



A high-resolution nationwide compound flooding forecast system in Japan

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What we do

1 Assess the impact of natural perils...

Elemental
(earth, water,
air, fire)

Biological
(epidemic,
pandemic)

Foundational
(climate change)

2

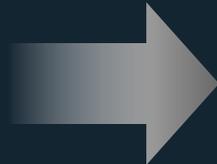
...on companies and communities

3

...by creating a digital twin

4

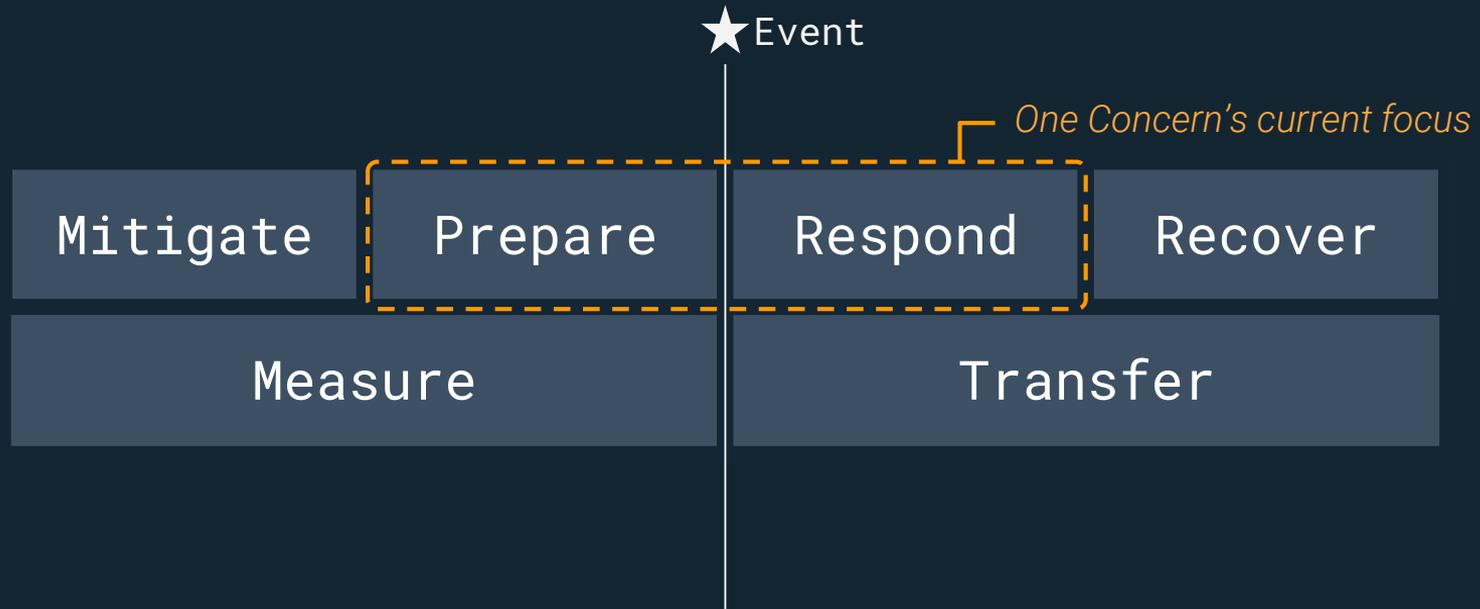
...to identify vulnerabilities...



How we will do it

5

...so organizations can take action to minimize their risk



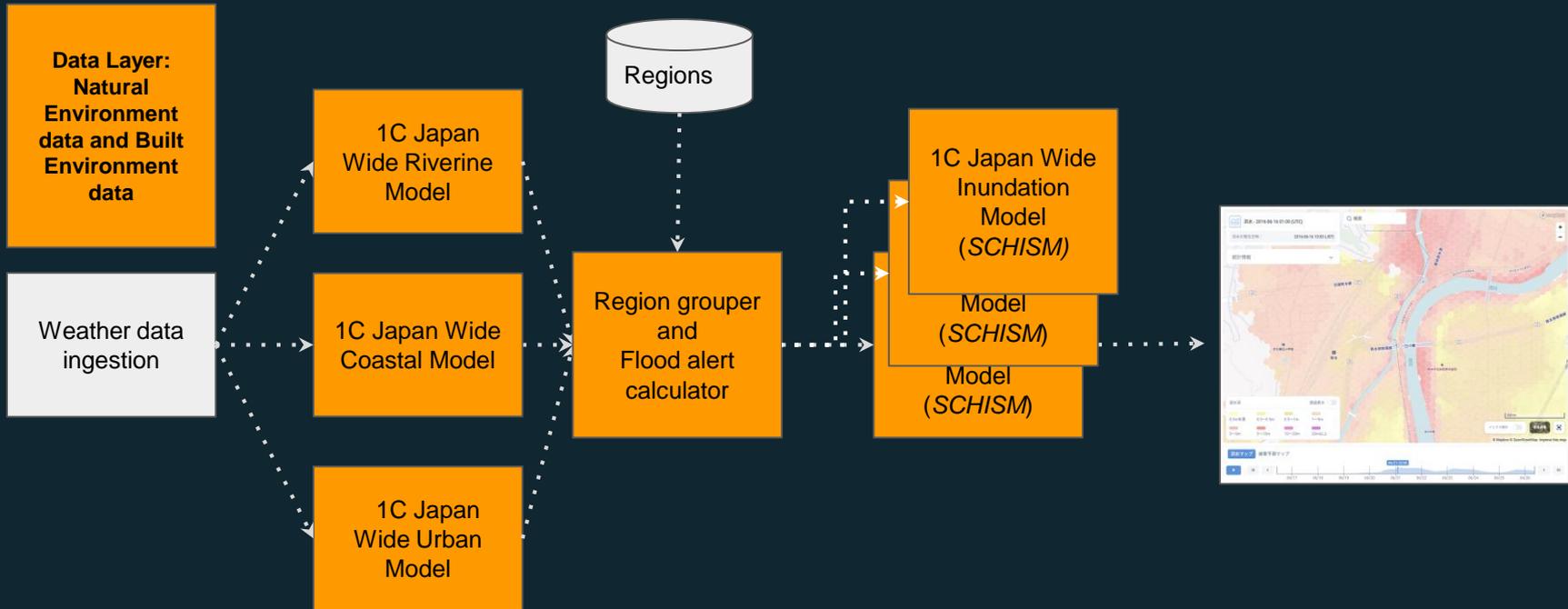
Live Flood Event Response in Japan

One Concern and VIMS team are co-developing a high-resolution nationwide compound flood model. This model couples coastal, riverine (fluvial), and urban (pluvial) floods. 1C platform allows users to predict and address flood risk, and leaders to better understand potential flood impact to buildings, shelters and key infrastructure, including:

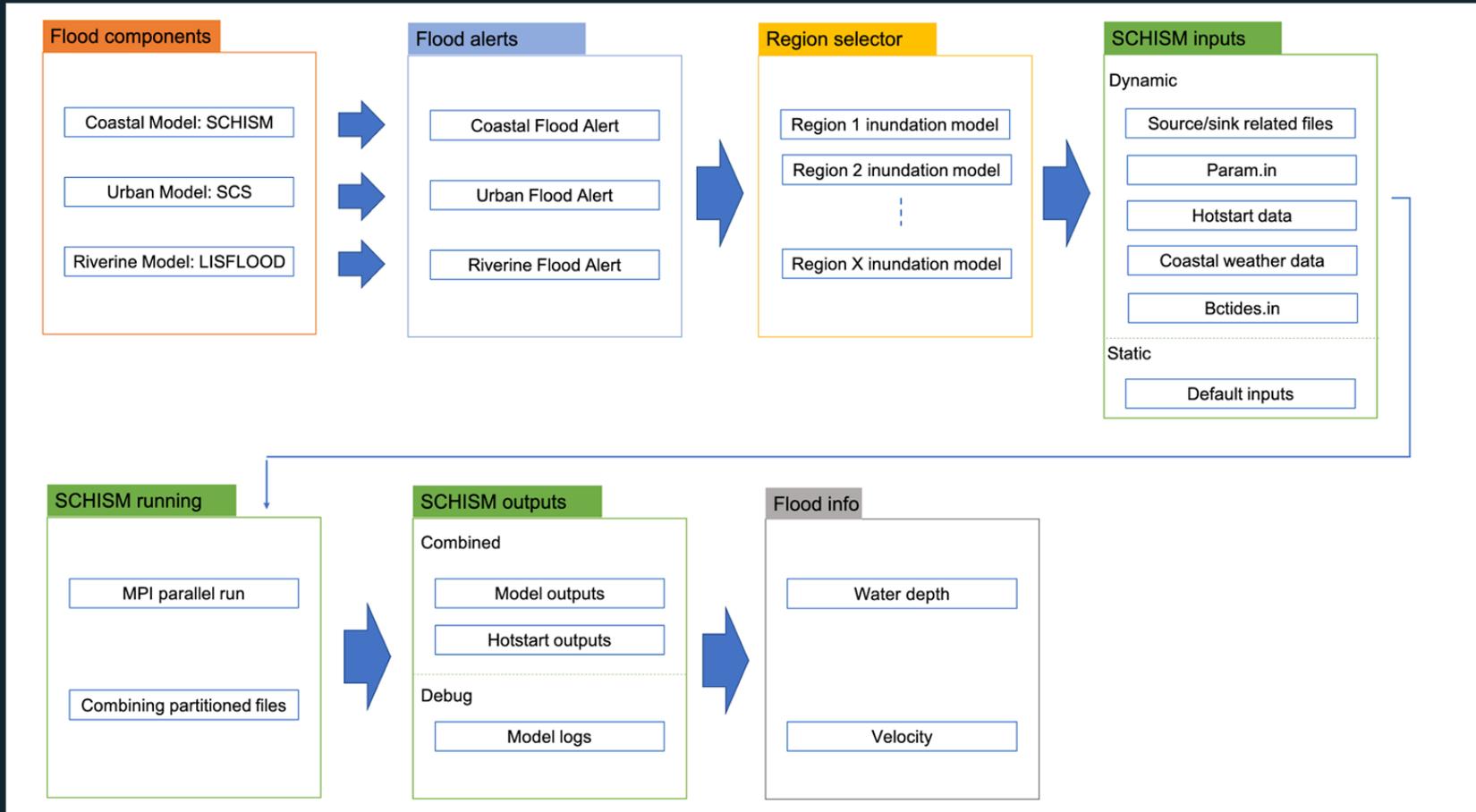
- Hourly compound flooding predictions
- River overflow locations
- Statistics of impacted business and residential buildings



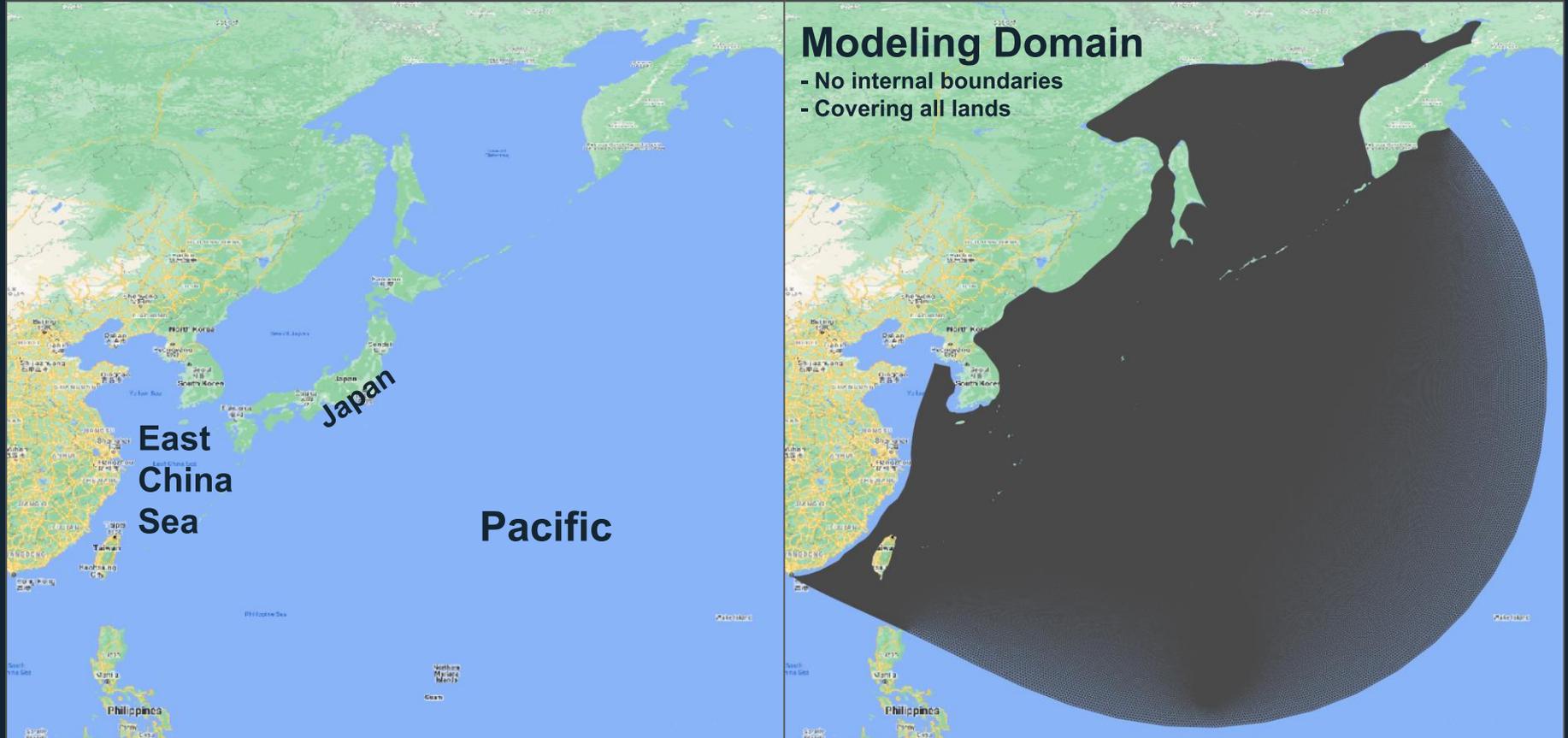
Automatic Prediction Pipeline on Google Cloud



A SCHISM-based Compound Flood Forecast System

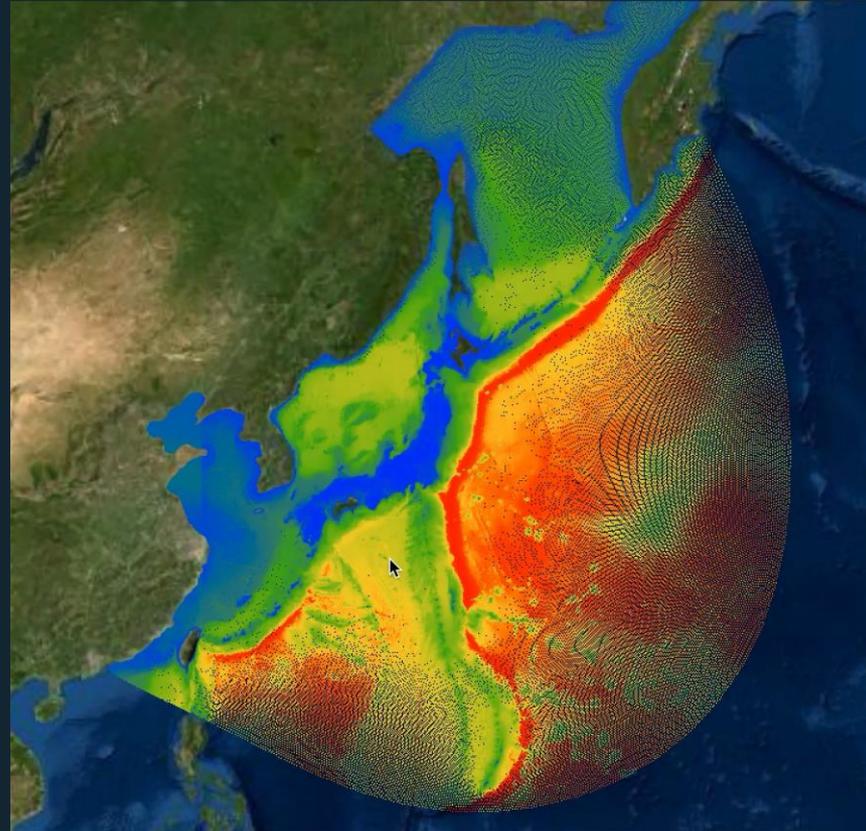


Japan Nationwide Modeling Coverage



Cross-Scale High-Resolution Modeling Mesh

High-resolution (30m)
in population centers

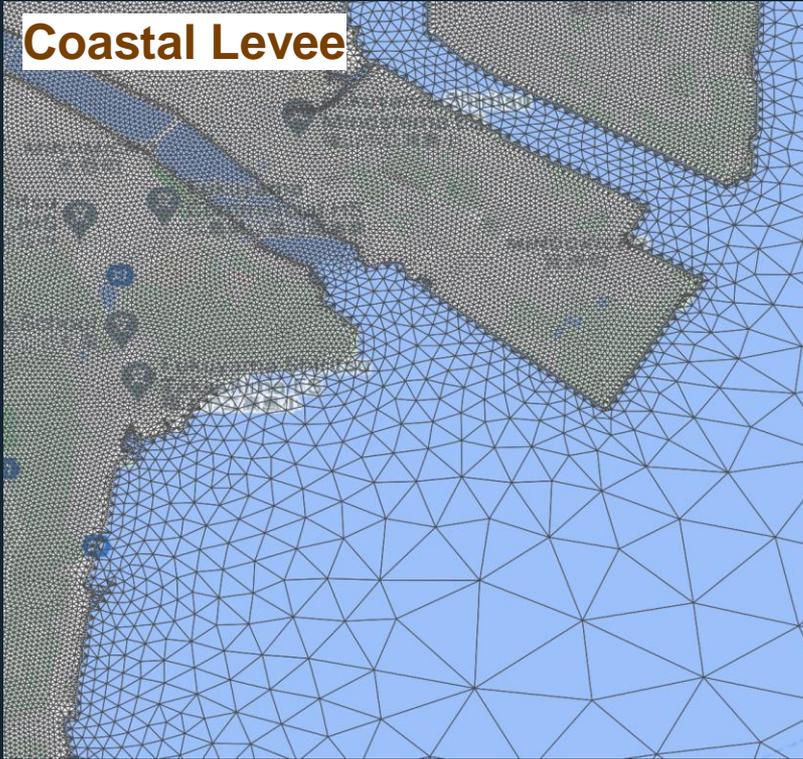


Low-resolution (300+
m) in rural areas



Incorporating coastal and riverine levee data

Coastal Levee



Riverine Levee



Validations - 4 Major Flooding Events



Inputs:

- Tidal boundary forcing
- Riverine streamflow
- Urban rainfall runoff and infiltration
- Wind and pressure

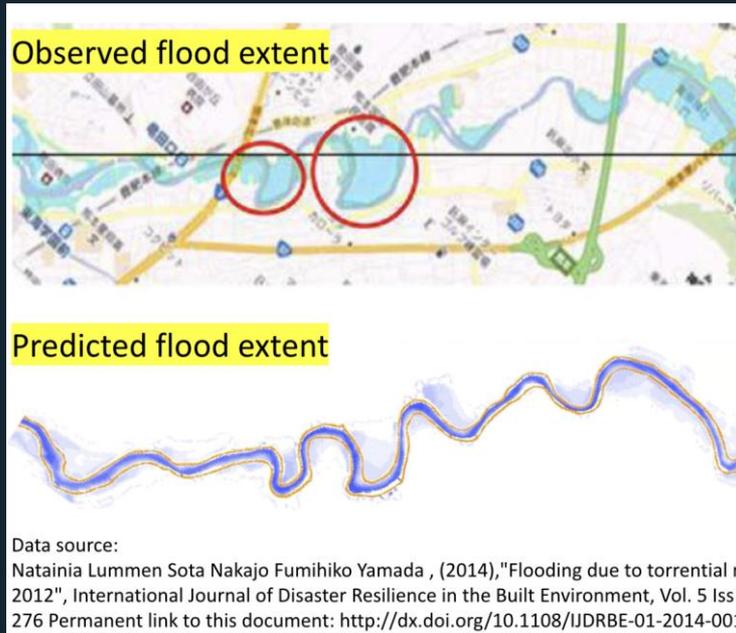
Outputs:

- Depth (x, y, t)
- Velocity (x, y, t)



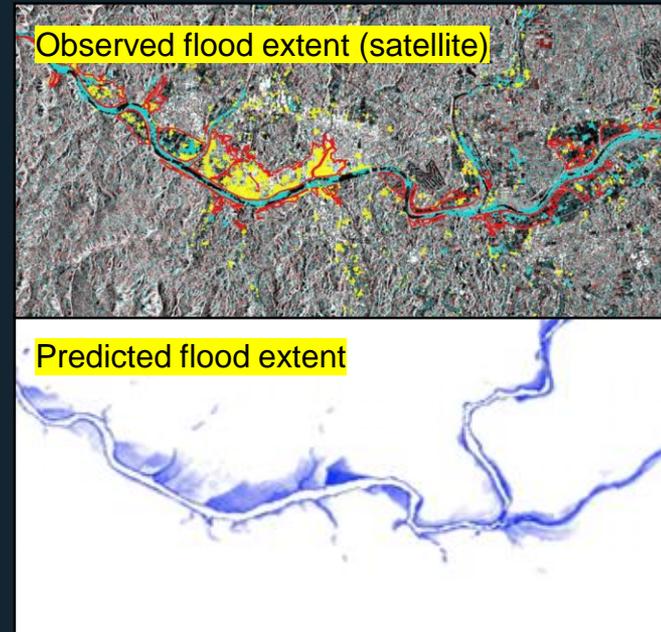
Validations - 4 Major Flooding Events

2012 Kumamoto Flood



Mean Absolute Error: 0.27m

2020 Kumagawa Flood

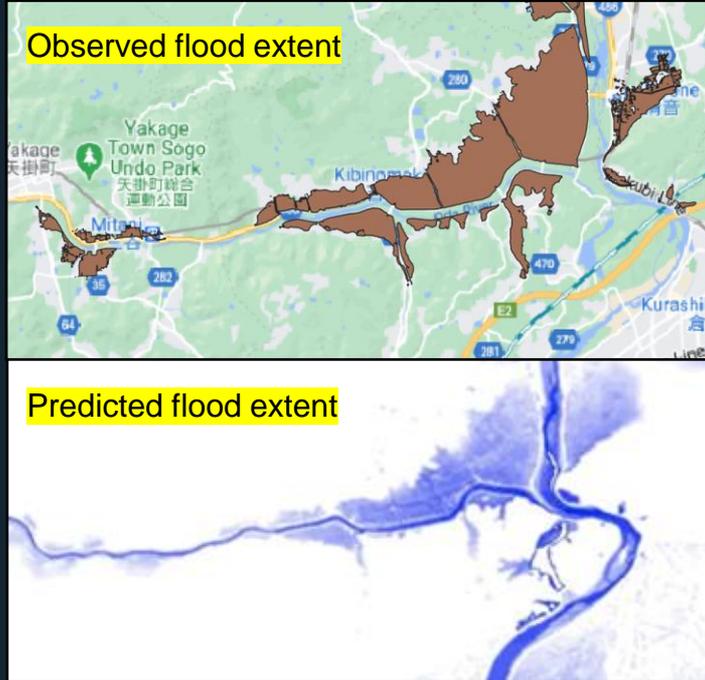


Hit Rate: 0.76



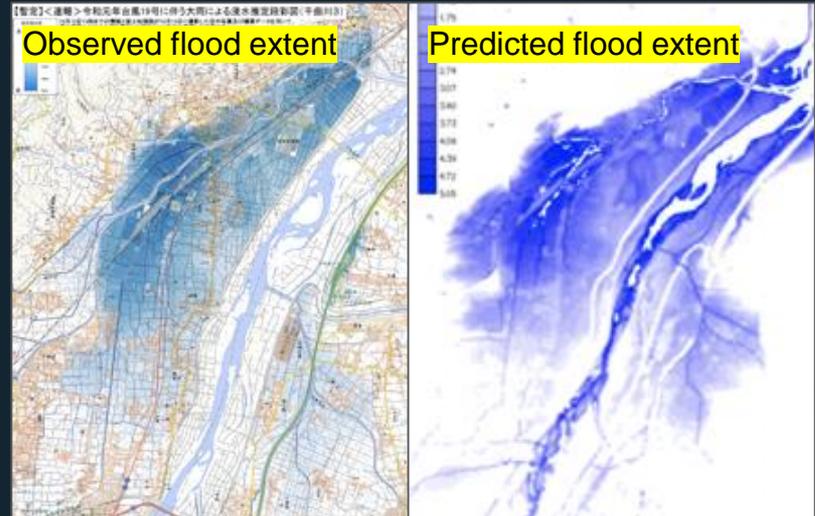
Validations - 4 Major Flooding Events

2018 West JP Flood



Hit Rate: 0.87

2019 Hagibis Flood



Hit Rate: 0.82



Challenges and Future Work

- Research on a more scalable way to incorporate defense information
 - Remote sensing + ML + DEM
- Find more validation data
 - Satellite imagery
 - Social media
- Ensemble simulations
 - Quantify uncertainty



Thank You!



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