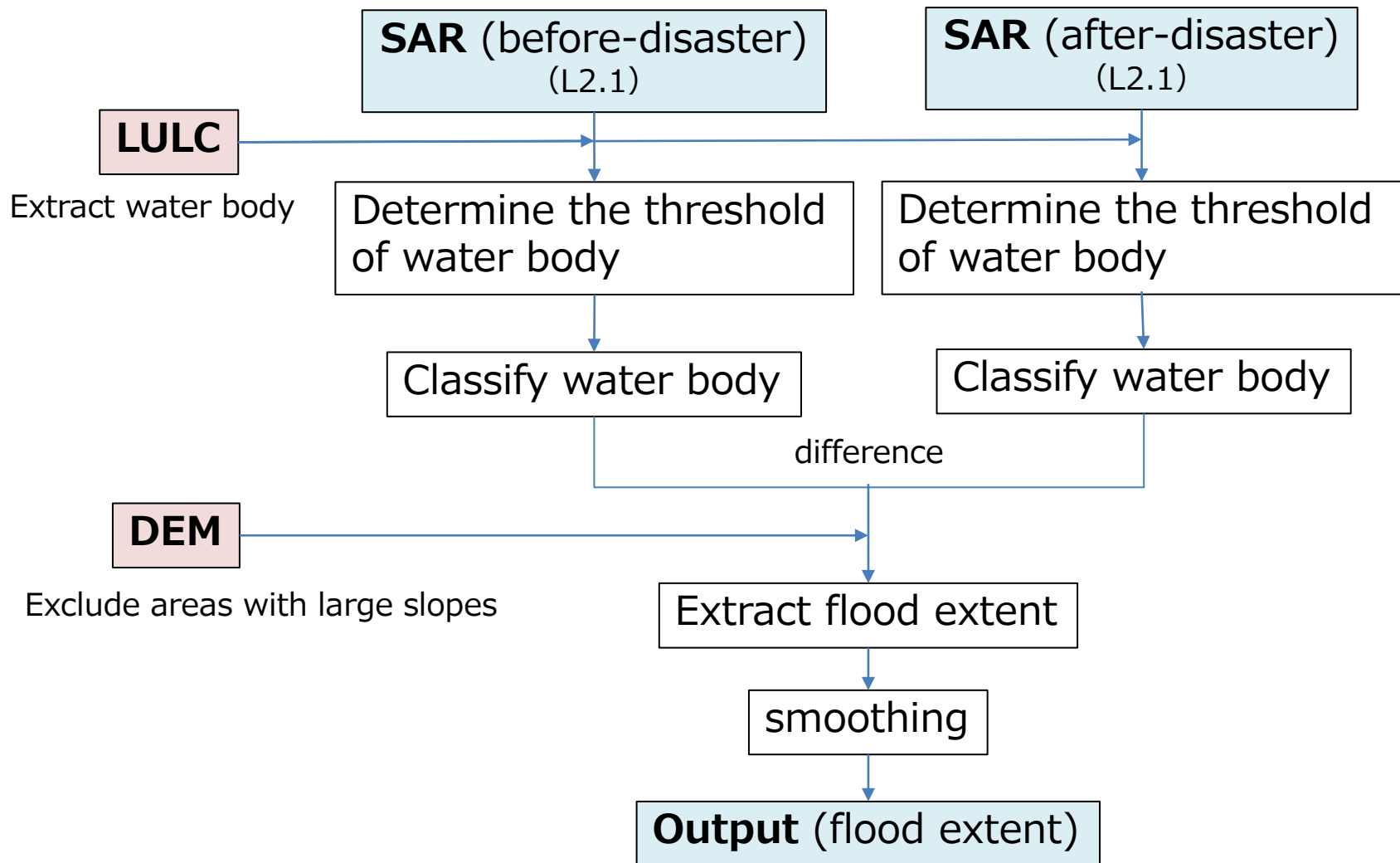
➤ **Analysis Method:**

This analysis uses a simple and primitive SAR analysis method and is fully automated. (Therefore, the accuracy may be lower than that of other DANs that use more sophisticated analysis methods.)

Notice

- The information is automatically estimated from satellite data and could differ from the actual flood extent.
- It shows estimated flood extent at the time of satellite observation and does not indicate the maximum extent.

A **simple and primitive method** of extracting the flood extent by automatically determining the threshold of water from the **backscatter intensity** of the ALOS-2 (SAR) image.



Storm, Flood and Landslide in Vietnam on 28 September, 2022

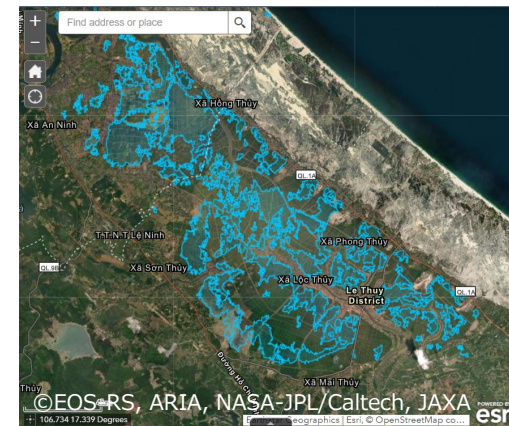
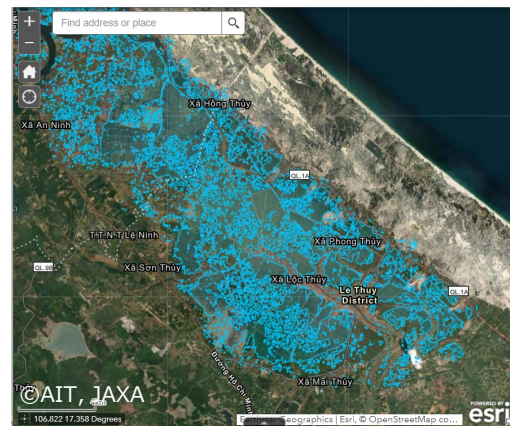
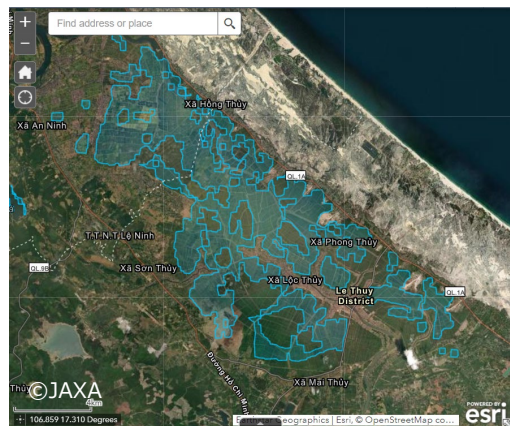
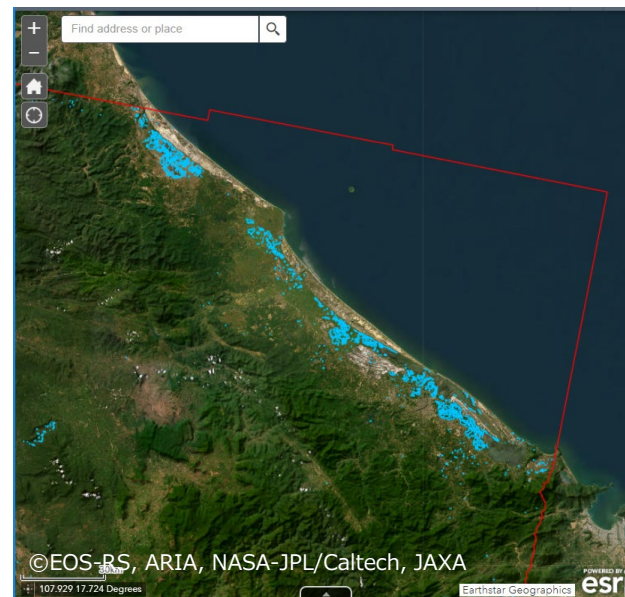
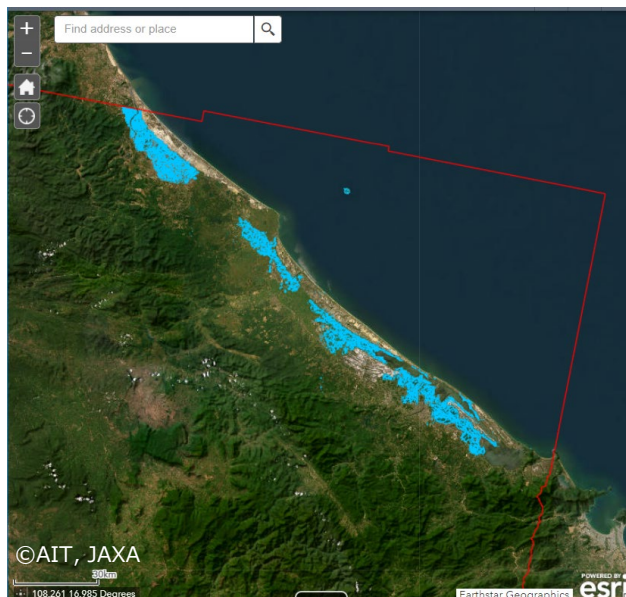
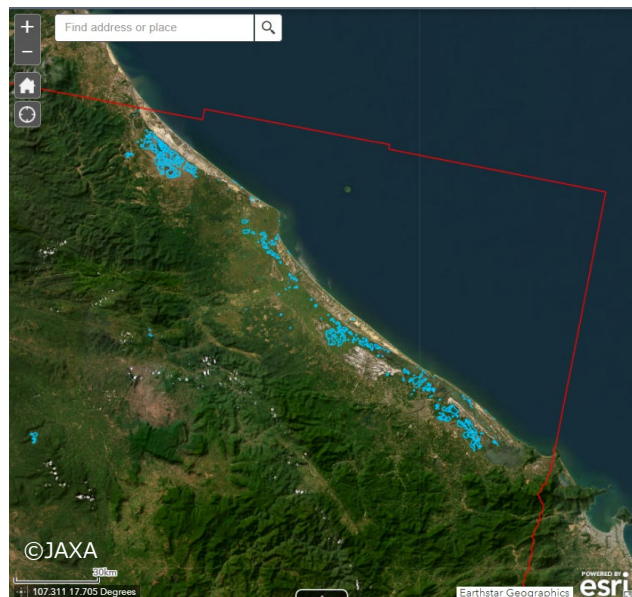
JAXA's VAP is almost same as AIT's and EOS's

ALOS-2, ScanSAR mode

JAXA

AIT

EOS



ALOS-2, ScanSAR mode

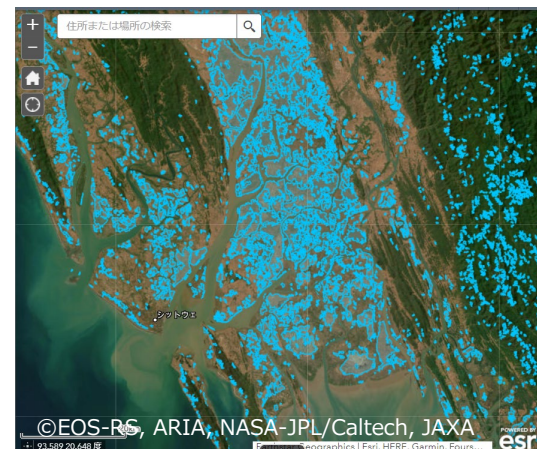
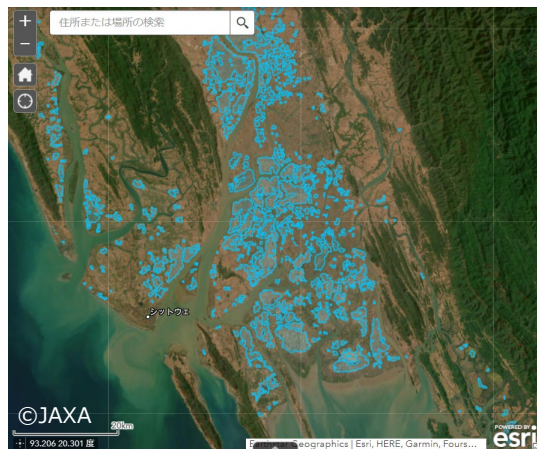
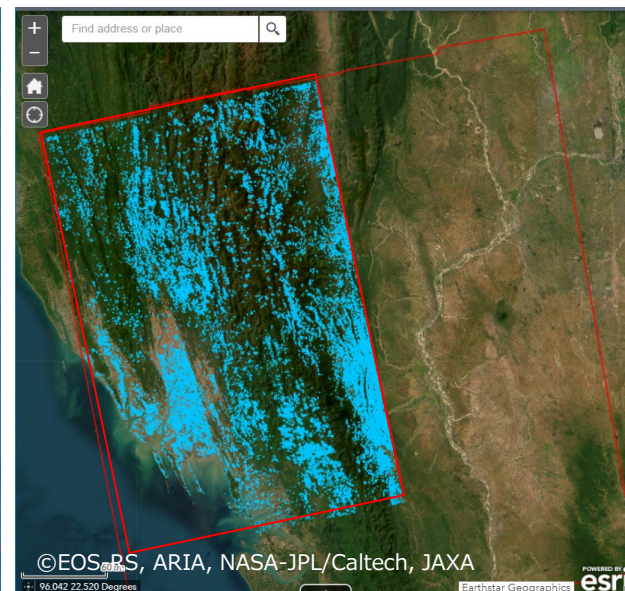
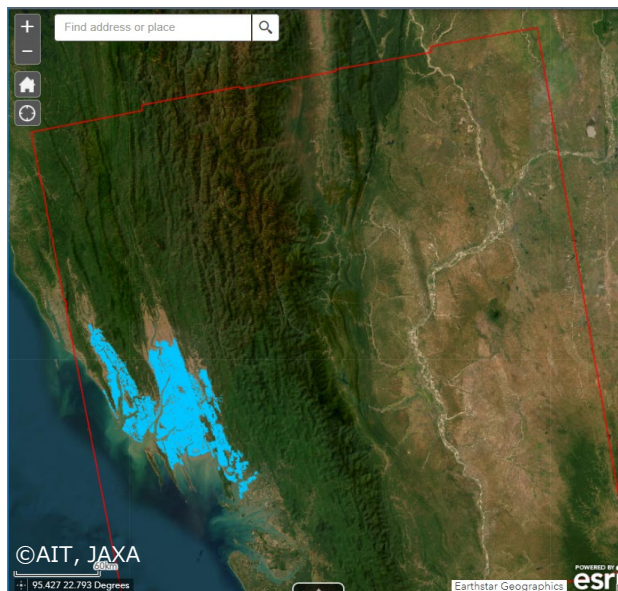
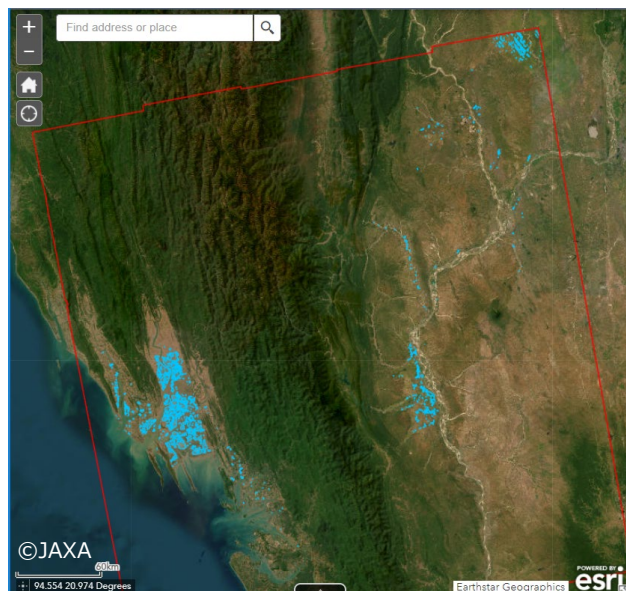
Cyclone MOCHA in Myanmar on 14 May, 2023

<https://storymaps.arcgis.com/collections/6c2cdd4f4b92434cbb6d343eaa0006db?item=1>

JAXA

AIT

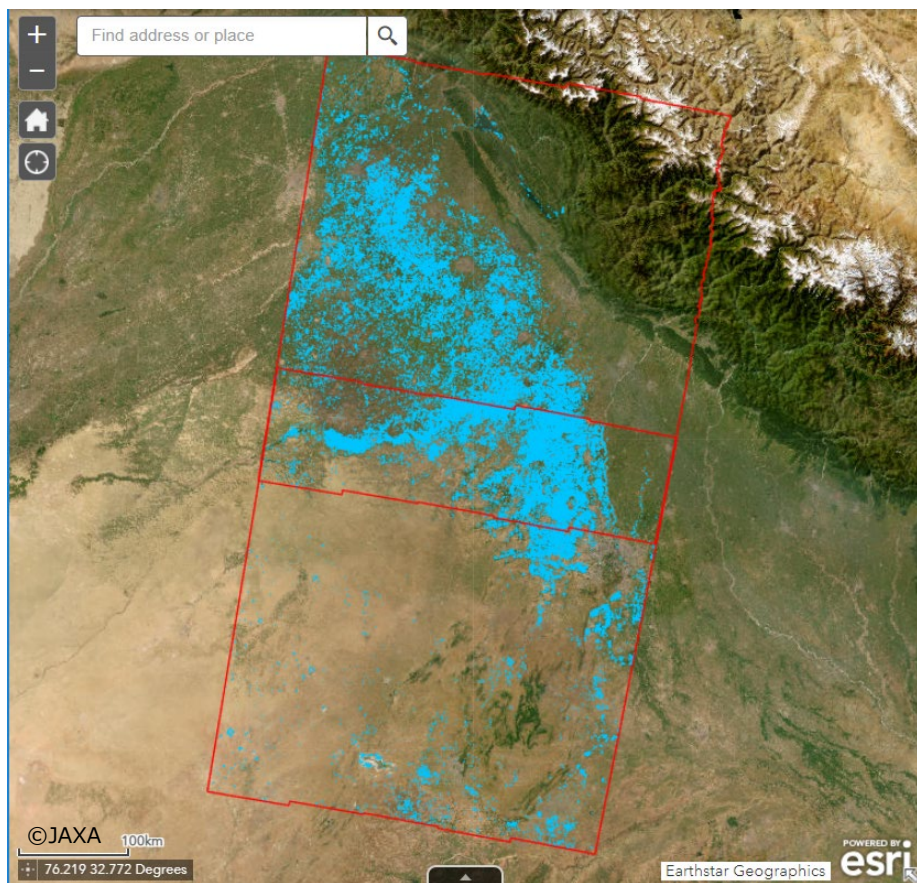
EOS



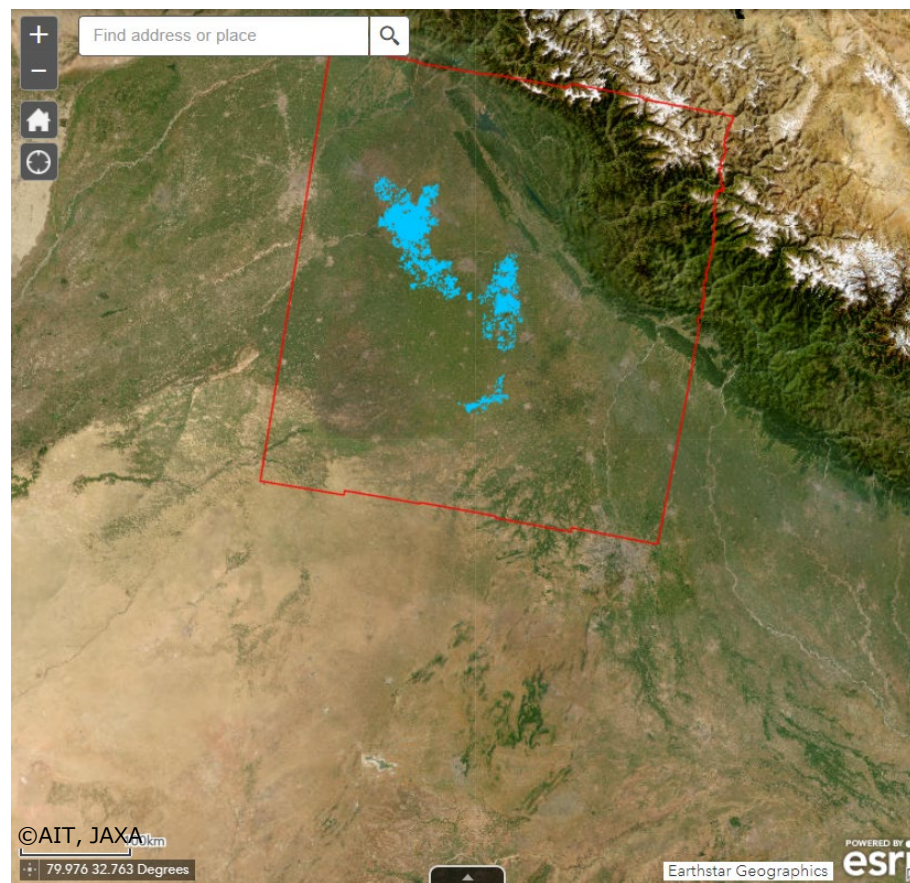
Flood, Landslide and Storm in India on 13 July, 2023

<https://storymaps.arcgis.com/collections/9ee0925945ec4659b107b814c2f99b5e?item=1>

JAXA



AIT



ALOS-2, ScanSAR mode

JAXA is developing another automated system with higher accuracy.

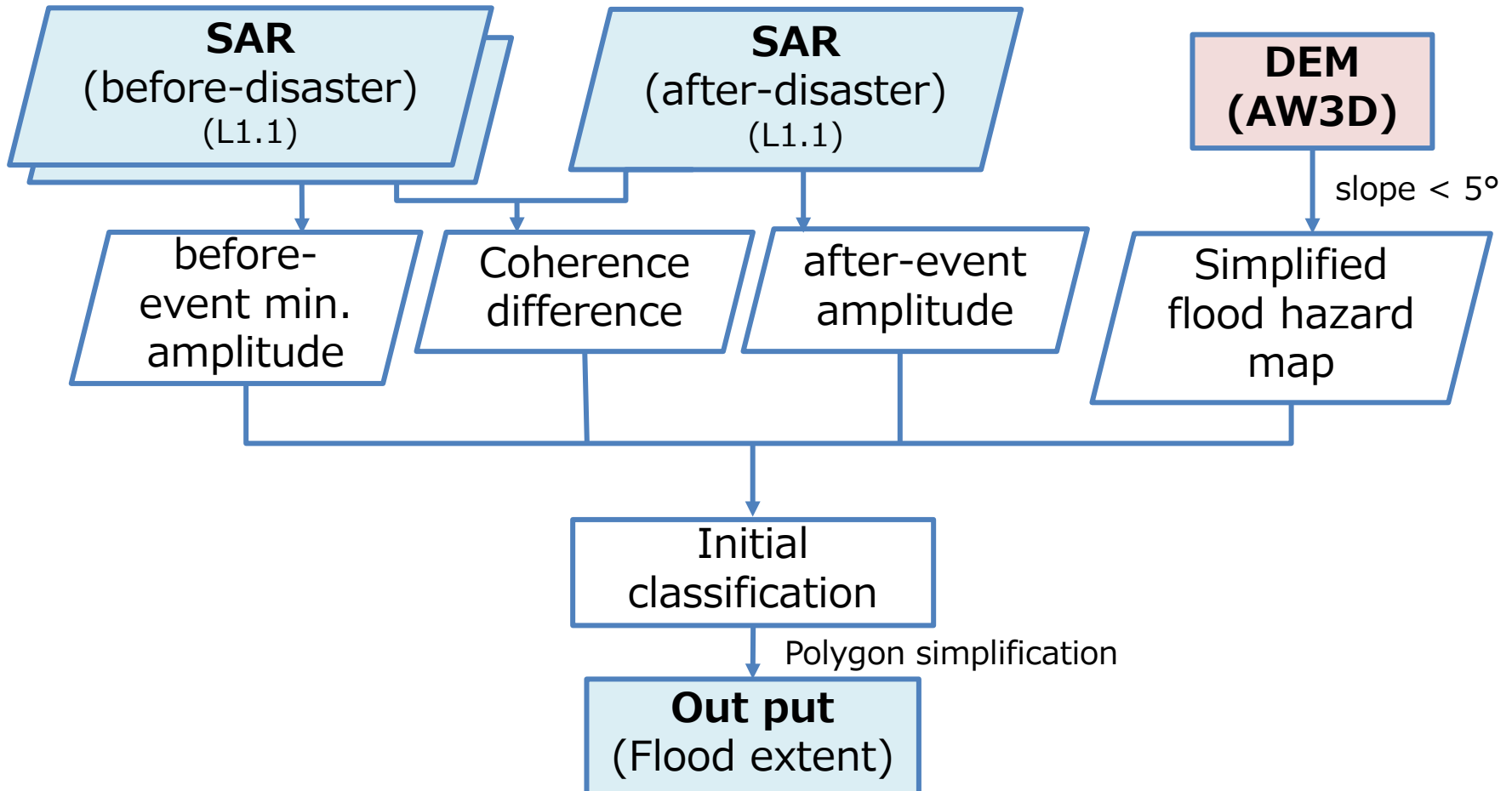
This system requires ALOS-2 L1.1 data, which is closer to raw data than ALOS-2 L2.1 data used in the algorithm introduced earlier, for analysis. This method is expected to be more accurate especially for urban area.

This method is currently being validated and may be replaced by this method in the future.

Notice

- The information is automatically estimated from satellite data and may differ from the actual flood extent.
- It shows estimated flood extent at the time of satellite observation and does not indicate the maximum extent.

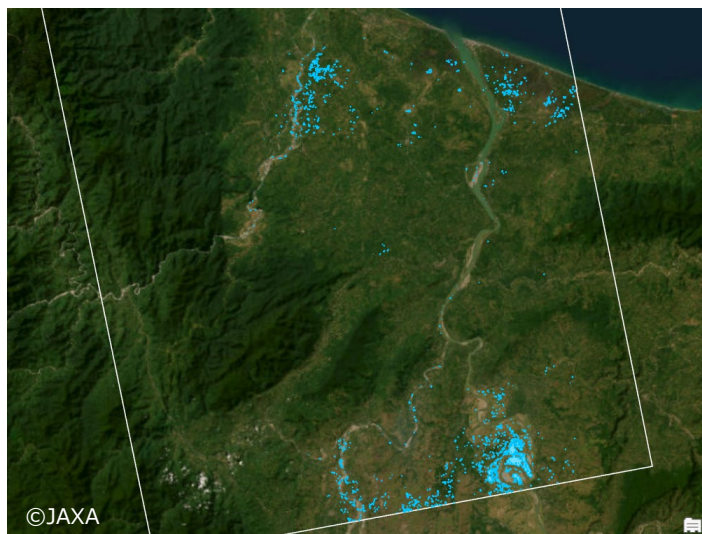
Use L1.1 data and perform interference analysis to improve accuracy especially in urban areas. Based on Ohki et al. (2020).



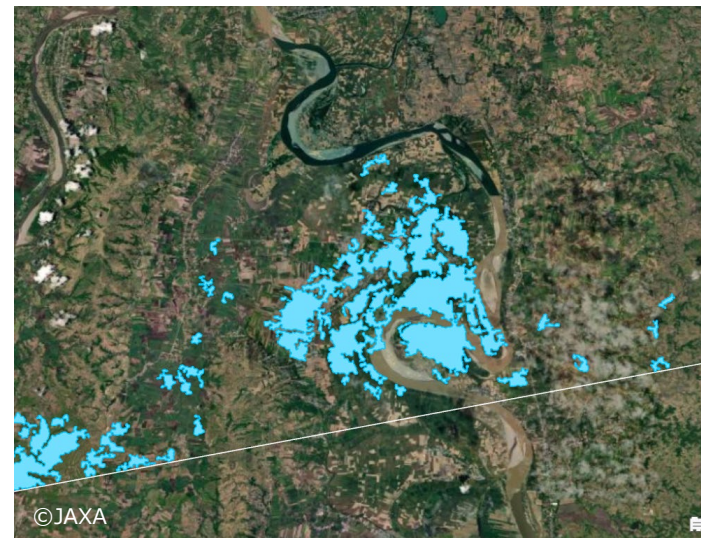
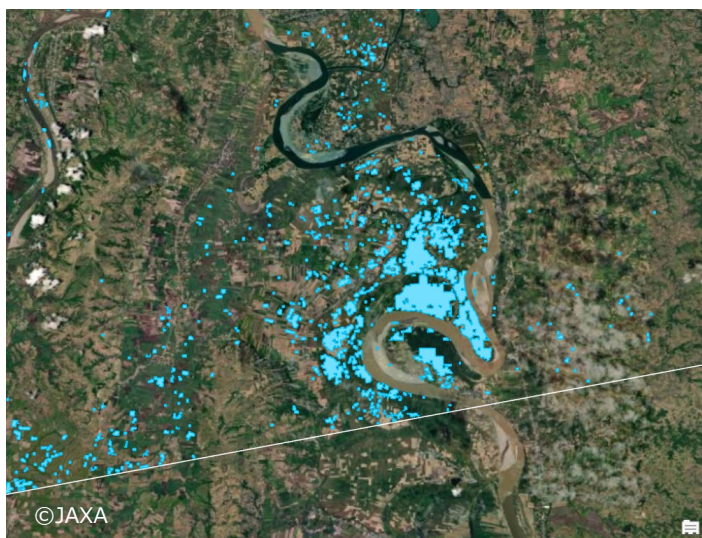
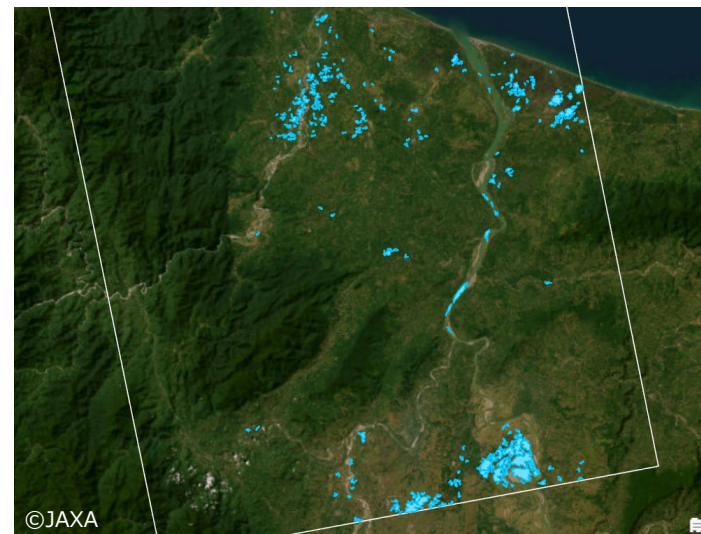
Typhoon Mawar in Philippines on 27 May, 2023

ALOS-2, SM3 mode

JAXA (New method, L1.1)



JAXA (Conventional method, L2.1)



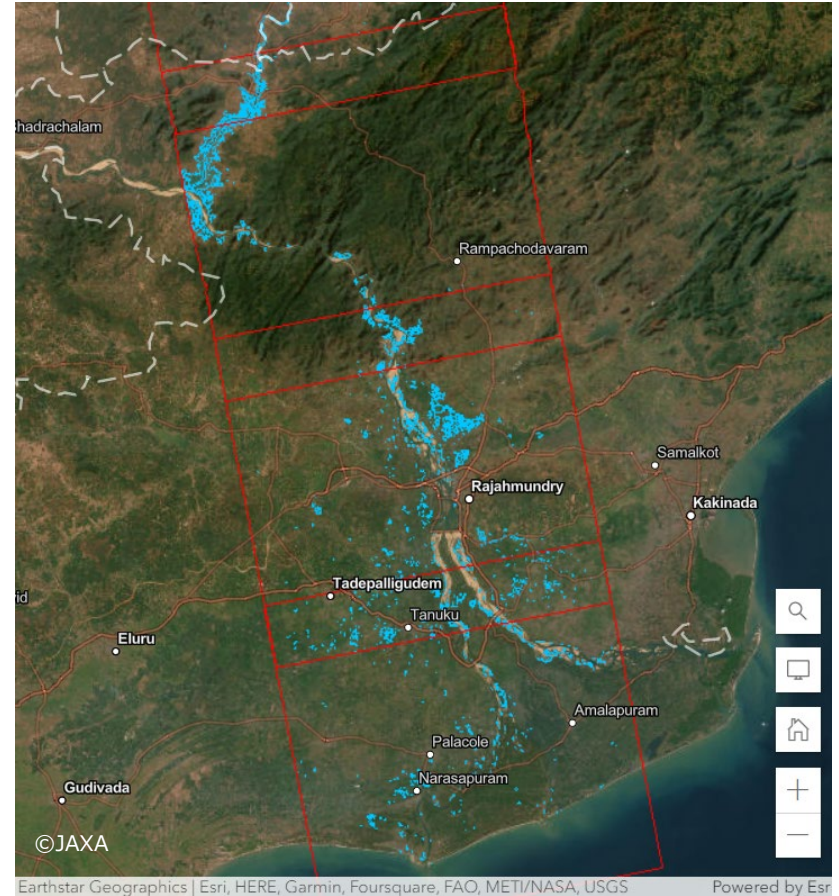
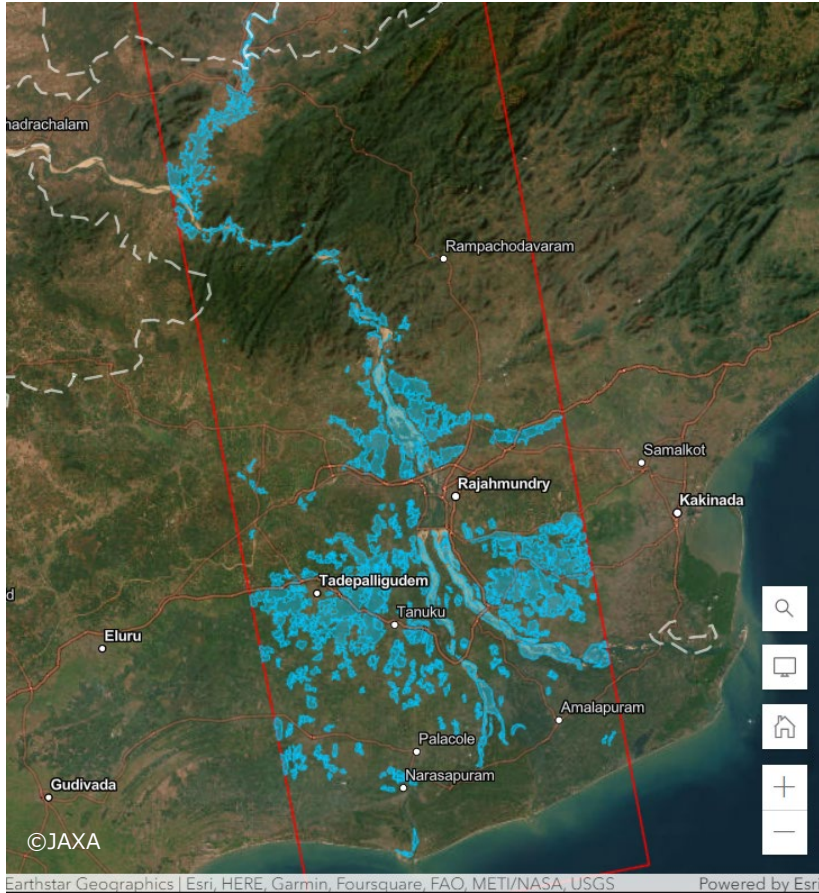
Flood in Andhra Pradesh, India on 12 July, 2022

ALOS-2, SM3 mode

<https://sentinel-asia.org/EO/2022/article20220712IN.html>

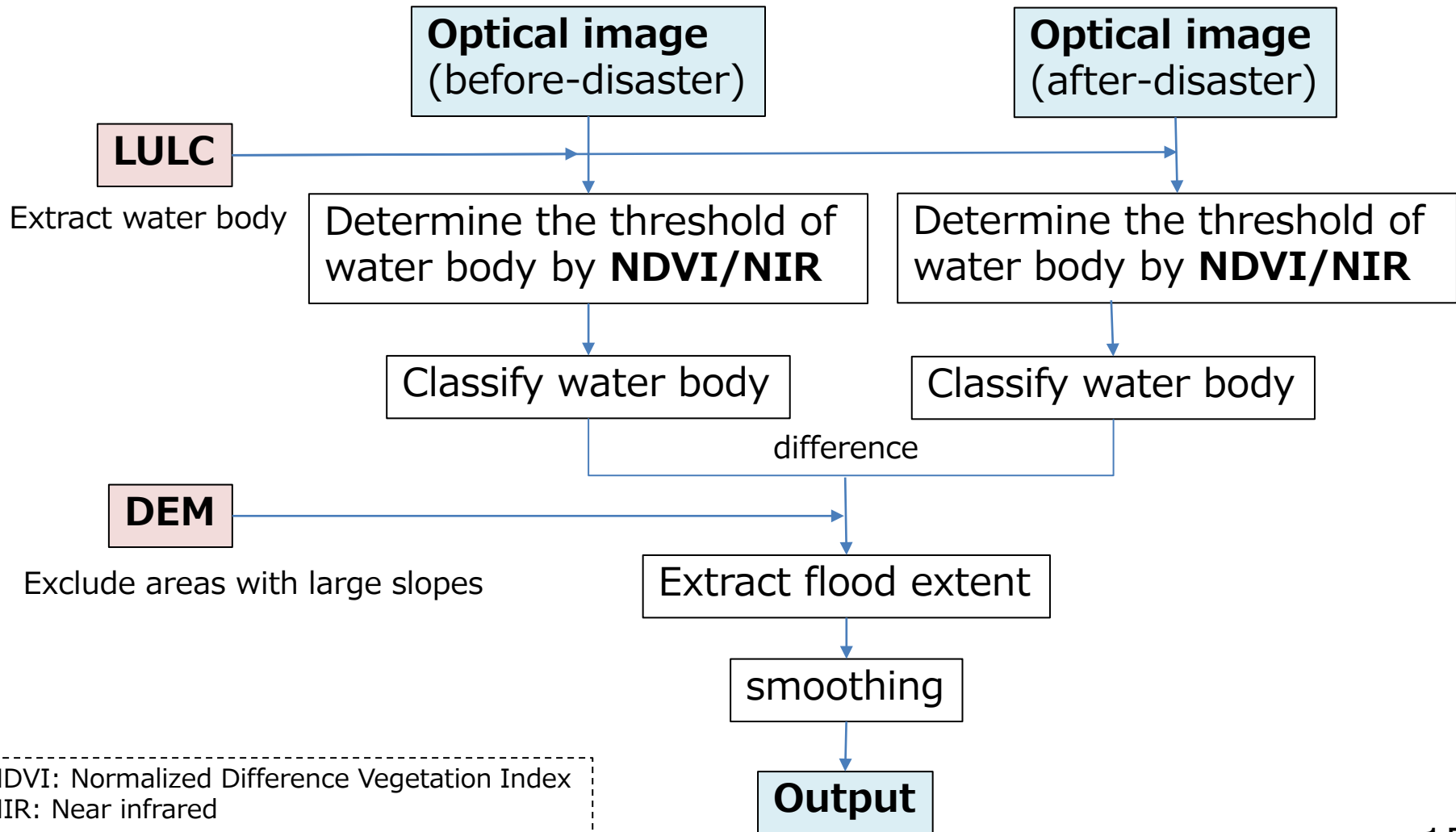
JAXA (New method, L1.1)

JAXA (Conventional method, L2.1)



Optical imagery

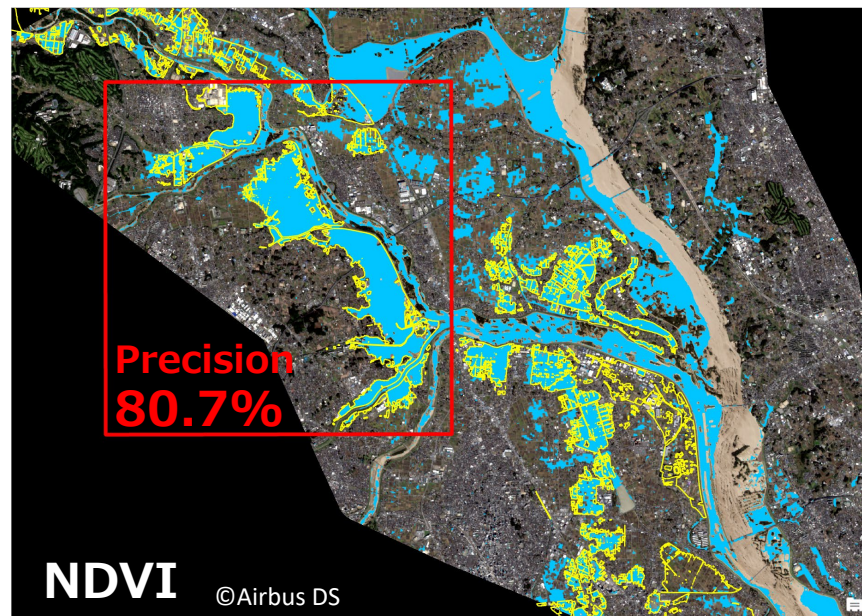
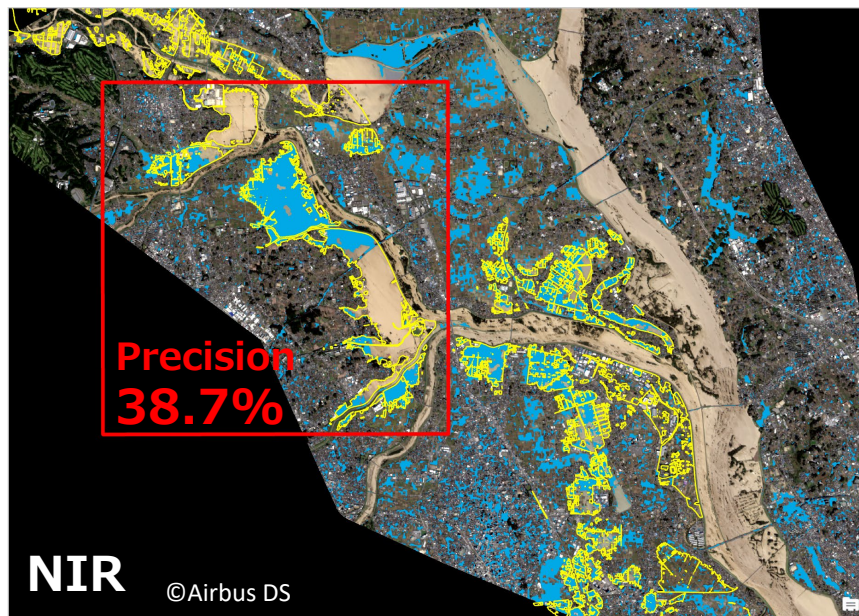
A **simple and primitive method** of extracting the flood extent by automatically determining the threshold of water from the NDVI or NIR of the optical image.





NDVI: Normalized Difference Vegetation Index
NIR: Near infrared

Blue: Estimated flood extent
Yellow: Grand truth by Geospatial Information Authority of Japan (GSI) (as of 10/14)



JAXA is developing automatic analysis systems to extract affected areas using SAR and optical imagery.

SAR imagery :

JAXA have already provided VAPs of the automatically estimated flood extent to Sentinel Asia.

We are also working to improve its accuracy.

Optical imagery :

Primitive and automatic methods have already been implemented.

Automatic analysis using deep learning is also under study.

Issue :

Lack of ground-truth data makes it difficult to assess the accuracy of VAPs. As a DAN, I would appreciate it if anyone who has grand truth data such as flood extent, location of landslides, location of building damage, etc., could share it with Sentinel Asia, because it will help improve the accuracy of DAN's VAP.