

Preliminary Analysis of Mapping Flooded Areas and Landslides following the July 2018 Flood Disaster



災害科学国際研究所
IRIDeS
International Research Institute of Disaster Science



CAIP
革新知能統合研究センター
Center for Advanced Intelligence Project

Mapping team

Tohoku Univ. team

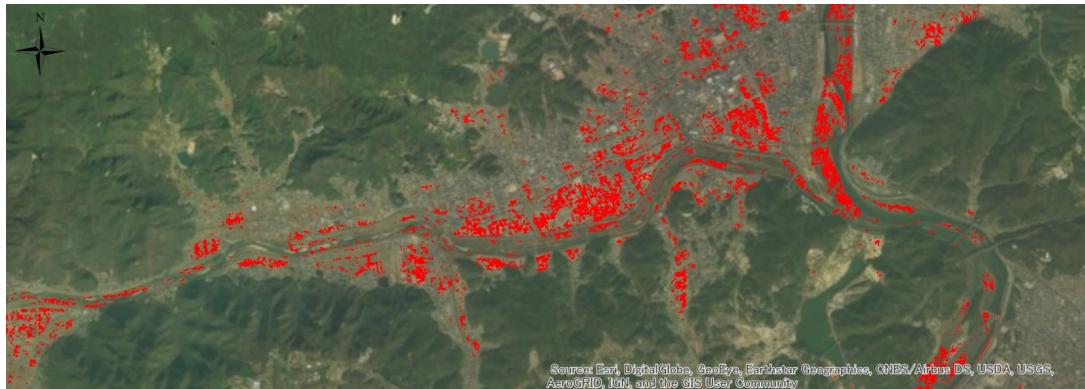
- Luis Moya
- Erick Mas
- Genki Okada
- Bai Yanbing
- Shunichi Koshimura

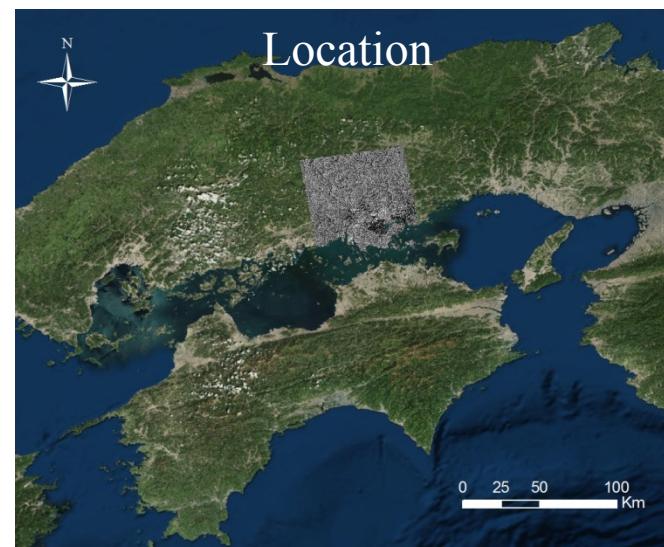
RIKEN team

- Bruno Adriano
- Naoto Yokoya

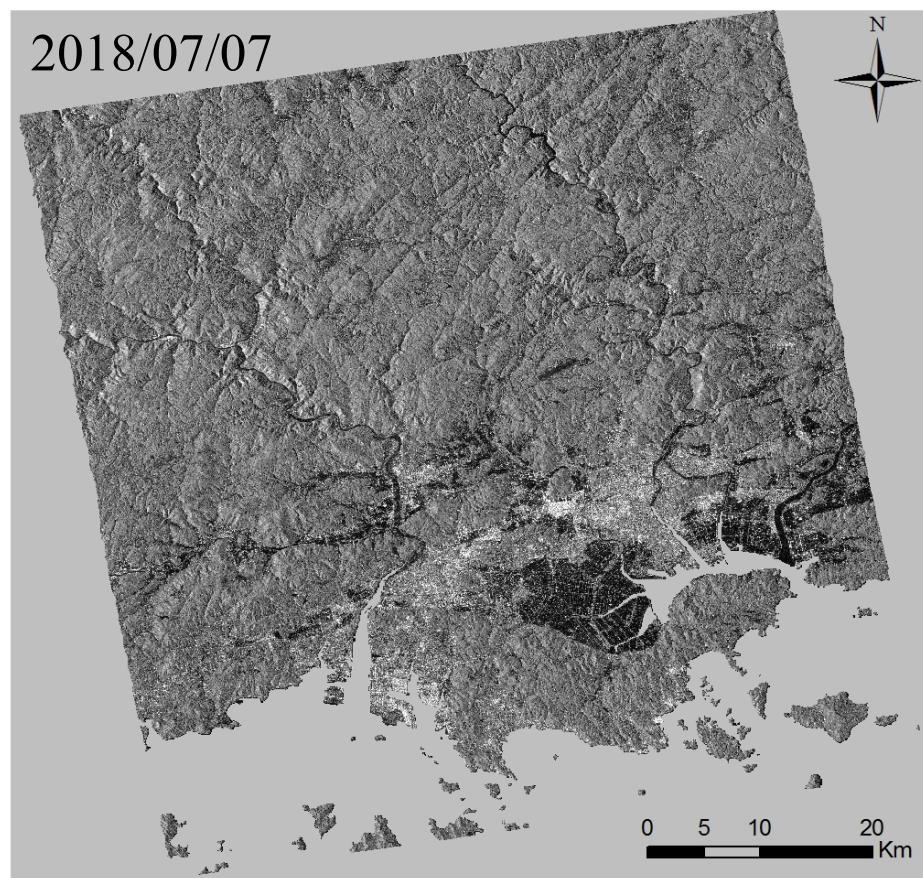
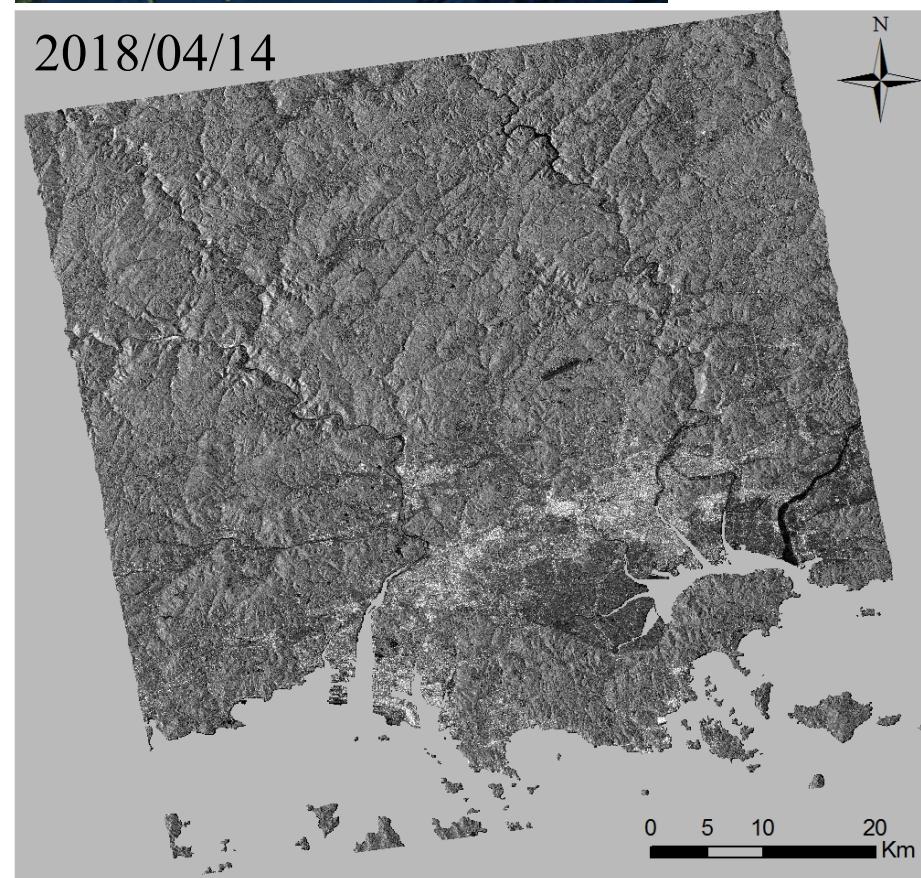
Contents

- Extraction of areas and buildings (Okayama)
- Extraction of land slides (Hiroshima)

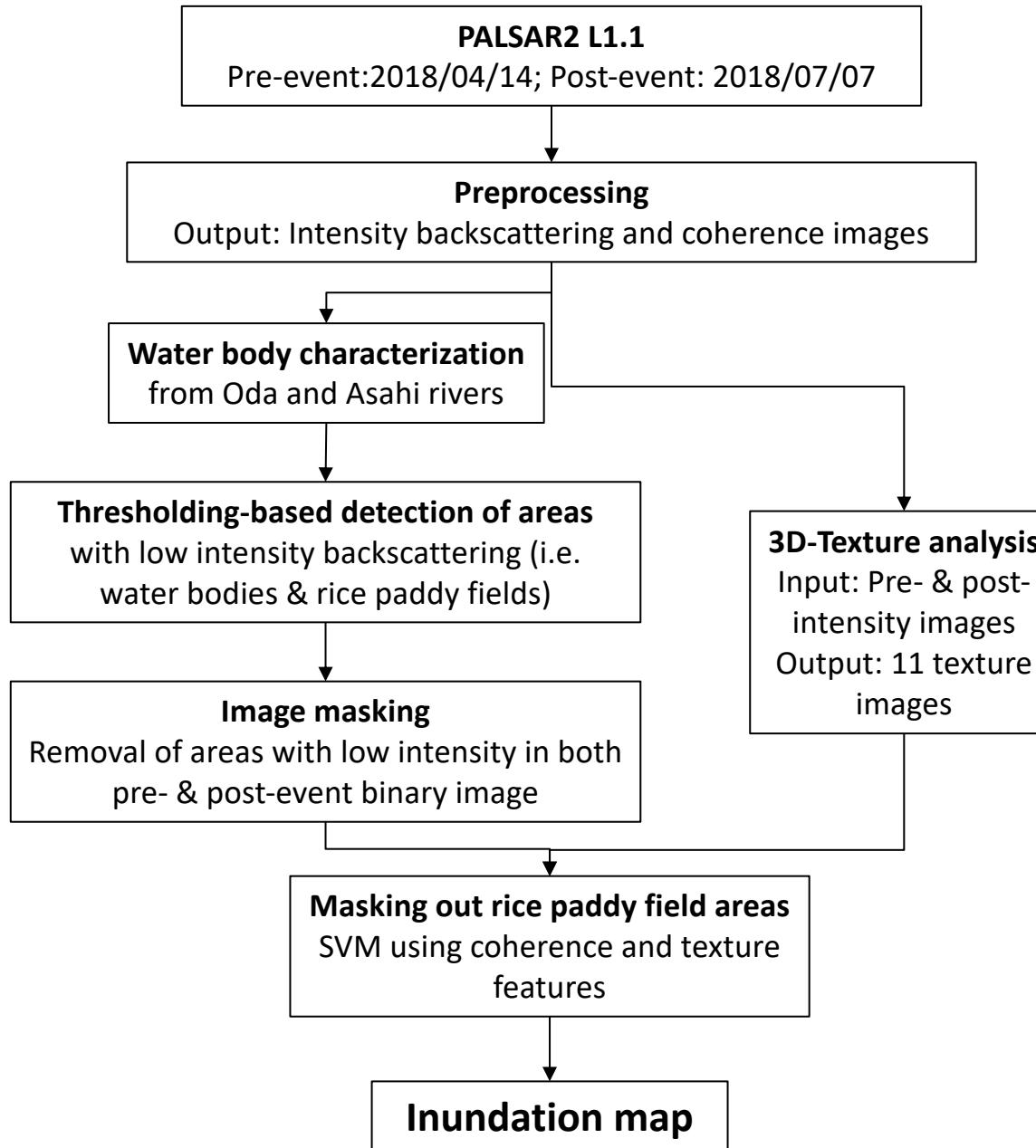




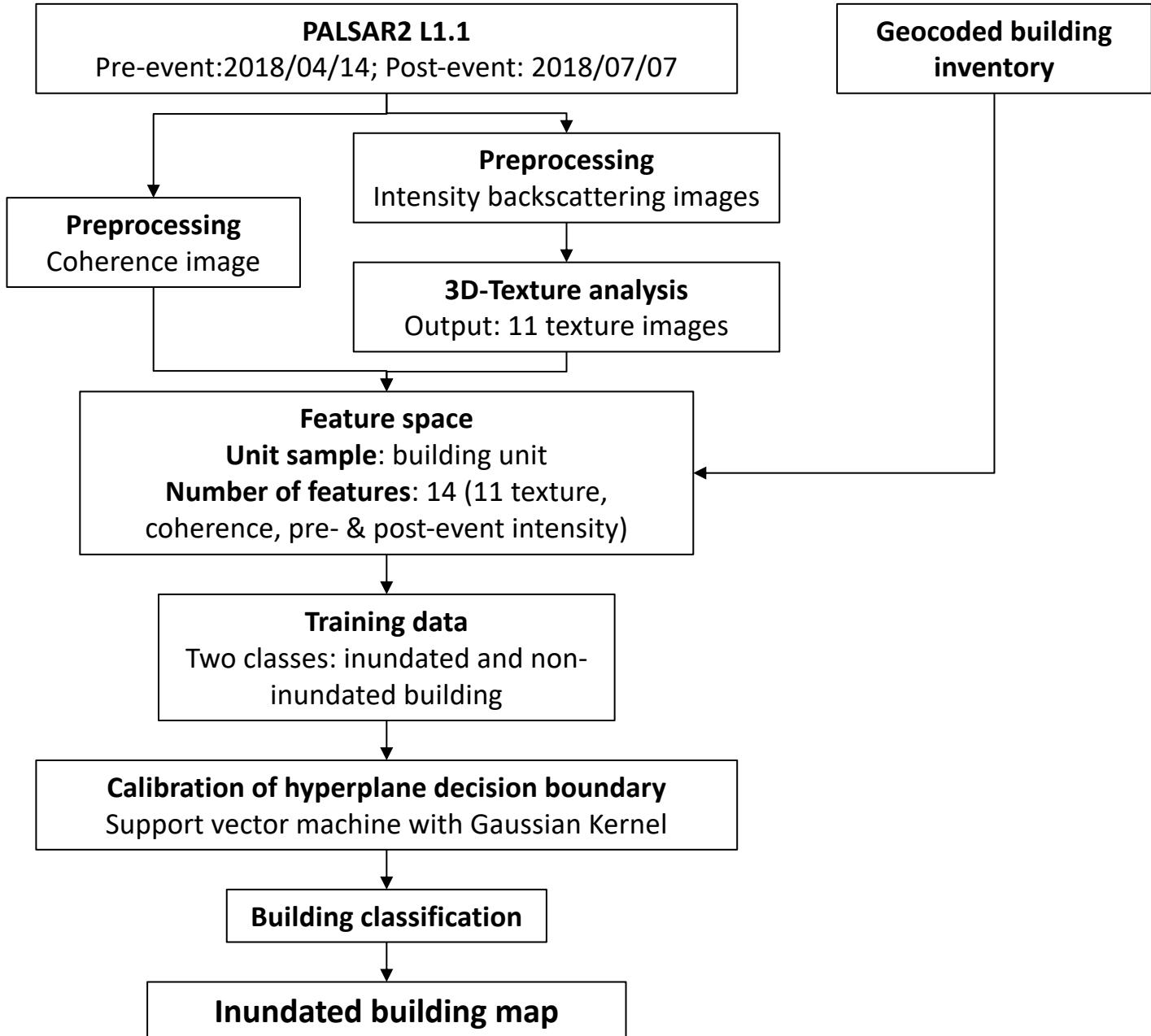
Area Okayama



Method 1: Flood-based water body detection

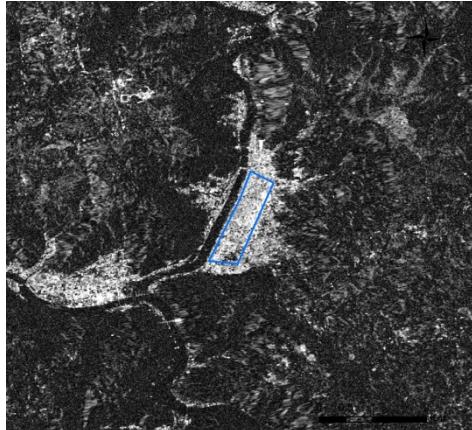


Method 2: Inundated building detection

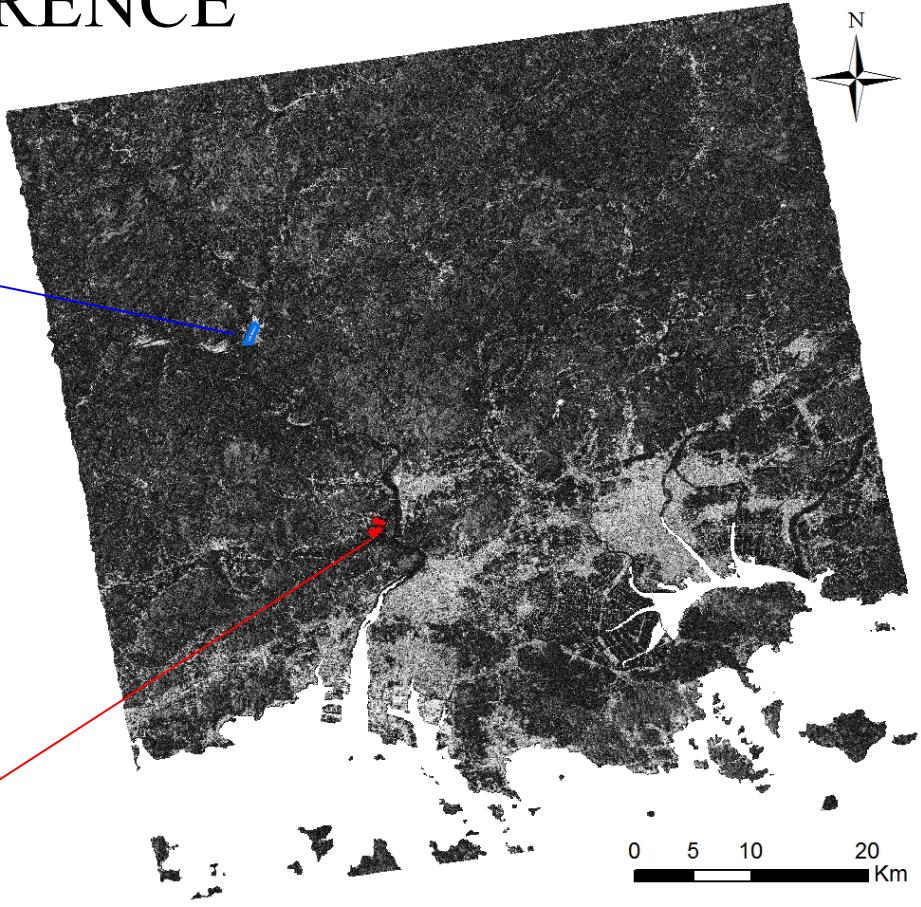
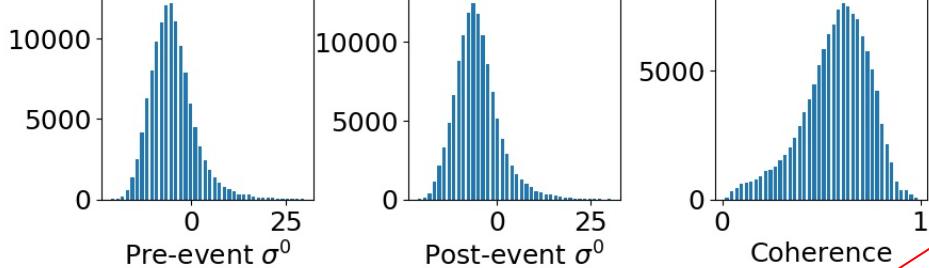


COHERENCE

Non-flooded
urban area



Non-flooded urban area



Flooded urban area

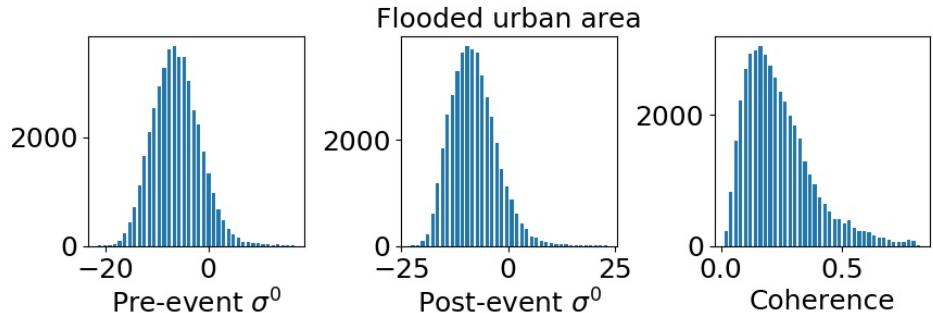
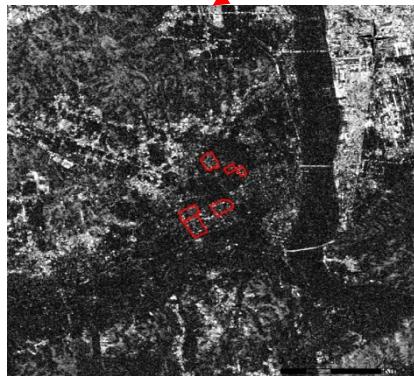
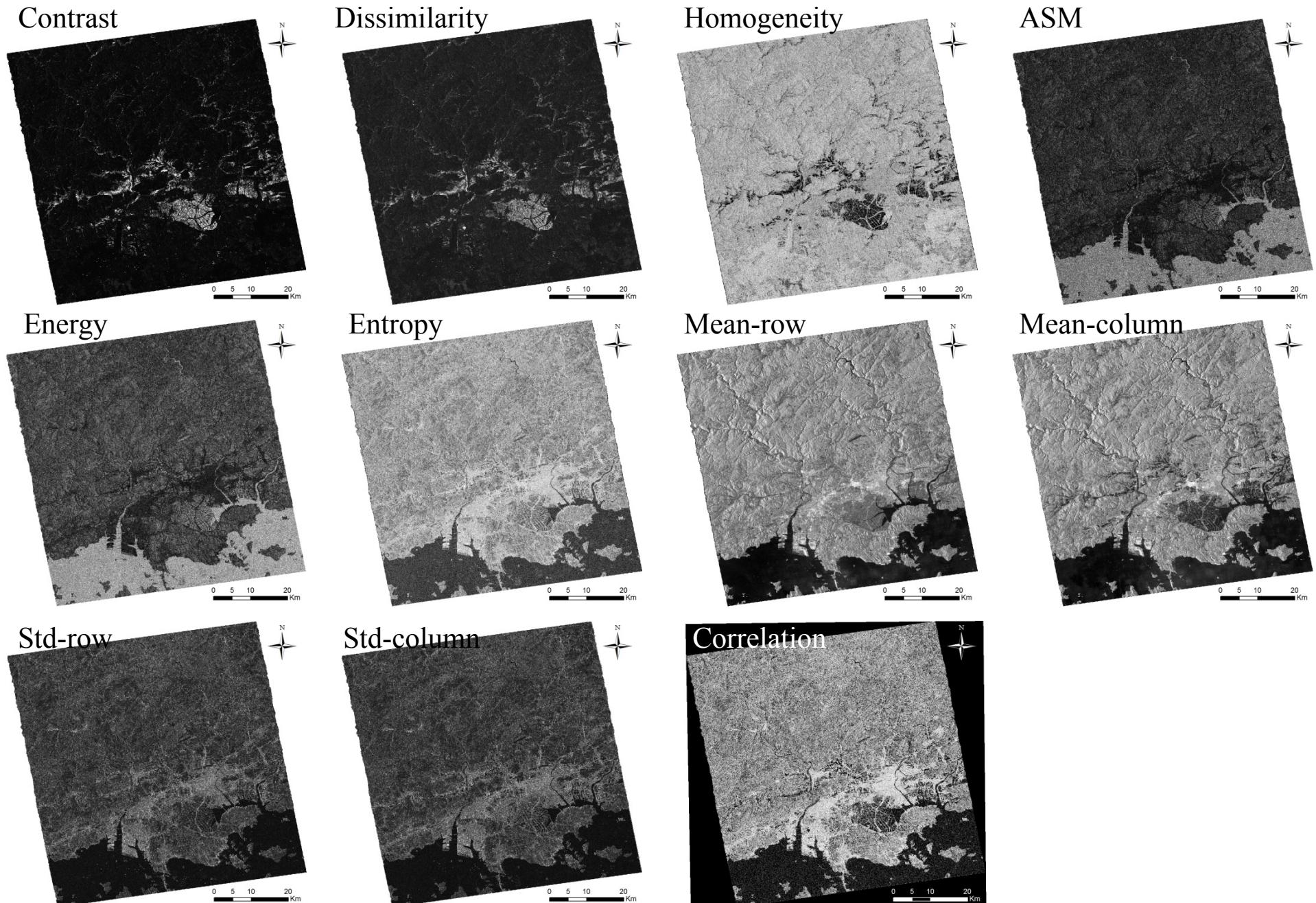


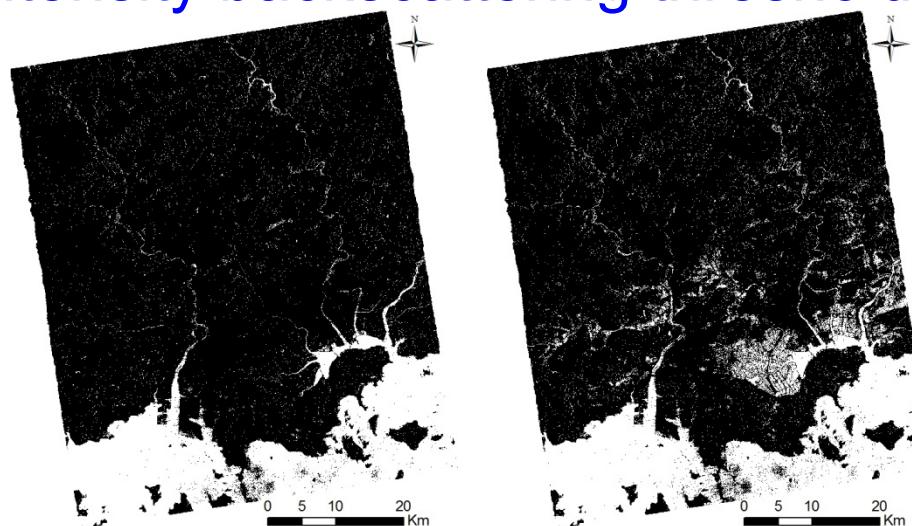
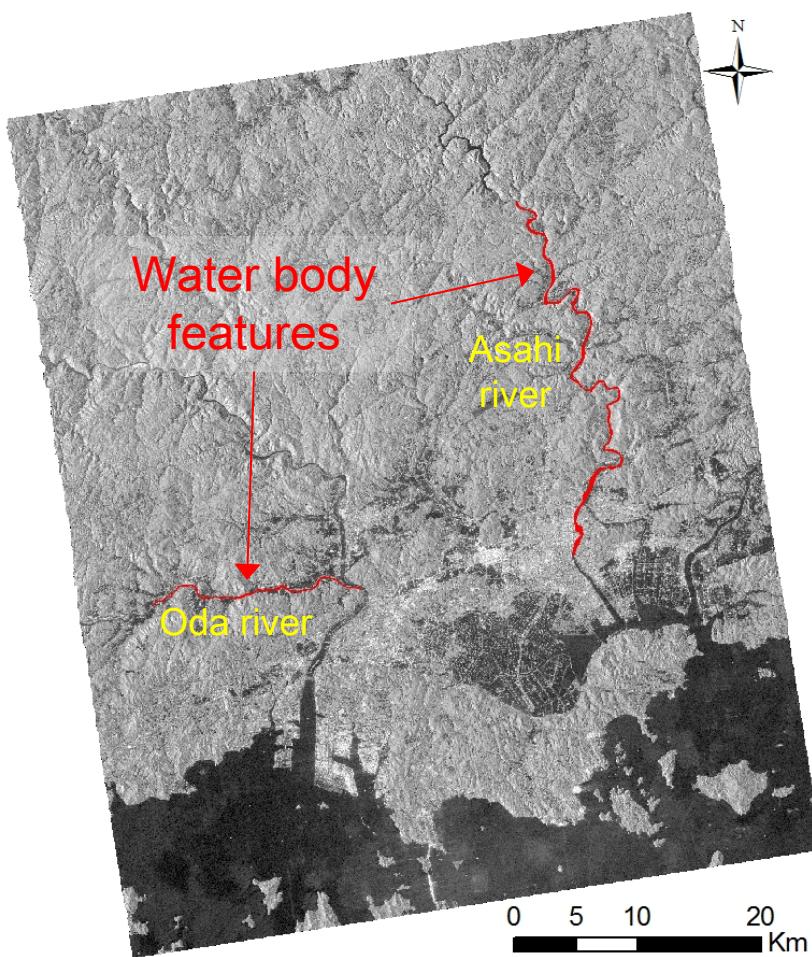
Photo Source: SFGATE news

THREE-DIMENSIONAL TEXTURE ANALYSIS

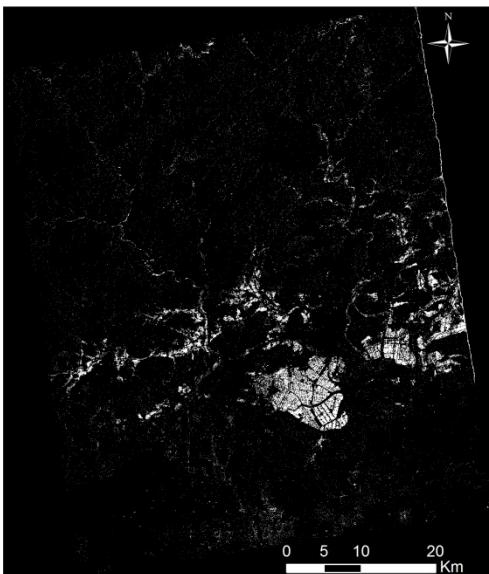


Water-Body-based Identification of Inundation Zone

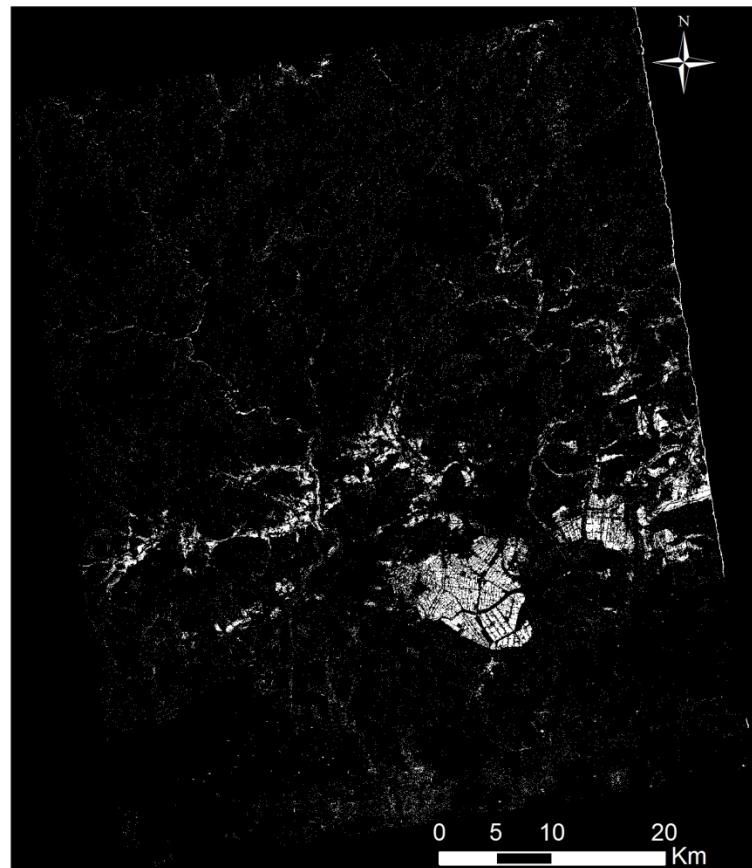
Intensity backscattering threshold



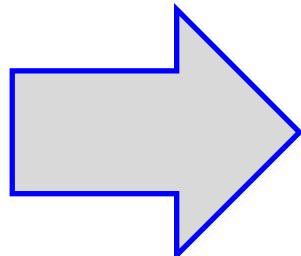
Difference of
images



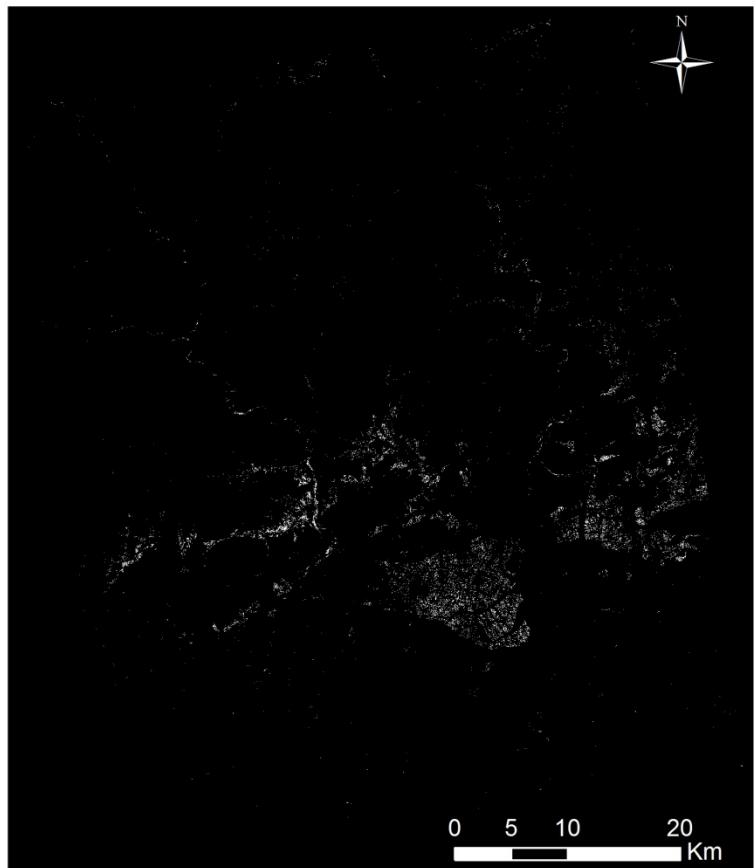
Water-Body-based Identification of Inundation Zone



Water body
+
Rice paddy fields

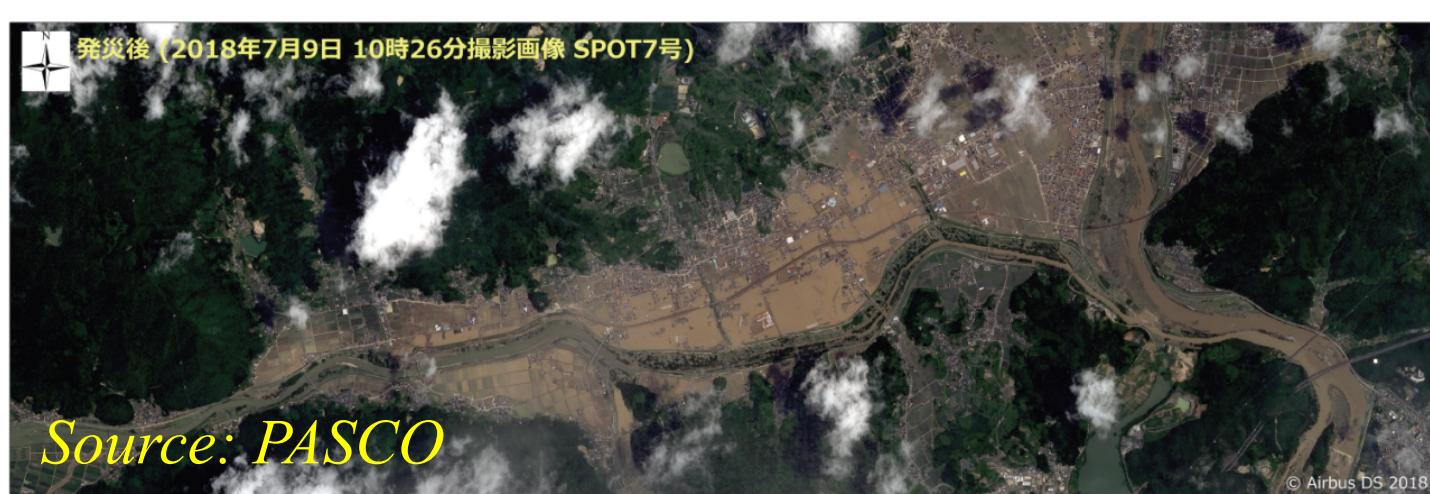
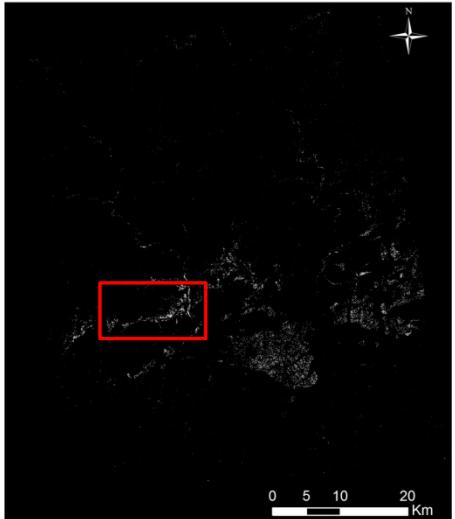
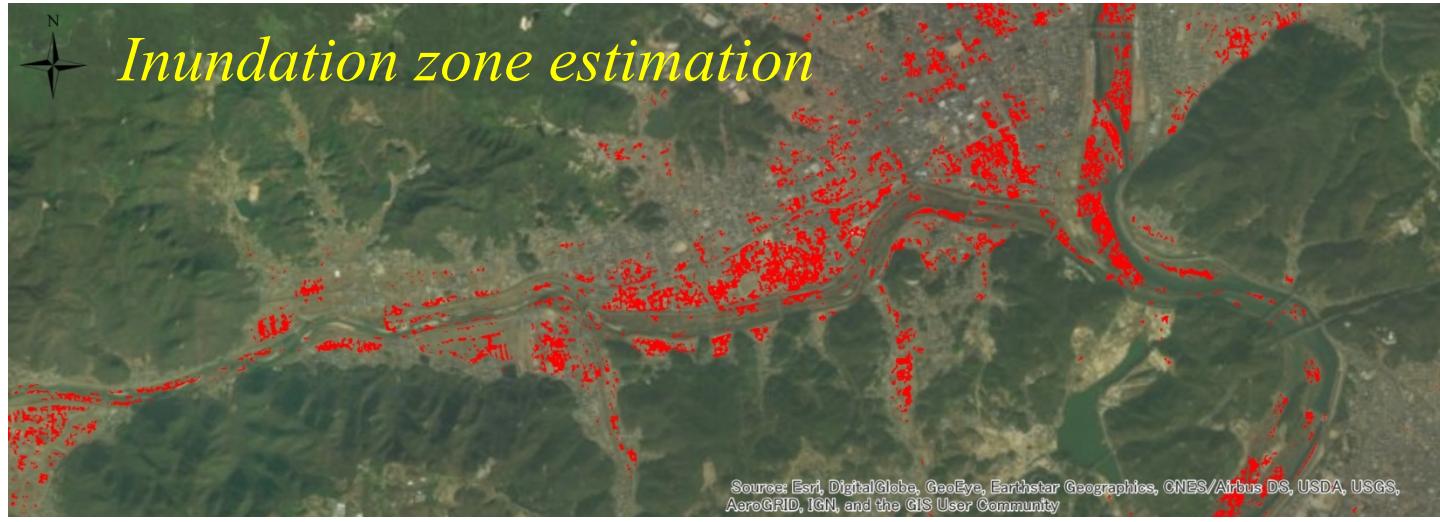
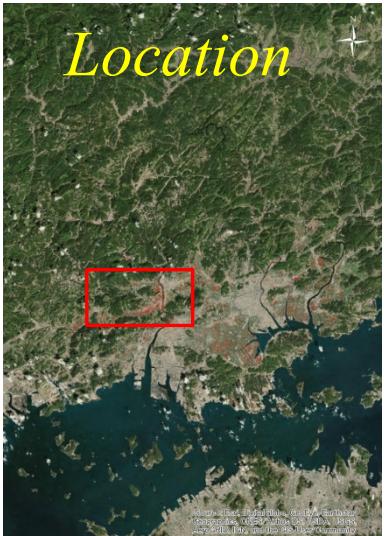


Supervised
Learning
Using
coherence
and
3D-texture
features



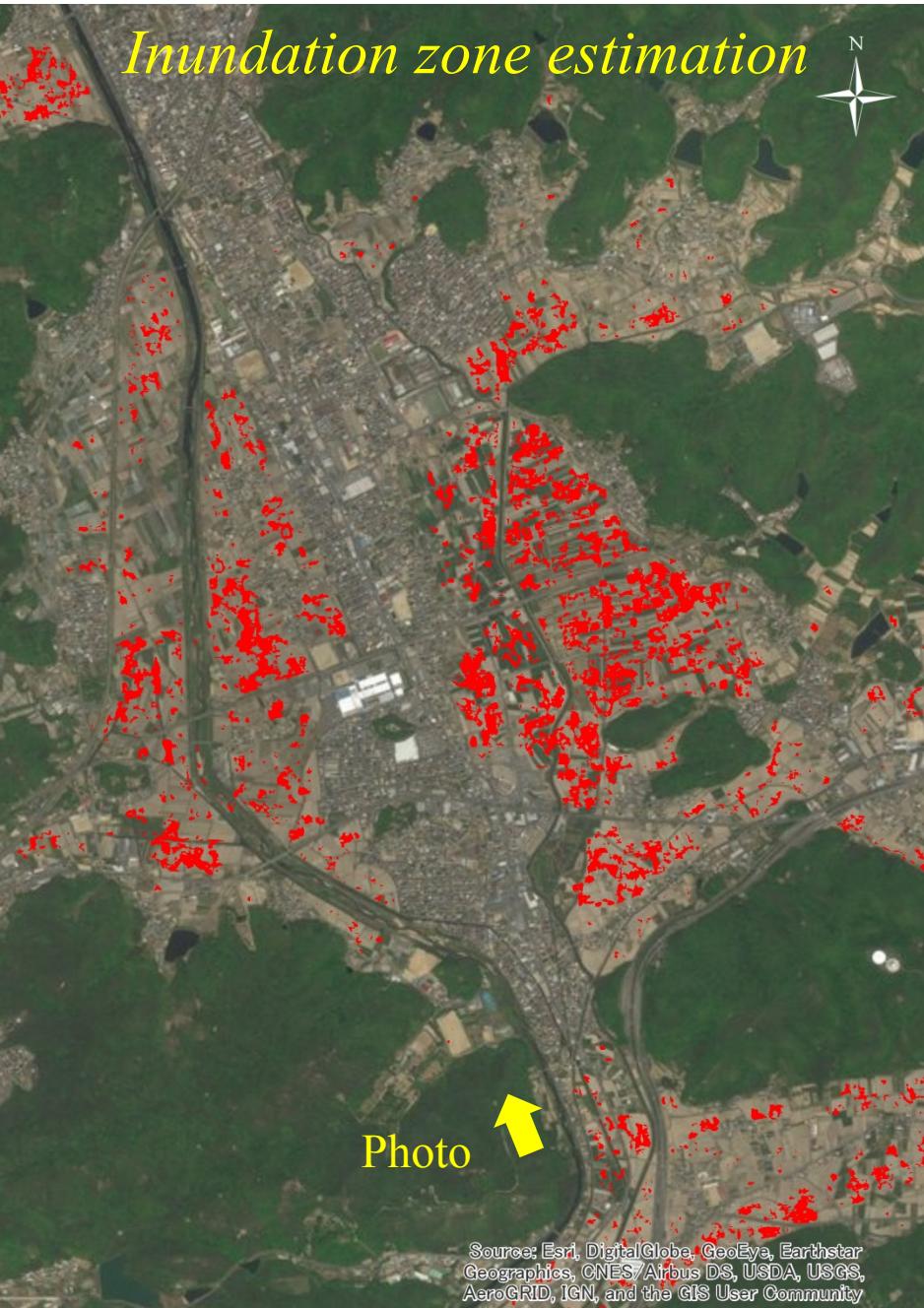
Water body

Water-Body-based Identification of Inundation Zone

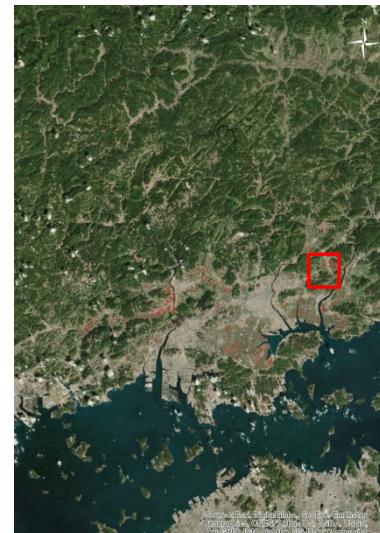


Water-Body-based Identification of Inundation Zone Location

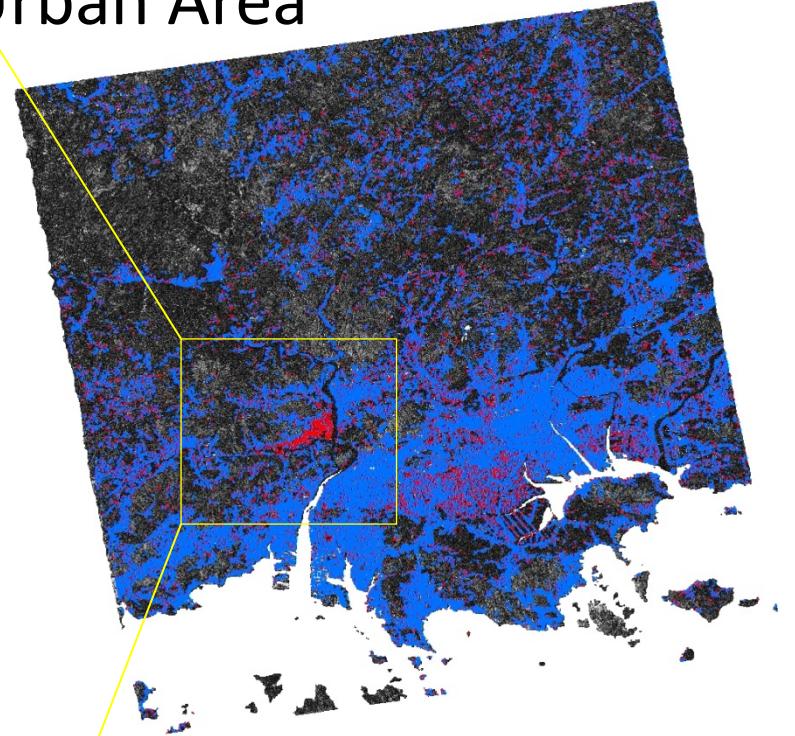
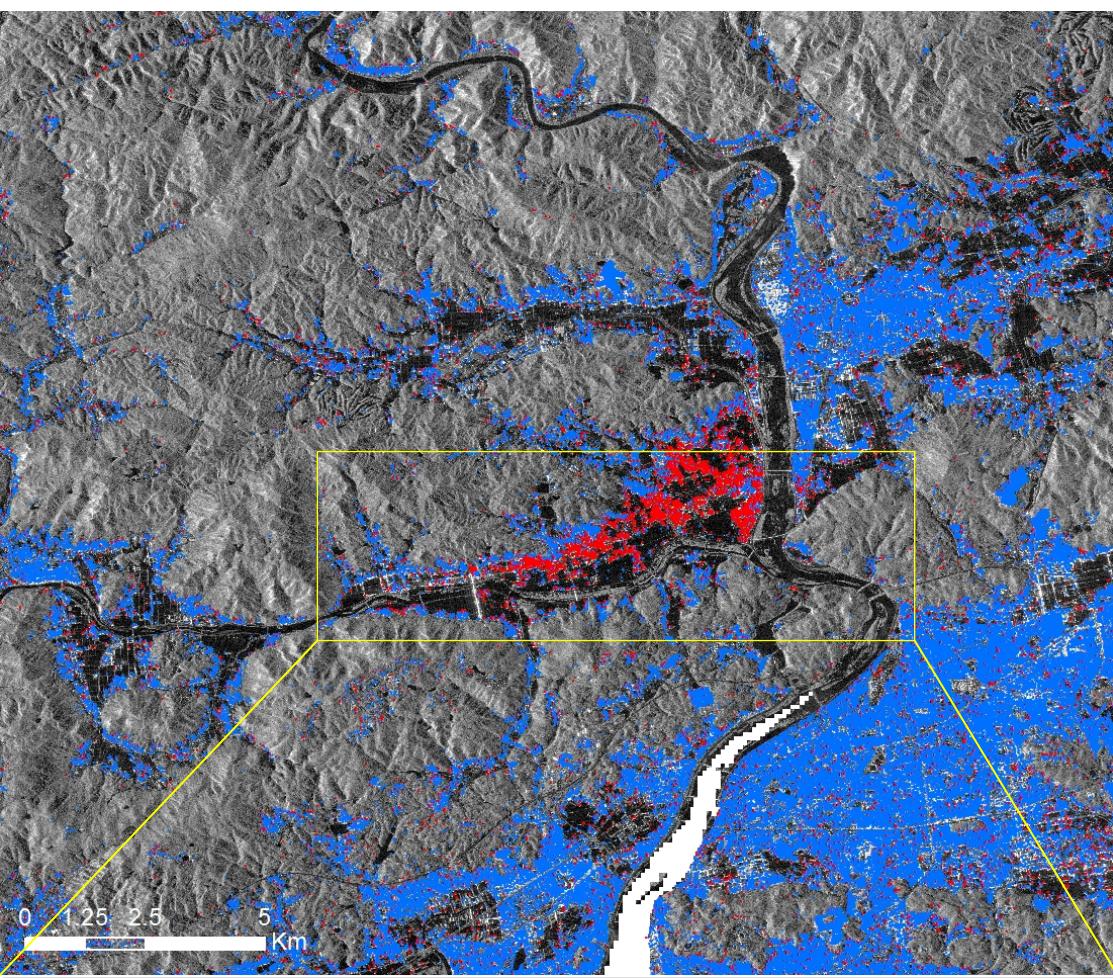
Inundation zone estimation



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Results Method 2 – Urban Area



- Inundated
- Non-inundated

Support Vector Machine Training database:

- Inundated buildings: 421 samples
- Non-inundated buildings: 1047 samples
- Number of features per sample: 14

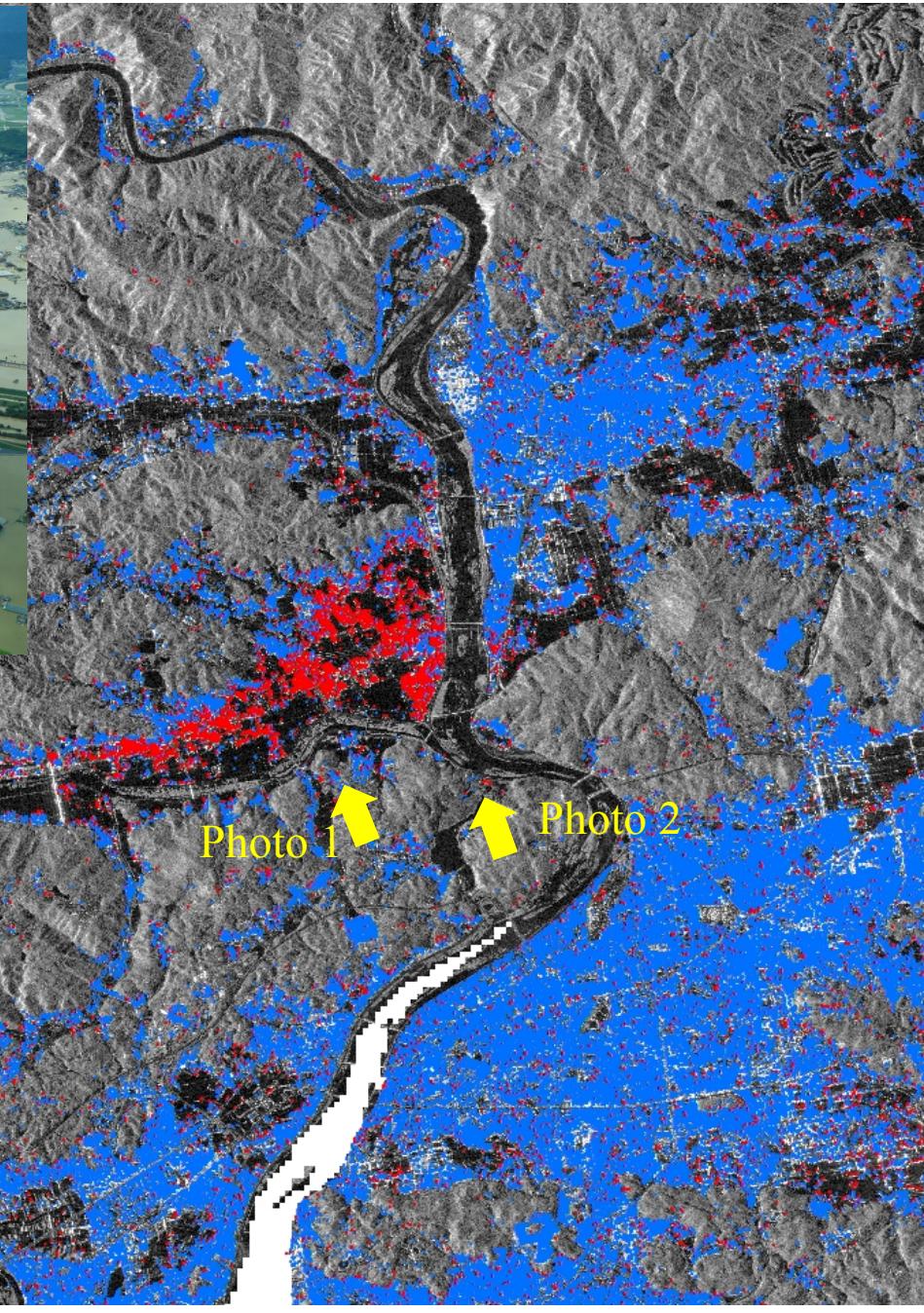
Source: PASCO

IMAGES FROM ASIA AIR SURVEY Co. LTD.

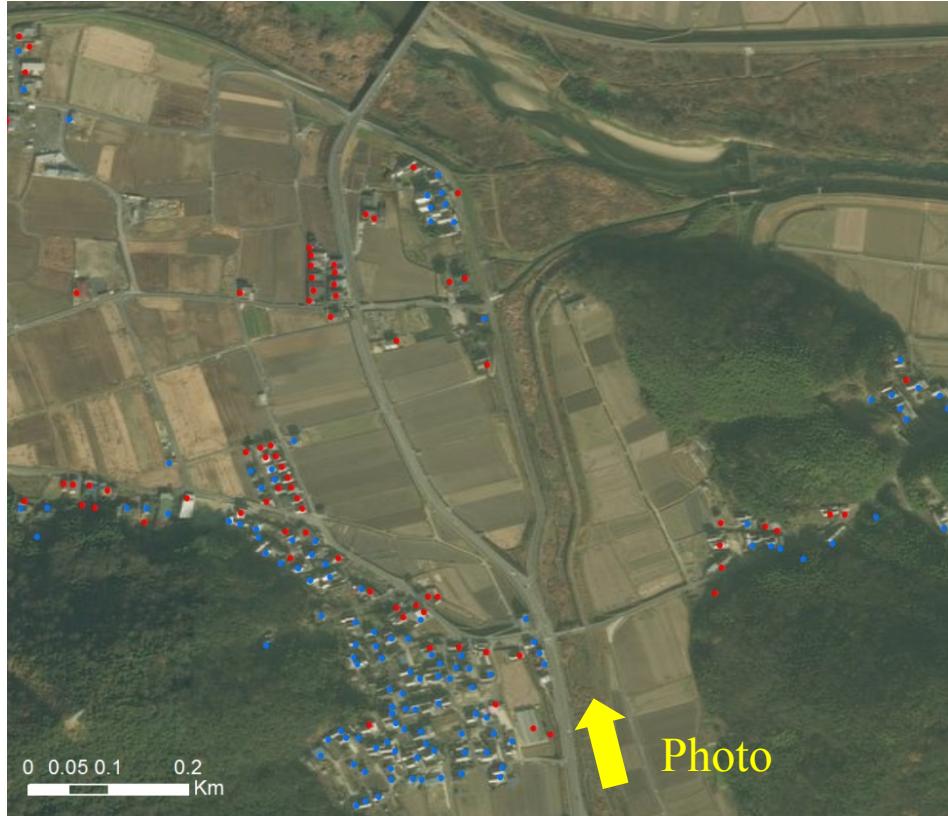
Photo 1



Photo 2



Results Method 2



Inundated building mapping from
ALOS-PALSAR 2

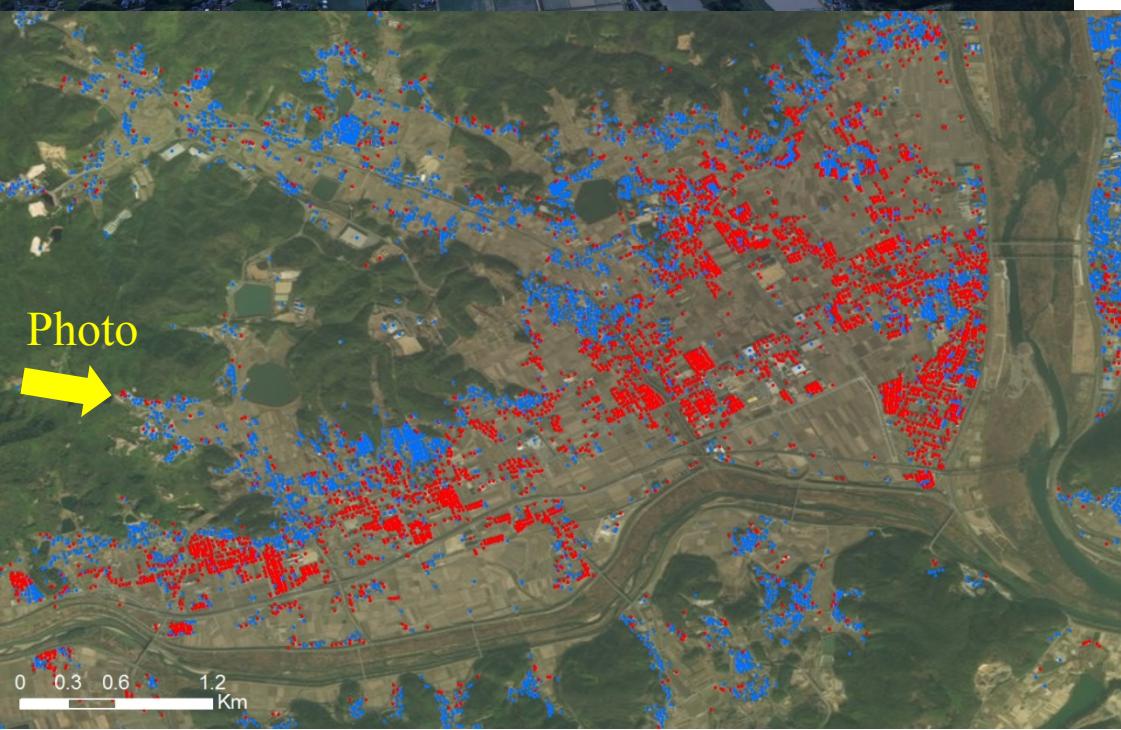
- Inundated
- Non-inundated





Results Method 2

Photo from Asia Air Survey Co. Ltd.



Inundated building mapping from
ALOS-PALSAR 2

Area



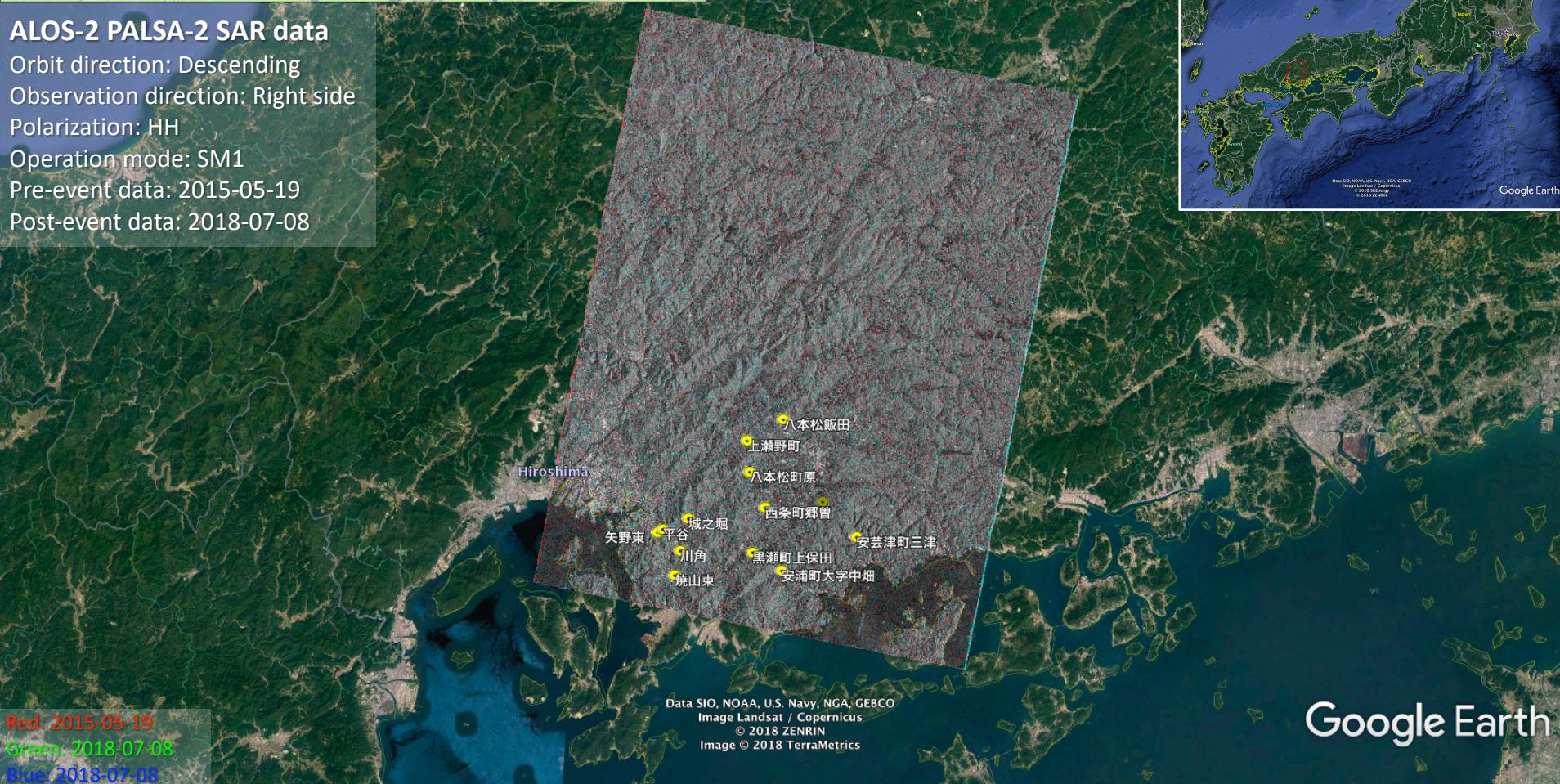
JAXA data area

Data (including in-situ information)



ALOS-2 PALSA-2 SAR data

Orbit direction: Descending
Observation direction: Right side
Polarization: HH
Operation mode: SM1
Pre-event data: 2015-05-19
Post-event data: 2018-07-08



Data (including in-situ information)

黒瀬町上保田



西条町福本



安芸津町三津



八本松飯田



西条町郷曾



安浦町大字中畠



Data (including in-situ information)

焼山東



城之堀



平谷



川角



上瀬野町



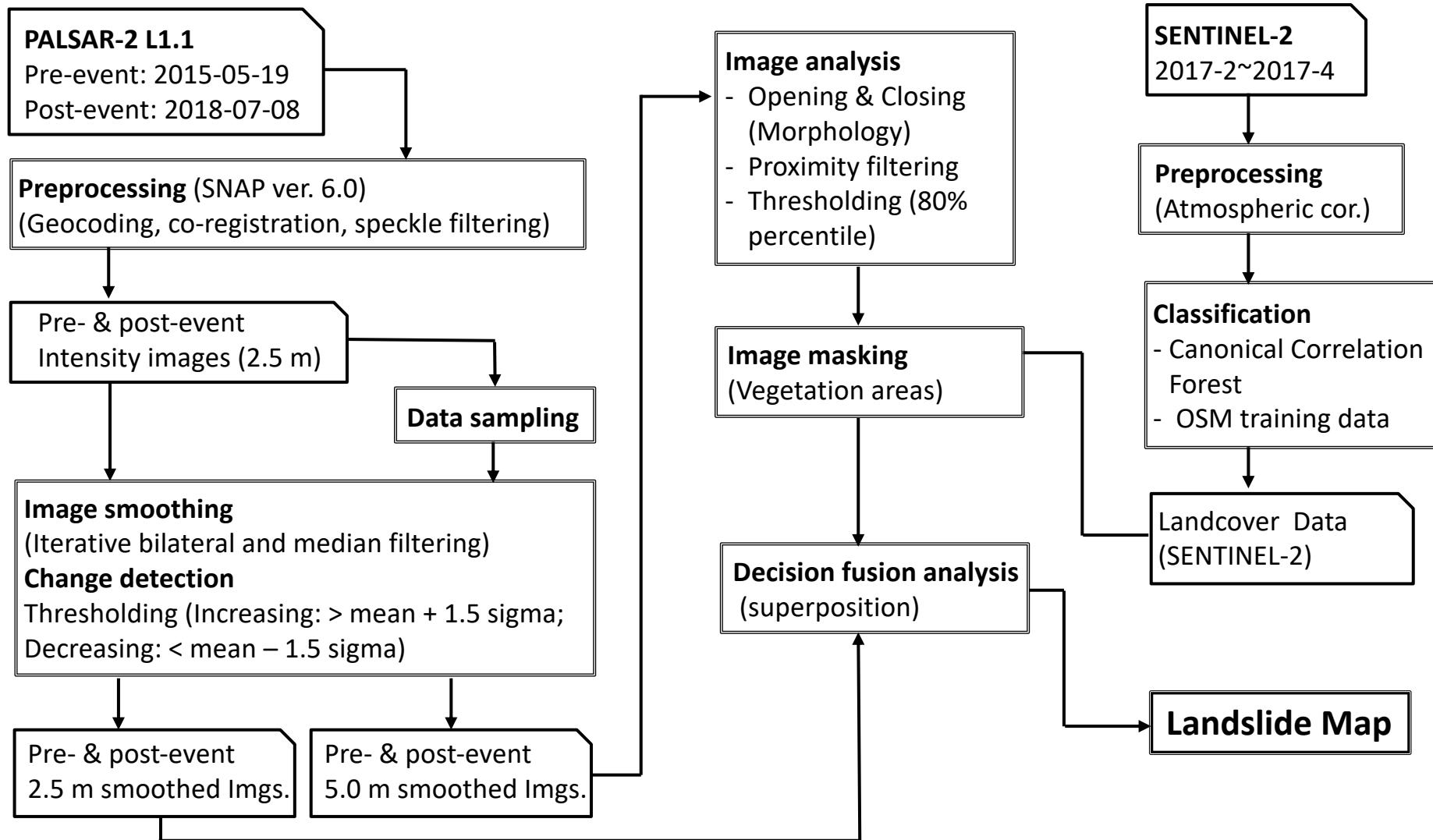
矢野東



Method

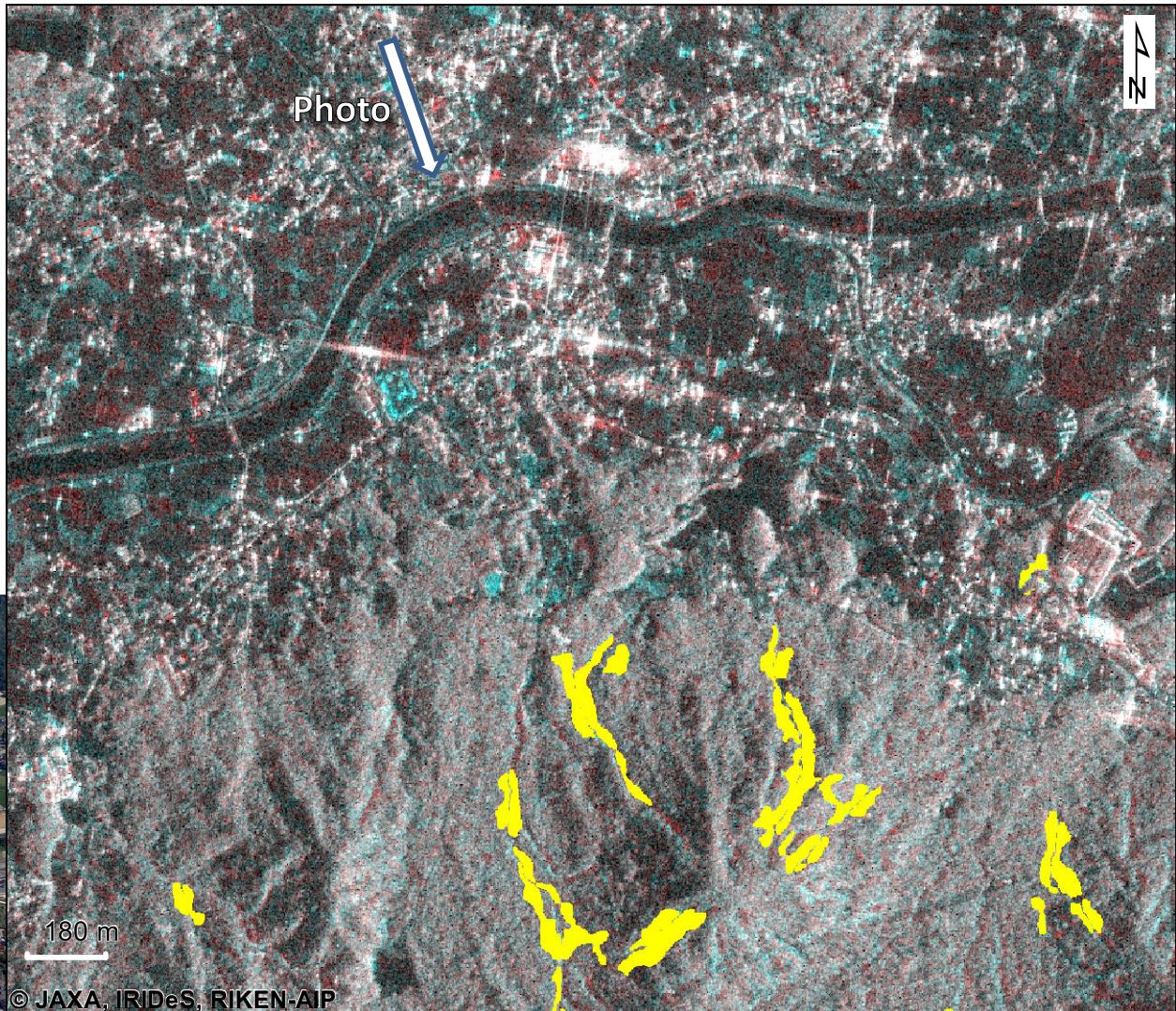
- Preprocessing with SNAP
- Filtering to make intensity imagery smooth
 - Iterative bilateral filtering on intensity imagery
 - Median filtering
- Detection of pixels with large intensity changes
 - Thresholding (Increasing: $> \text{mean} + 1.5 \text{ sigma}$; Decreasing: $< \text{mean} - 1.5 \text{ sigma}$)
- Postprocessing (Image analysis)
 - Opening & Closing (Morphology)
 - Remove segments that are not surrounded by opposite-change segments (we assume that landslides lead to both increase and decrease in intensity)
 - Remove small segments using 80 percentile

Method



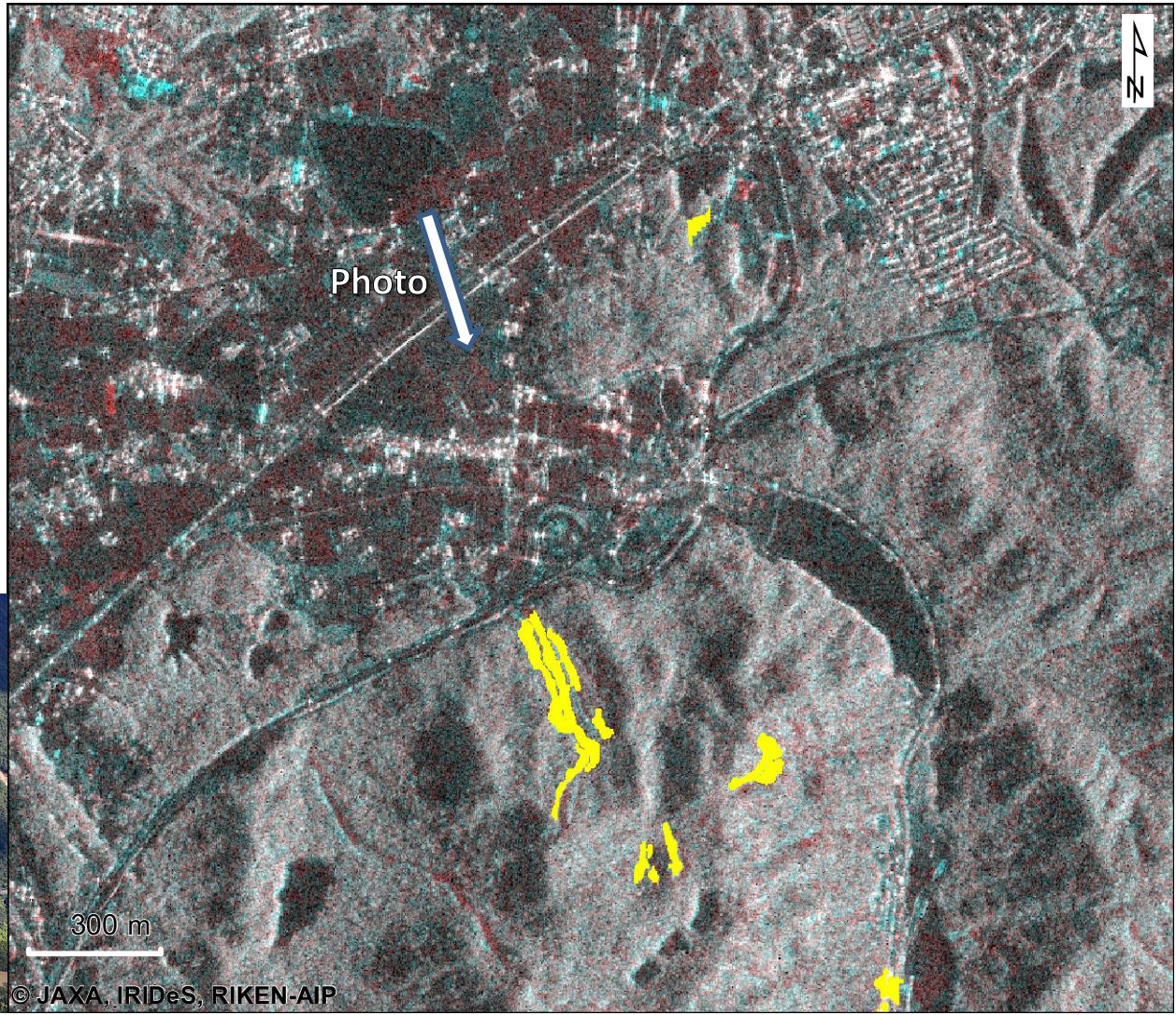
Results

広島県東広島市
黒瀬町上保田



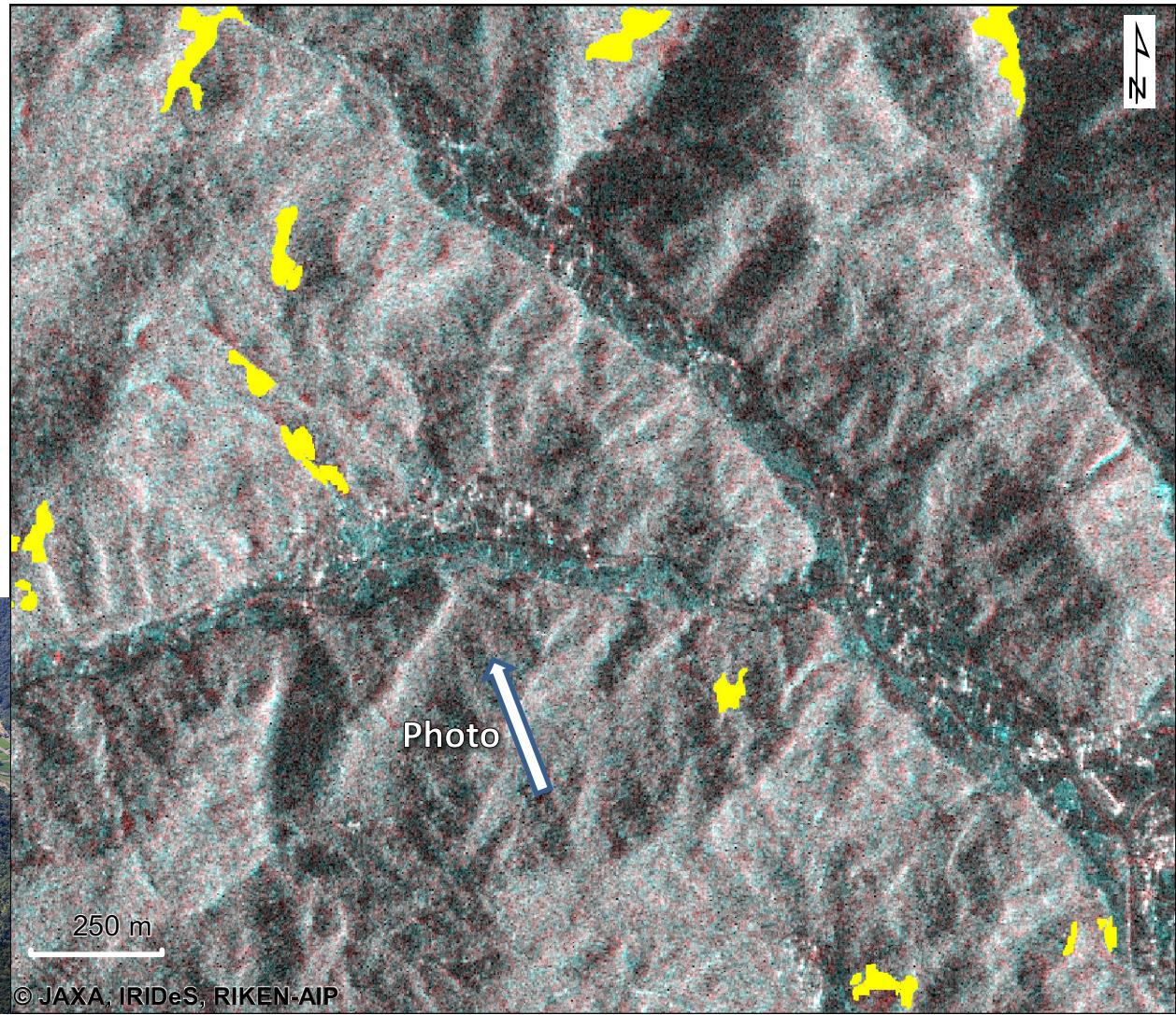
Results

広島県東広島市
西条町福本



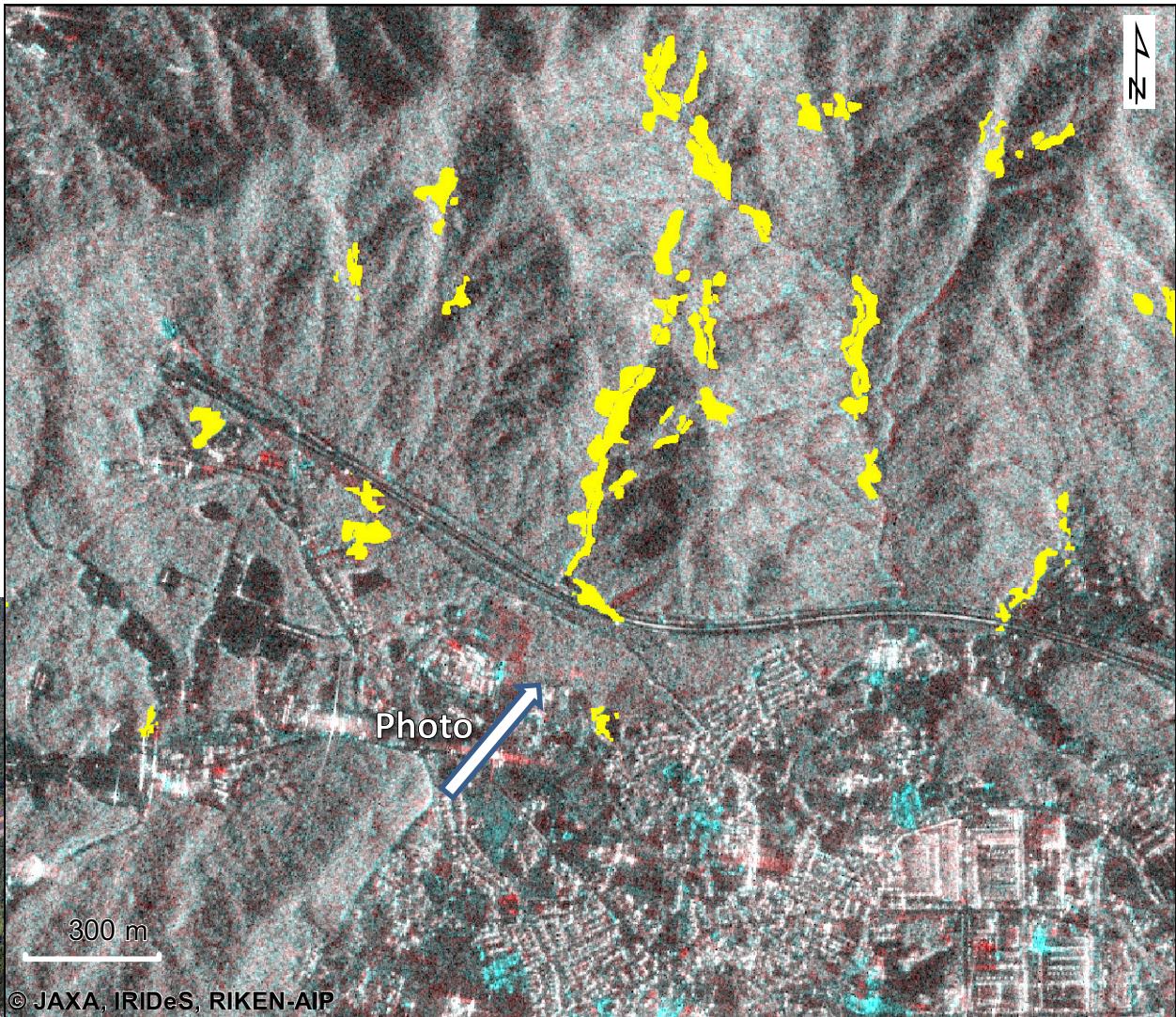
Results

広島県東広島市
安芸津町三津



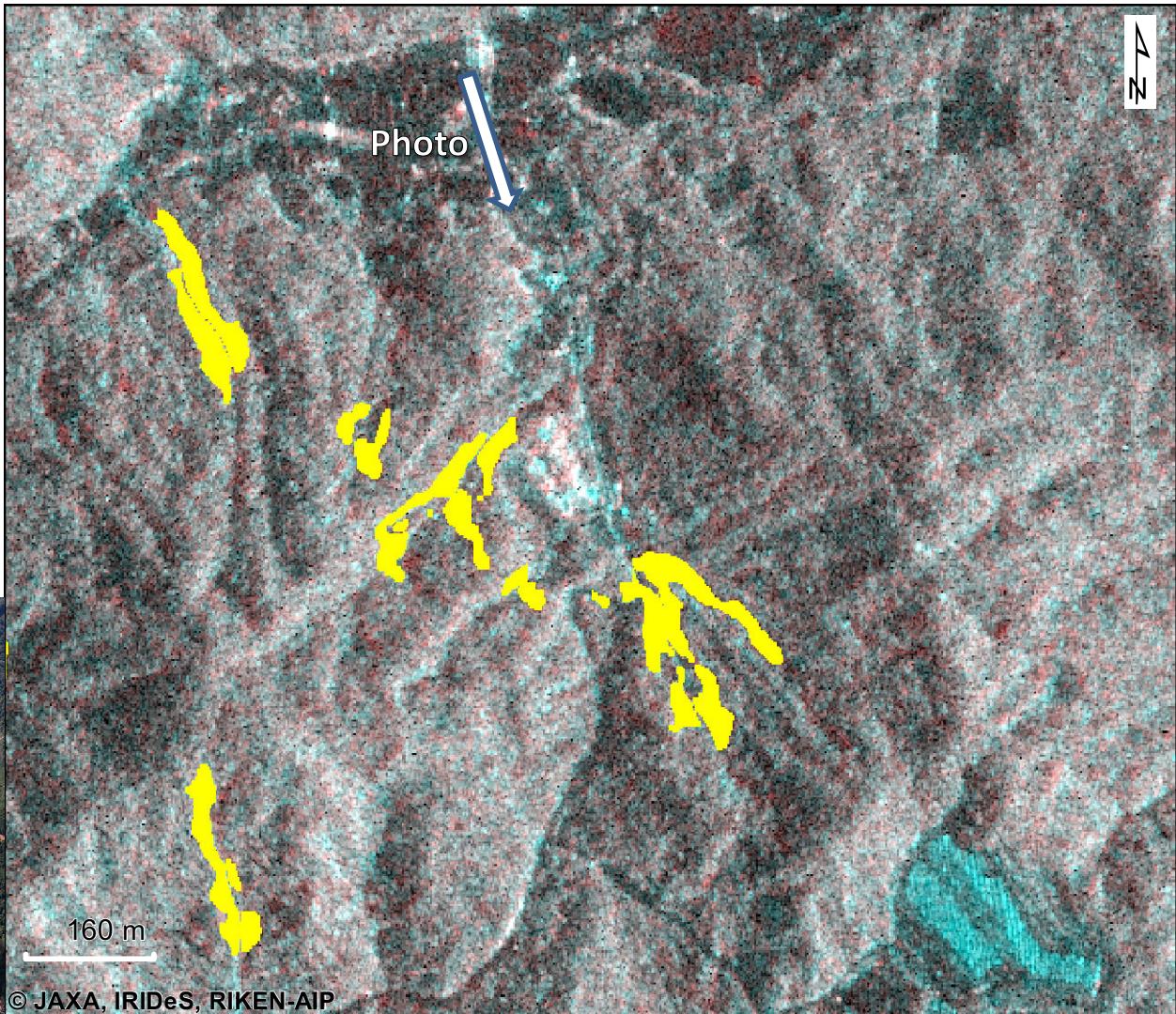
Results

広島県東広島市
八本松飯田



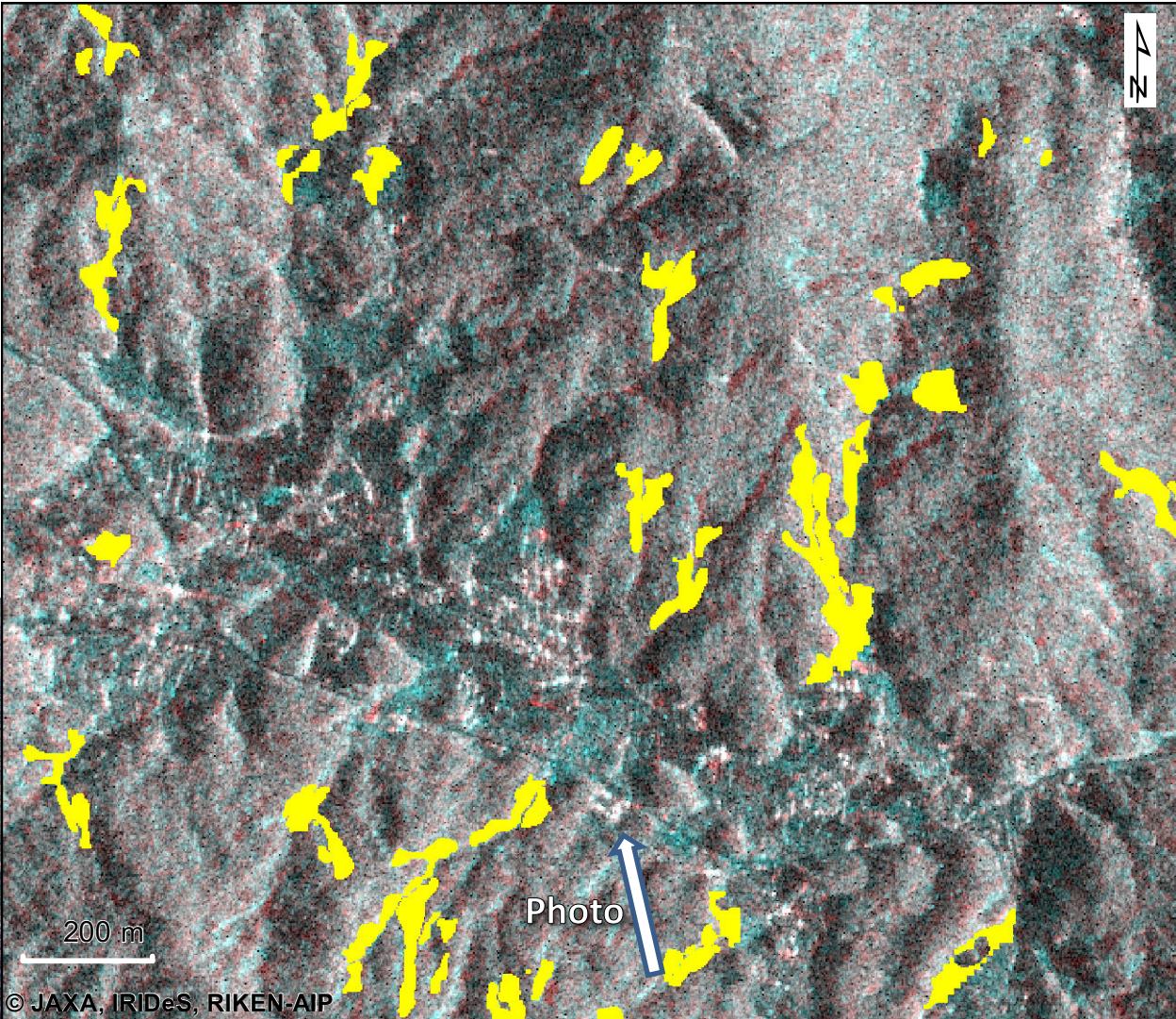
Results

広島県東広島市
西条町郷曾



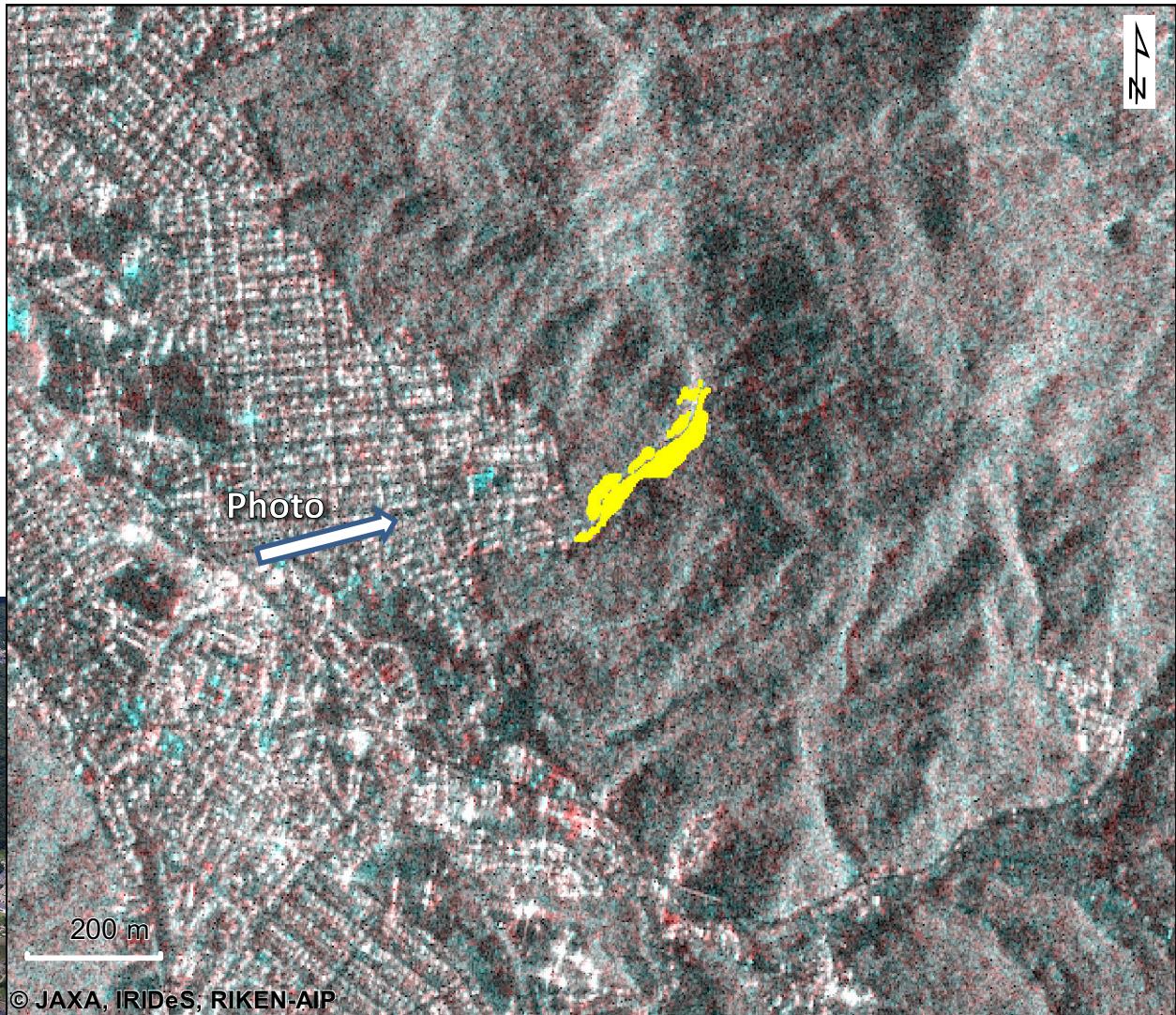
Results

広島県呉市
安浦町大字中畠



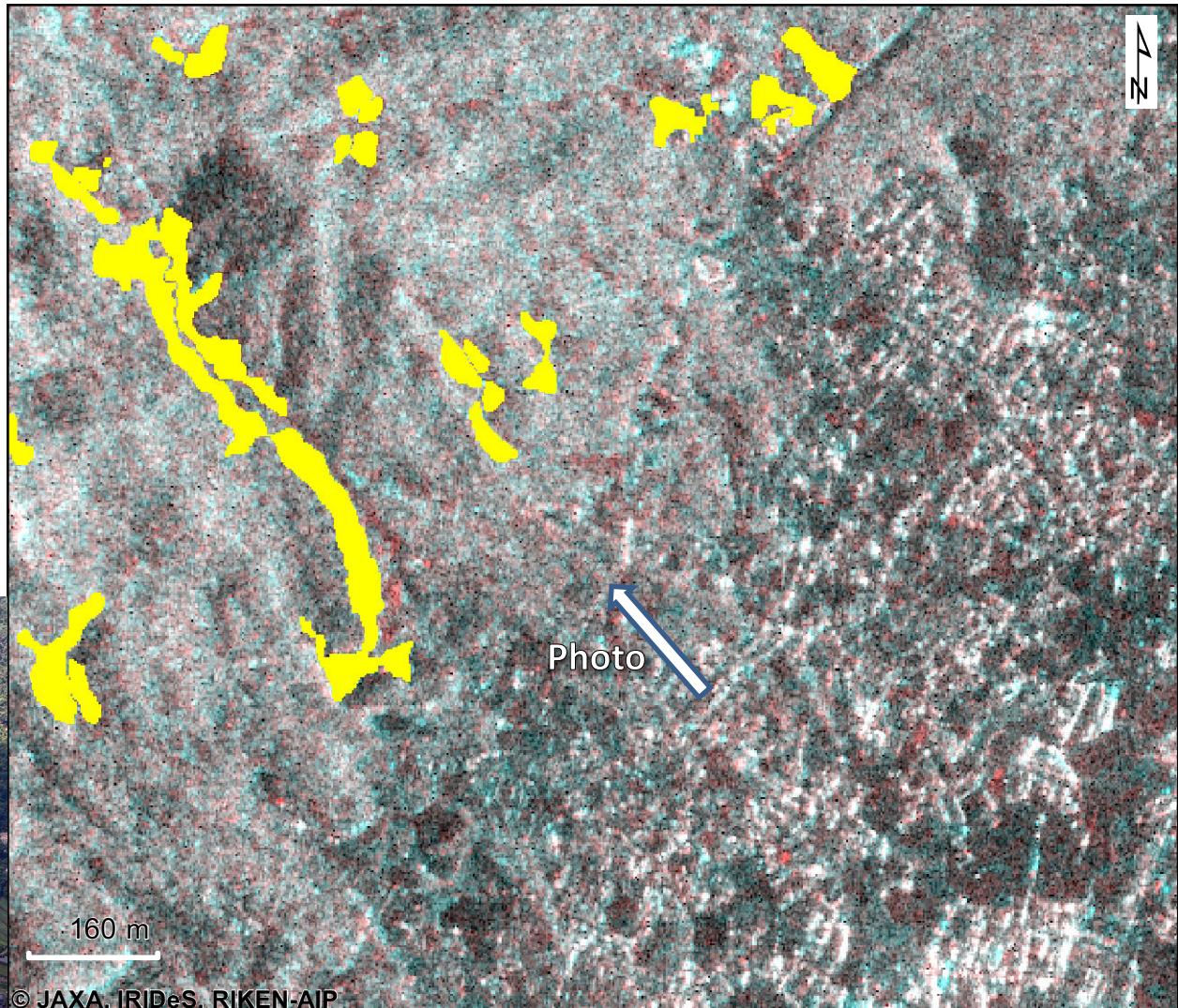
Results

広島県呉市
焼山東



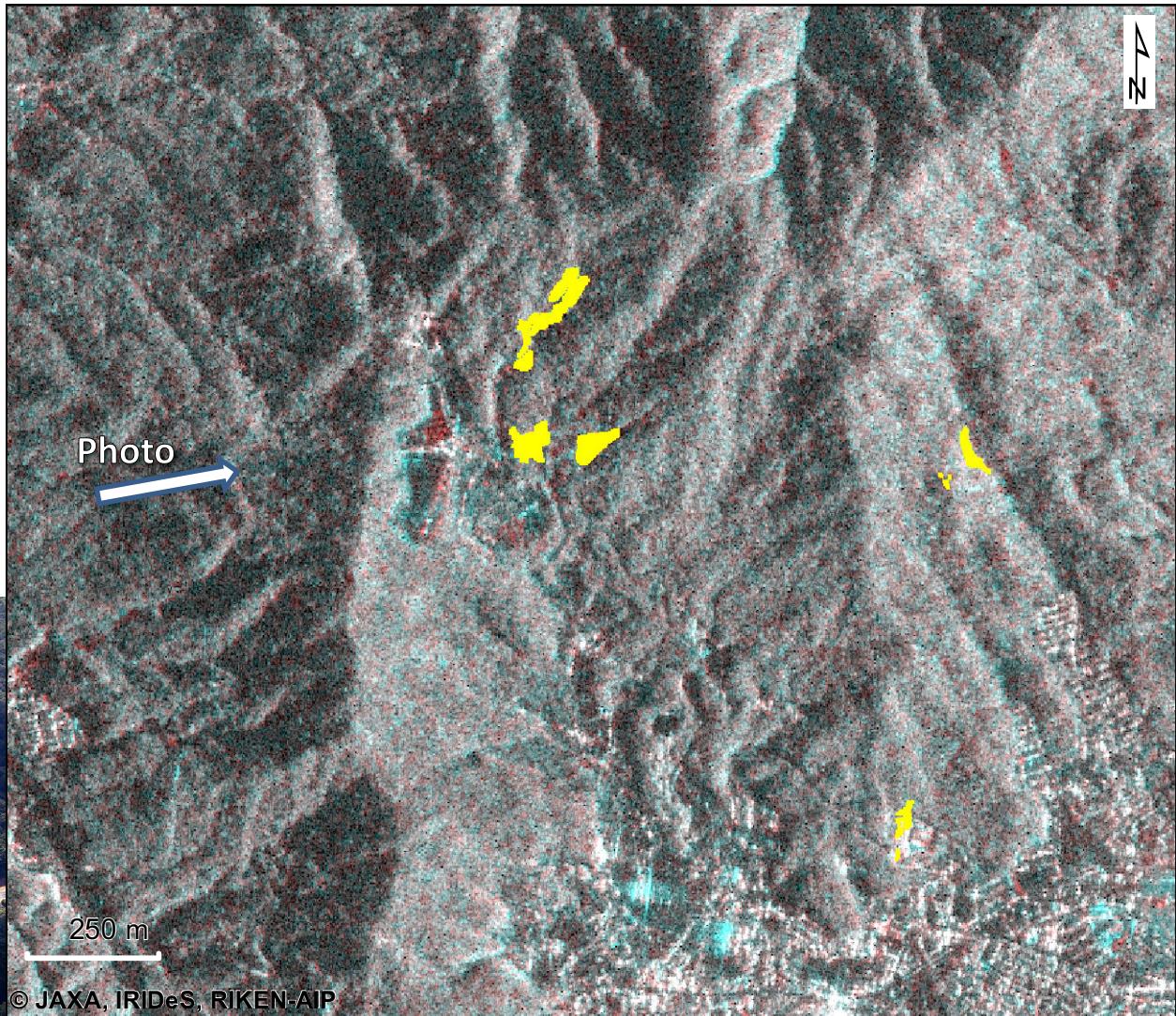
Results

広島県安芸郡熊野町
城之堀



Results

広島県安芸郡熊野町
平谷

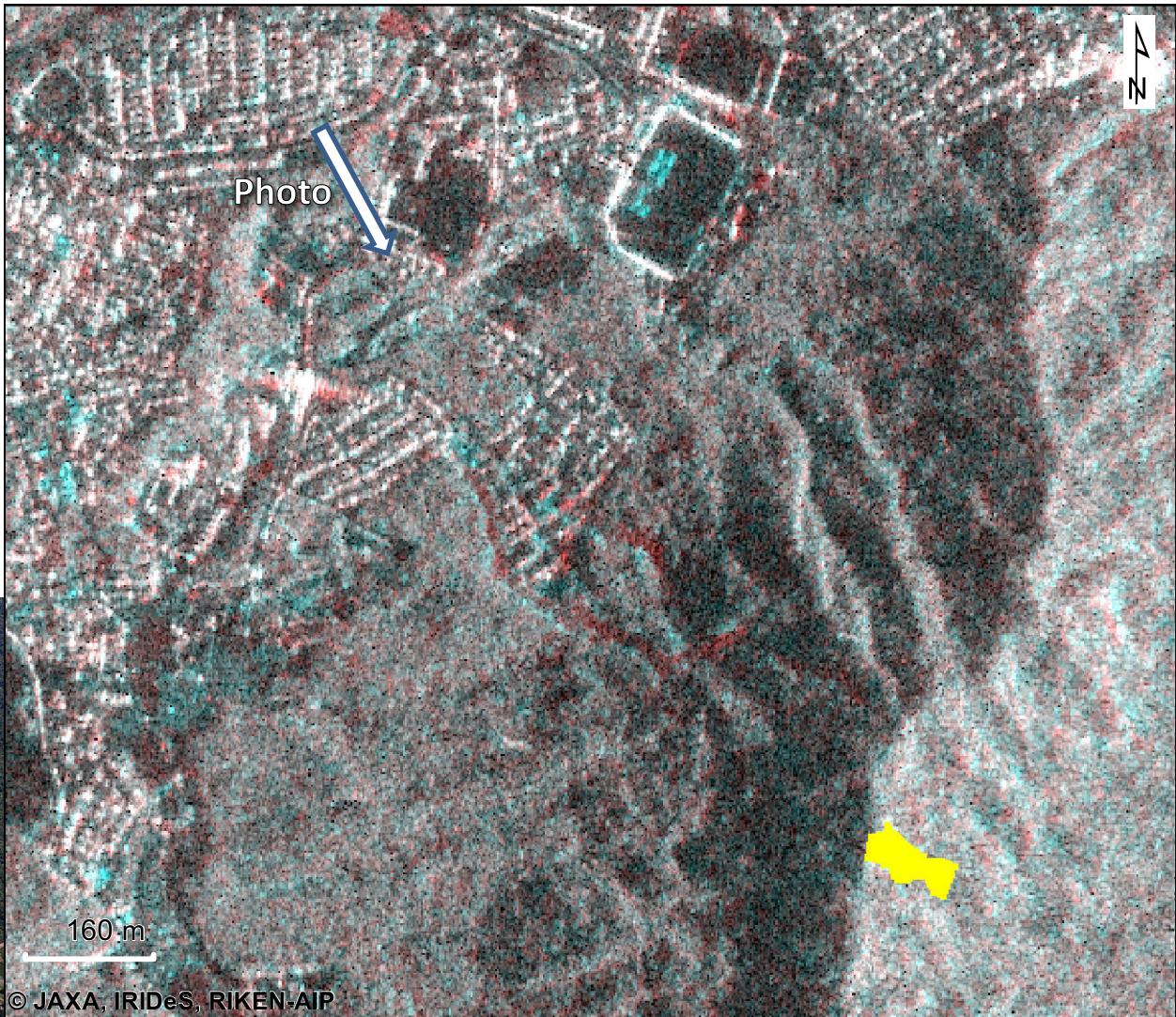


Results

広島県安芸郡熊野町
川角

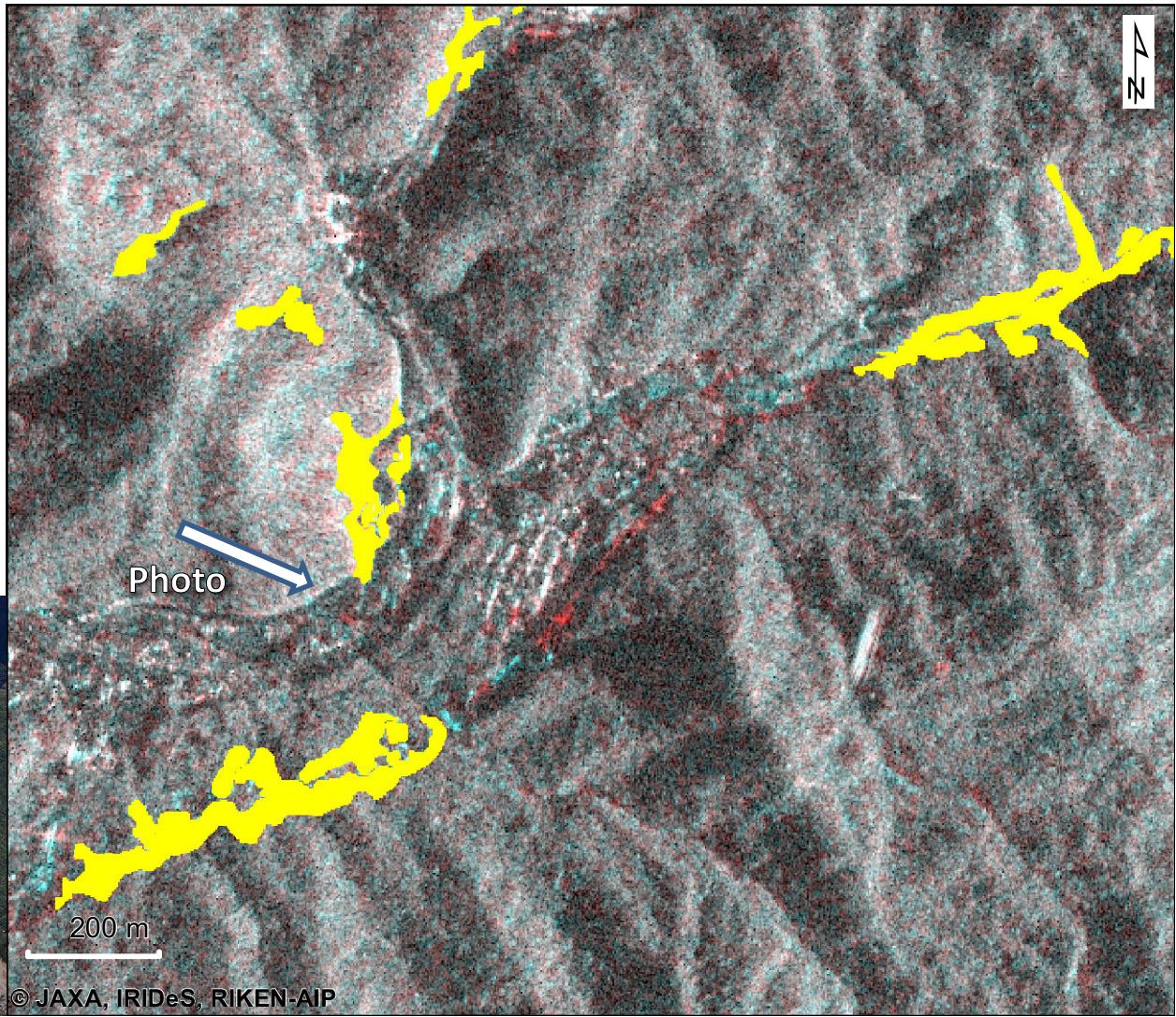


写真提供: 株式会社パスコ



Results

広島県広島市安芸区
上瀬野町



Results

広島県広島市安芸区
矢野東

