Real-time Impact-based Tsunami Forecast Facility
Contribution to EW4ALL & Tsunami Ready

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RTi-cast was officially approved by JMA in March 2024,
as a unique private-based impact-based tsunami forecast provider.

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International Research Institute of Disaster Science
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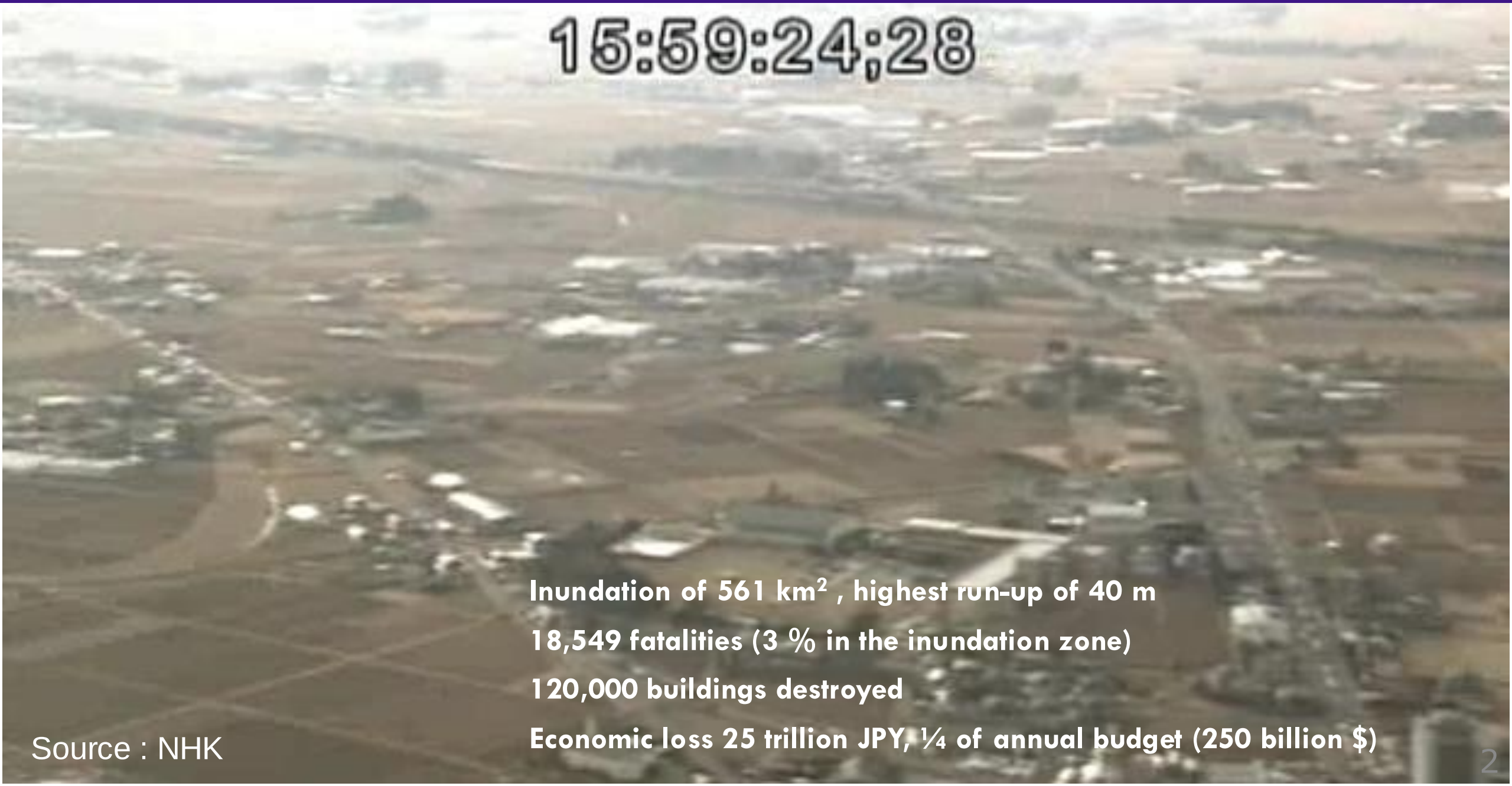
The 2011 Great East Japan Earthquake Tsunami



Inundation of 561 km^2 , highest run-up of 40 m

18,549 fatalities (3 % in the inundation zone)

120,000 buildings destroyed

Economic loss 25 trillion JPY, ¼ of annual budget (250 billion $)

Source : NHK

TsunamiCast
Real-time Impact-based Tsunami Forecast

- **Tohoku University and partners** developed a unique **end-to-end impact-based tsunami forecast system** (Generation-Inundation-Damage) with **fully operational capability using supercomputer**.
- **RTi-cast, (est. in 2018)** provides real-time tsunami inundation and damage forecast **products** (**TsunamiCast**) for **responses of government organizations and commercial clients**; insurance and transportation, etc.
- **RTi-cast** was approved by JMA in March 2024, as a unique private-based impact-based tsunami forecast provider to support disaster response.

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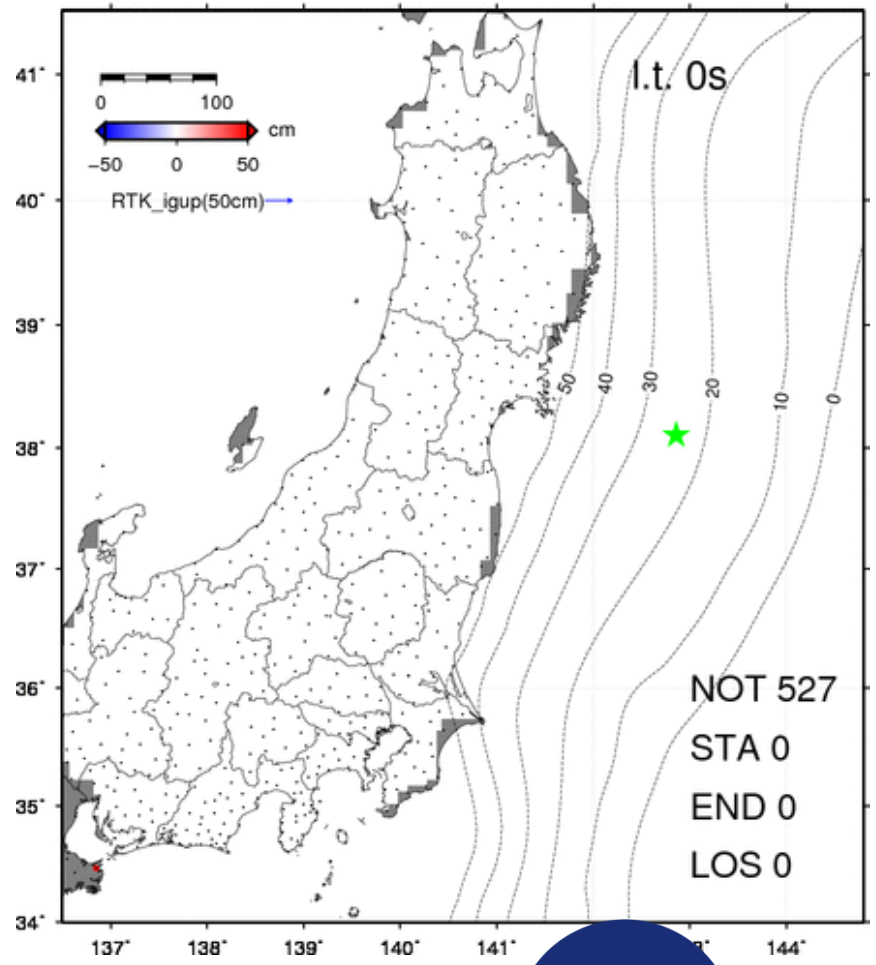
TsunamiCast

Operational GNSS-based Tsunami Inundation Forecast TsunamiCast™ by RTi-cast, Inc.

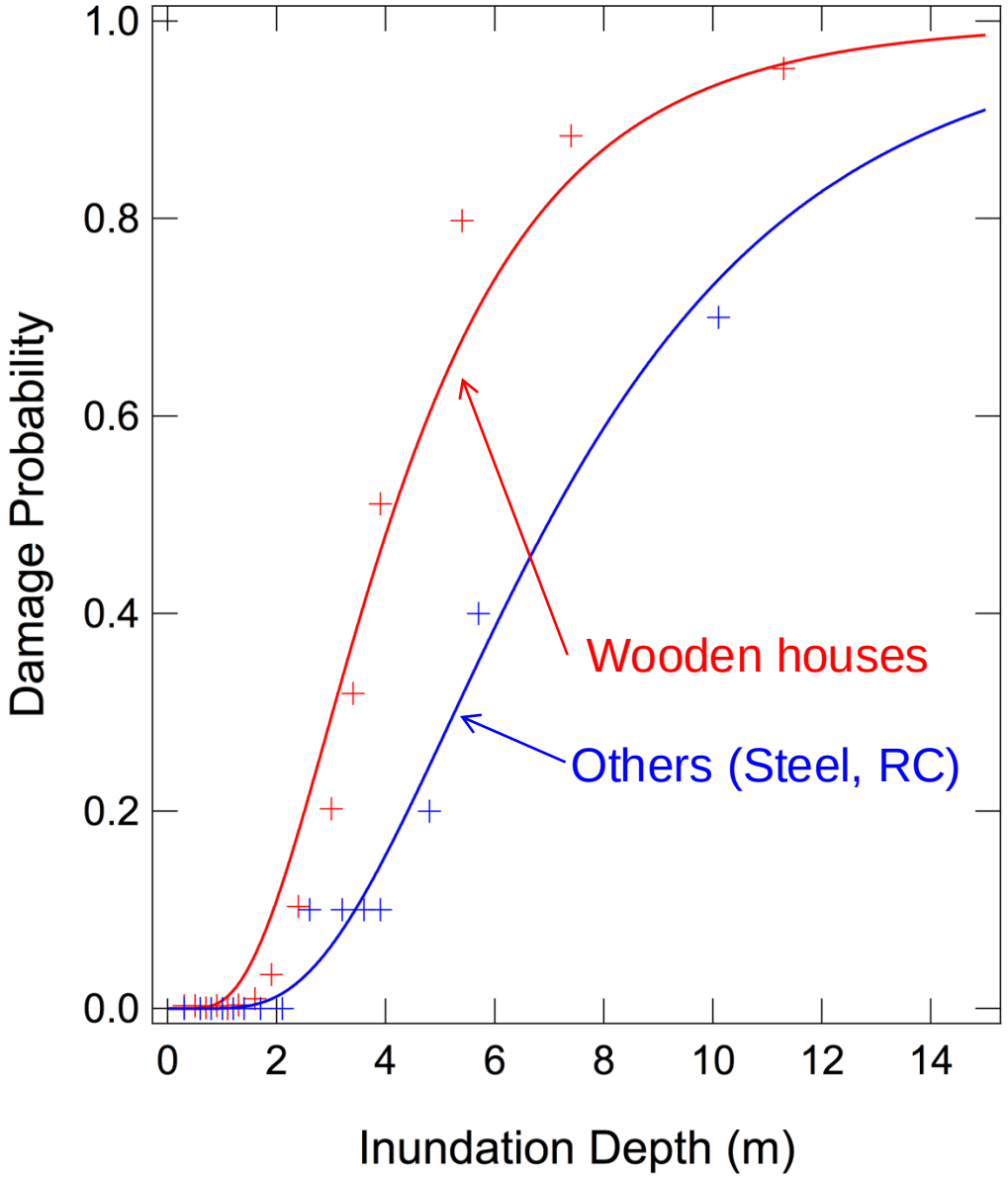
Supercomputer

RTi-cast



TsunamiCast

Tsunami Fragility Curves



Koshimura et al. (2014)

TsunamiCast

Value of TsunamiCast
Real-time Tsunami Inundation and Damage Forecast

~minutes

~hours

~days

Supporting Resilience – Reduce Loss and Recover Quickly

- How extensive does the tsunami penetrate? (Where is the safe place?)
- How many people are exposed?
- How many structures/infrastructures are damaged?
- How extensive disaster relief activities should be deployed?
- How much losses?

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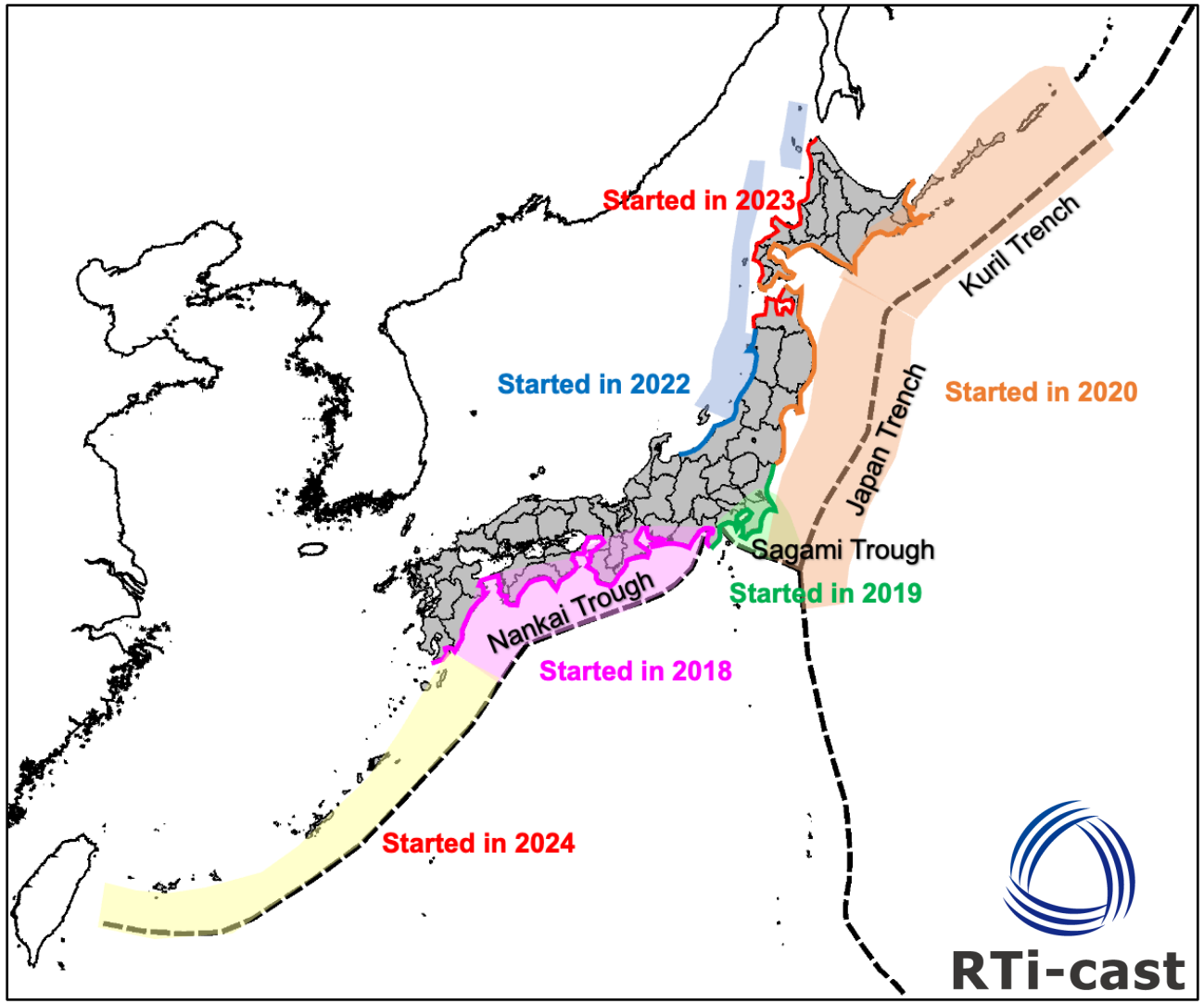
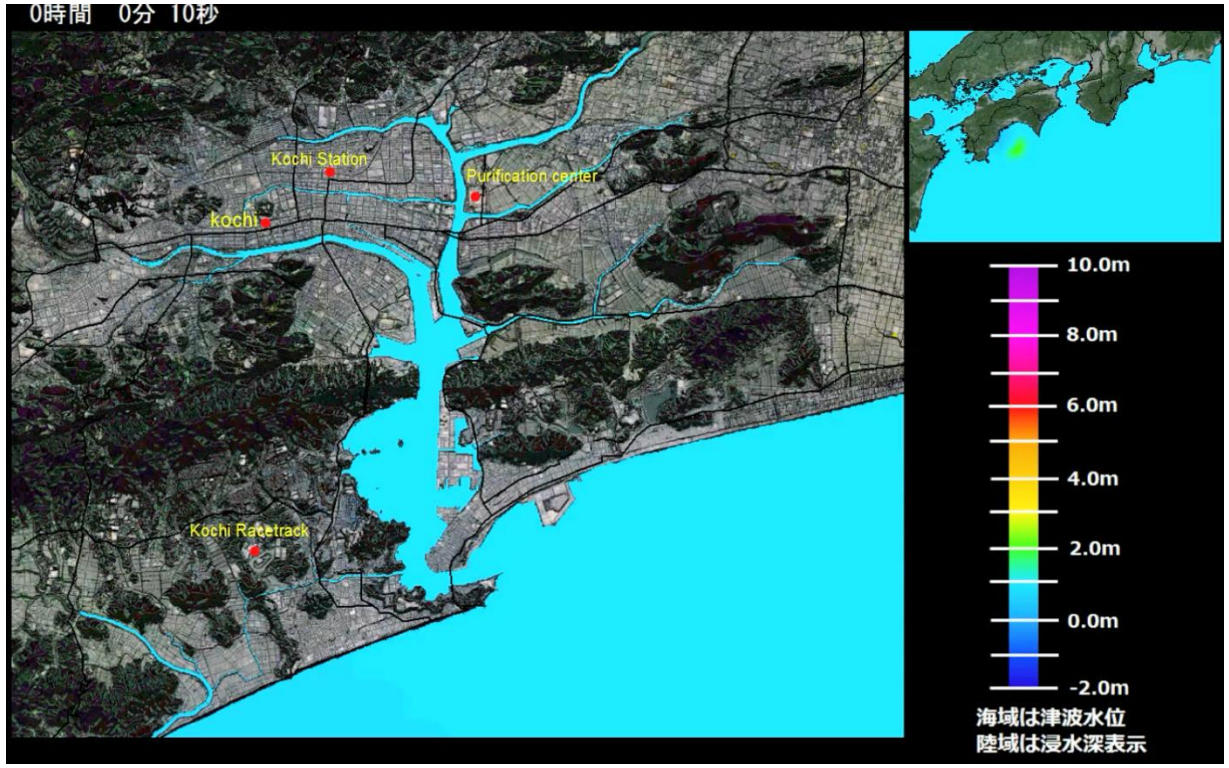
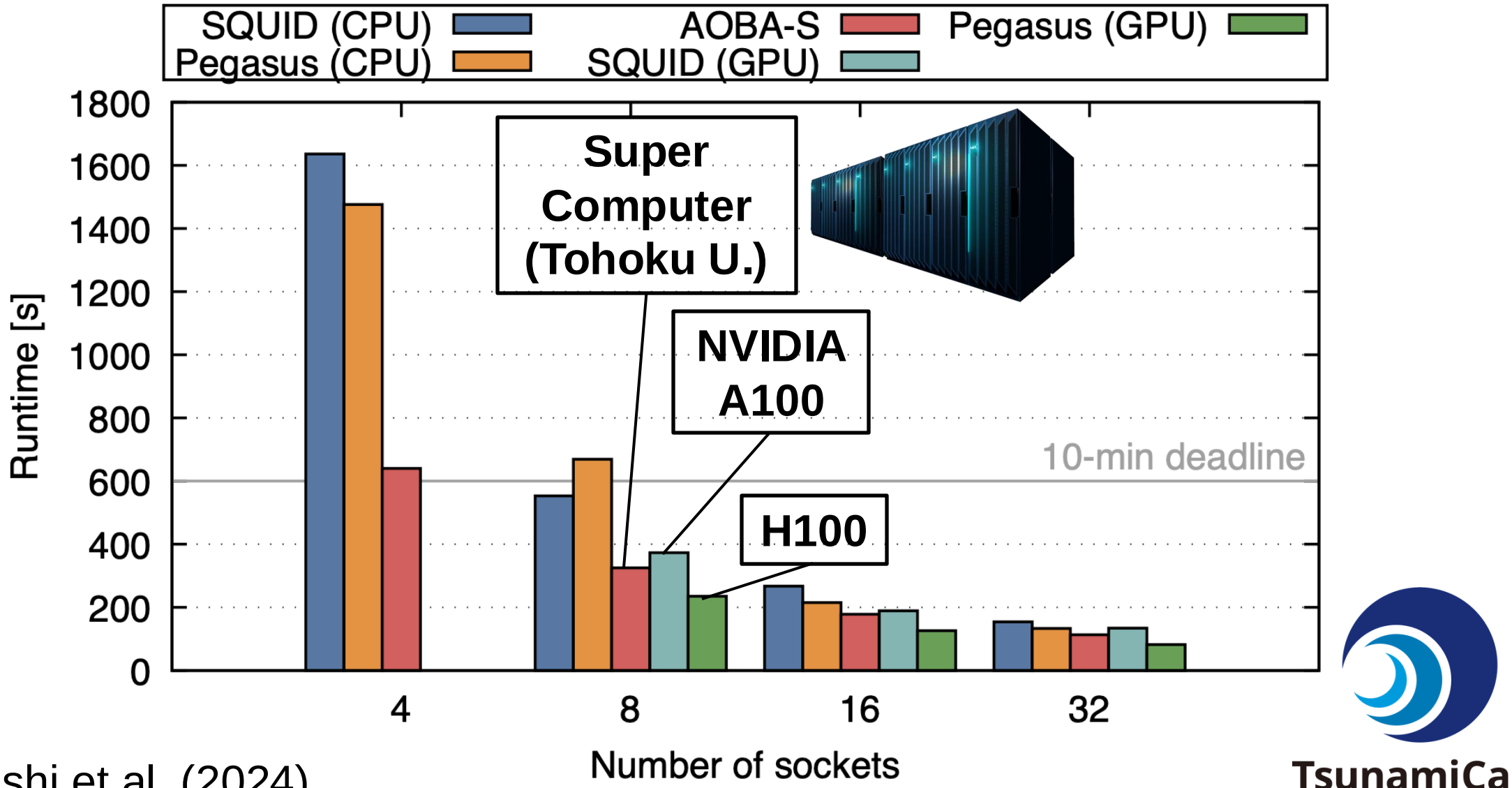
Nation-wide Impact-based Tsunami Forecast System for Cabinet Office of Japan and Prefectural Government





TsunamiCast

Performance of TsunamiCast for Diverse Users
Time to Complete 6-hour Forecast with 10m resolution



Takahashi et al. (2024)

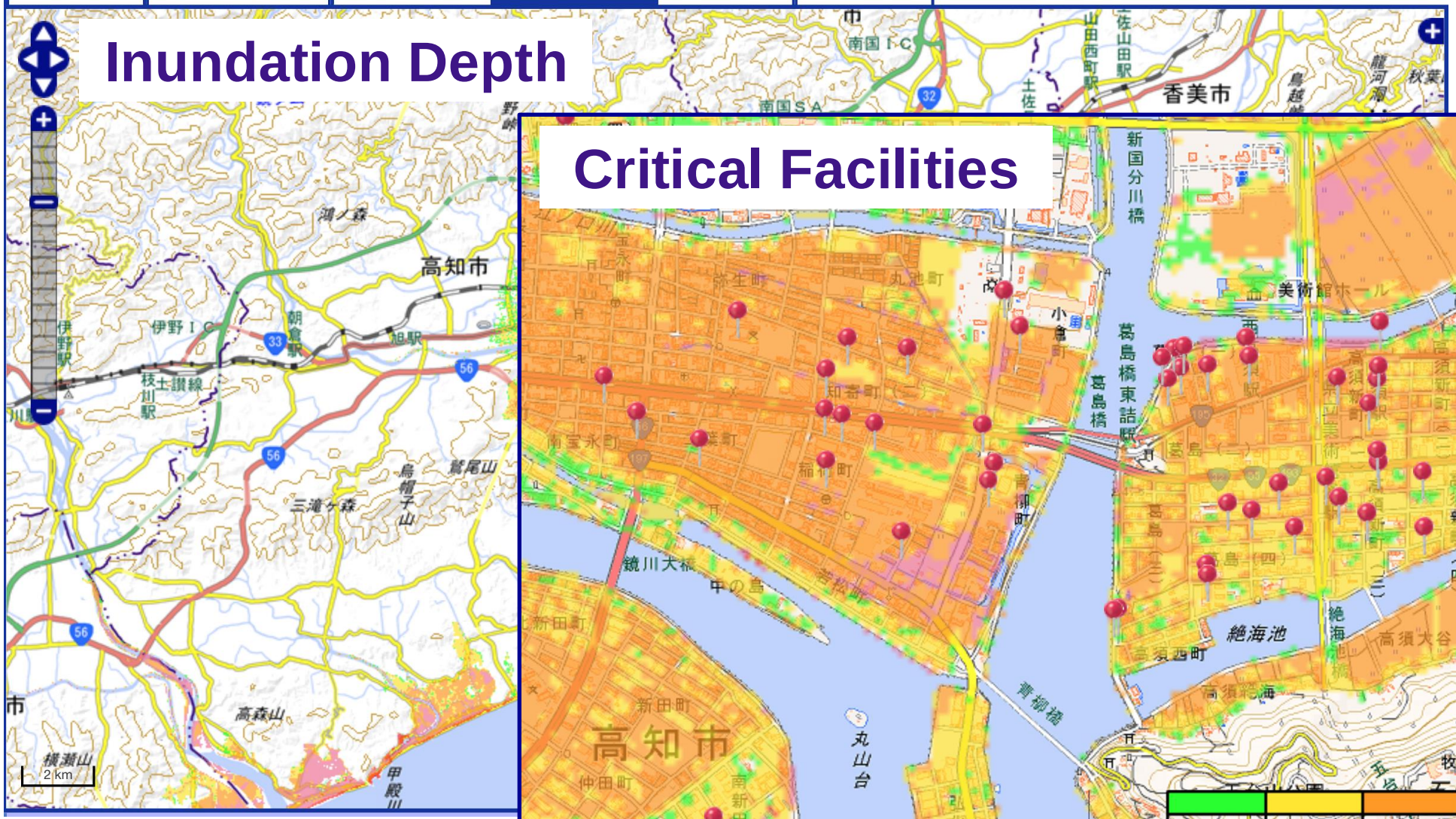
TsunamiCast

TsunamiCast Products

到達時間 | 浸水開始時間 | 水位時系列 | 最大浸水深 | 最大水位 | 被害推定

TsunamiCast

Inundation Depth

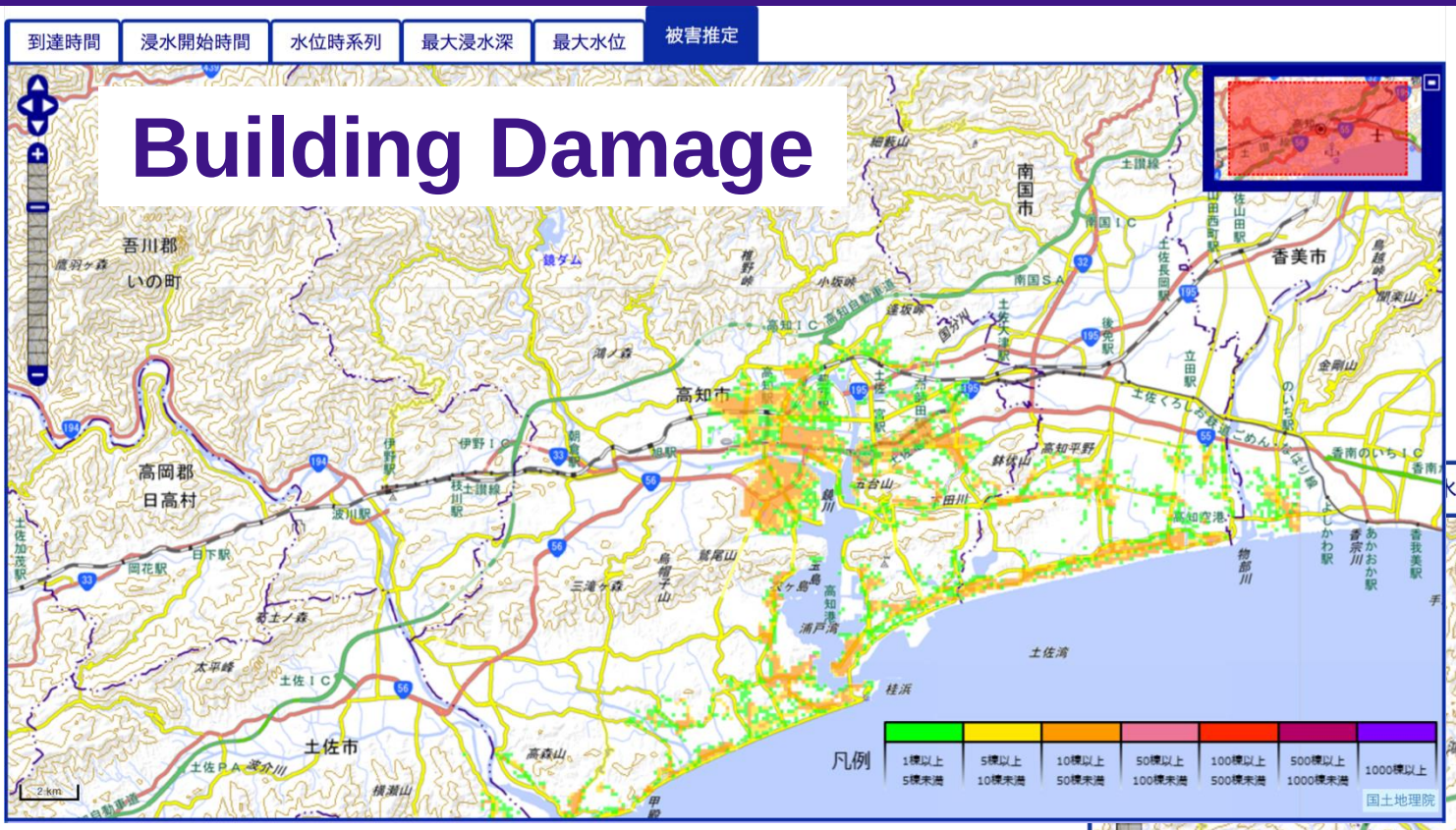


Critical Facilities

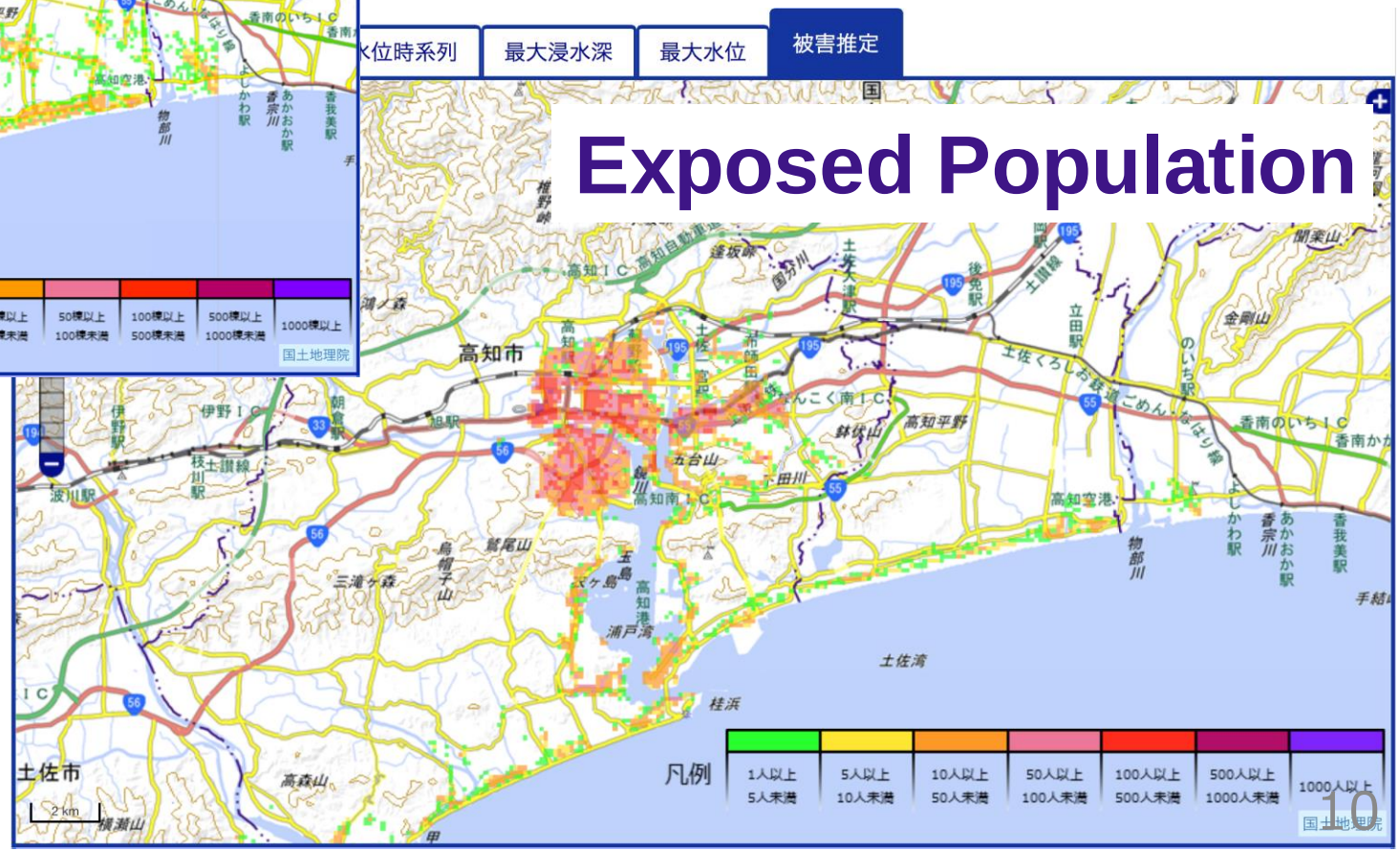
TsunamiCast Products

TsunamiCast

Building Damage

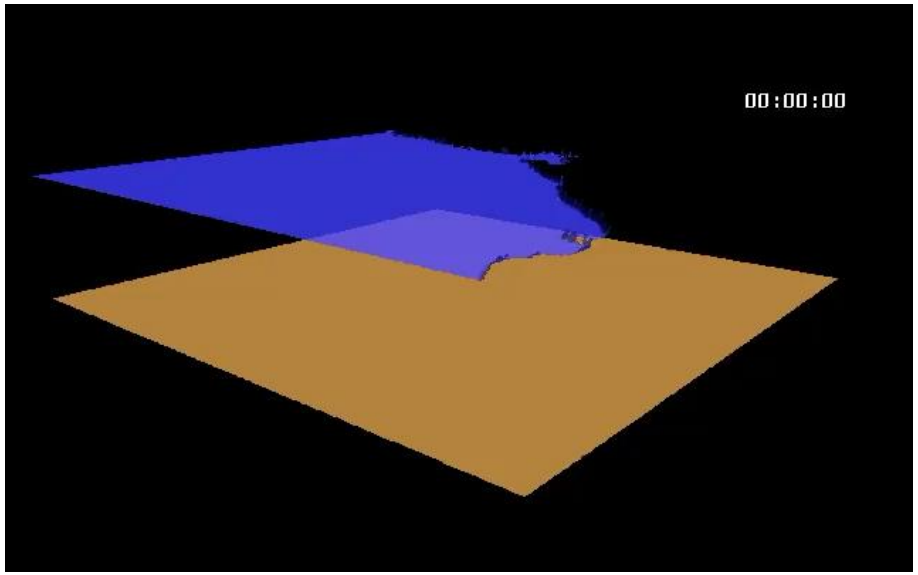


Exposed Population



Towards Global Real-time Impact-based Tsunami Forecast Facility

Rapid determination of tsunami source model



Urgent computing capability (HPCI)

aws

Generating map products

L1 Rectangular Fault w. Epicenter & Mw
L2 CMT solutions (e.g. GCMT)
L3 GNSS-based solutions (e.g. GFAST)
L4 Offshore Data Assimilation (e.g. SMART cable)

ArcGIS Online

New Partnership

Supporting Message from AWS

Mr. Ushio Usami
Country leader for the Amazon Web Services (AWS) worldwide public sector in Japan.

TsunamiCast

powered by aws

What We Propose ?
Real-time Impact-based Tsunami Forecast Facility

To promote cooperation with **private sector to develop new products and services** to help **accelerate Tsunami Ready**.

”Endorse private sectors to accelerate the achievements of EW4ALL”, says Prof. Dwikorita Karnawati (Head of BMKG)

Sendai Framework for Disaster Risk Reduction 2015 - 2030

1. Understanding disaster risk
2. Strengthening disaster risk governance
3. **Investing in disaster risk reduction for resilience**
4. Enhancing disaster preparedness for effective response

United Nations

Towards Global Partnership
Potential Roles and User Definition

Global partners' role	National partners' role	Users
System Plan & Design System Development Computational Environment Mapping Environment Tsunami Source Modeling Verification Testing Operation	Liaison with users Merged Bathy/Topo Data Exposure Data Tsunami Source Modeling Fragility Models Tsunami Observation Verification Testing Operation	Government organizations Insurance industries Critical facilities Energy industries Logistics Transportation Supply chains

Product Levels
Real-time Forecast

Level	Product Description
L 0	Simple tsunami propagation forecast : Arrival time, Maximum tsunami height.
L 1	Inundation forecast based on inundation modeling using finer merged bathymetry/topography grids.
L 2	Inundation and damage forecast based on inundation modeling with fragility models and exposure data using finer merged bathymetry/topography grids.

Product Levels
Non-real-time Forecast

Level	Product Description
L 1	Inundation forecast based on inundation modeling using finer merged bathymetry/topography grids with one maximum source scenario. (Tsunami Hazard Map, Evacuation Map)
L 2	Inundation and damage forecast based on inundation modeling and fragility models using finer merged bathymetry/topography grids with one maximum source scenario. (Loss estimation)
L 3	Probabilistic inundation and Loss estimation with fake quakes (or equivalent ensemble rupture scenarios).

Thank you for your kind attention

Terima kasih

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TsunamiCast Products

Standard Forecast Products

- Inundation depth
- Building Damage
- Exposed Population

Policy Design & Practice

- Evacuation Route
- Search & Rescue Operations
- Medical Services
- Road Network Recovery Plans
- Relief Supplies Estimates

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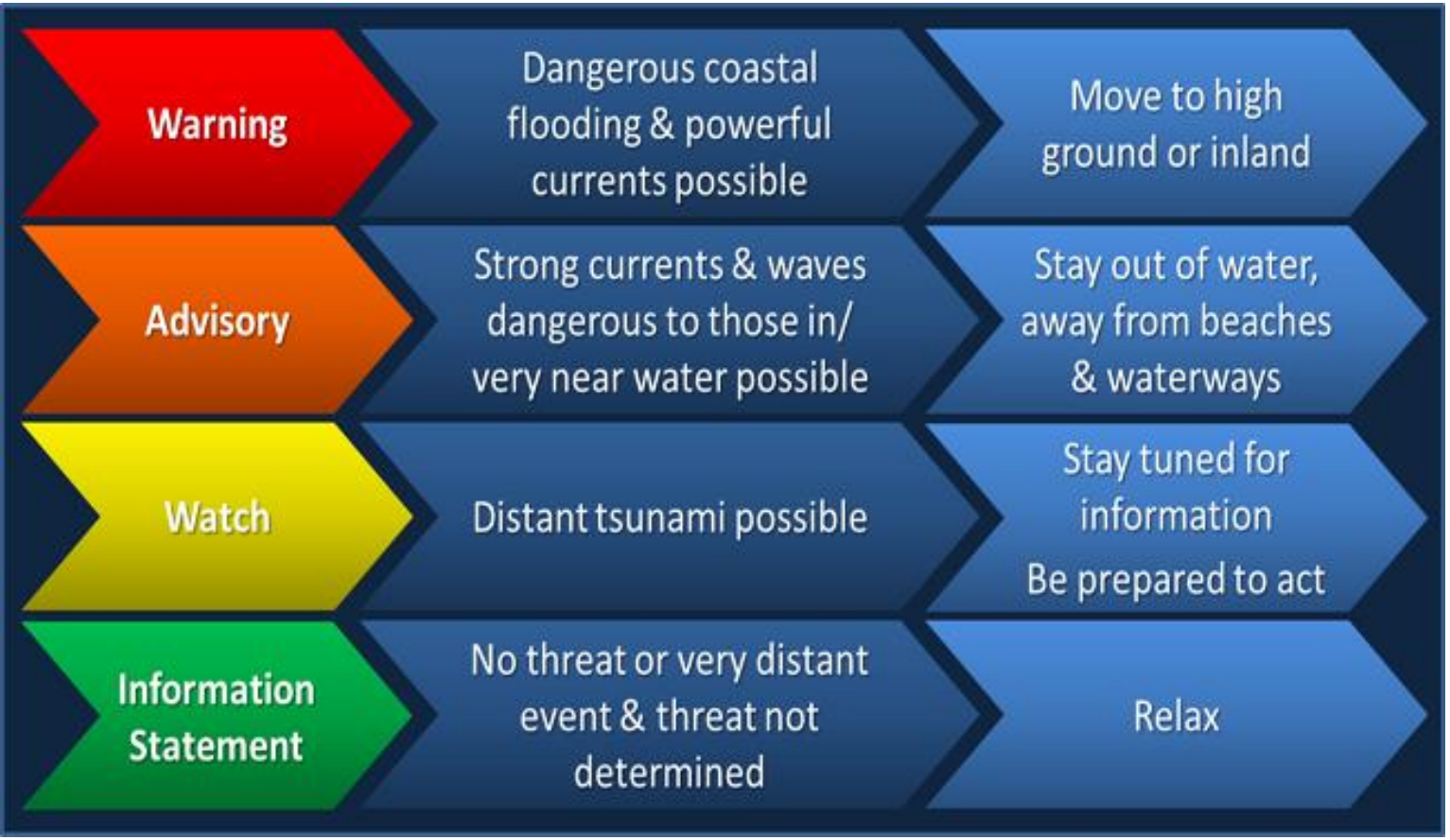
Standard Tsunami Warning Messages

National Weather Service



JMA

	Estimated maximum tsunami height	
	Numerical announcement	Expression in the case of the massive earthquake
Major Tsunami Warning	10 m < *h*	Huge
	5 m < *h* ≤ 10 m	
	3 m < *h* ≤ 5 m	
Tsunami Warning	1 m < *h* ≤ 3 m	High
Tsunami Advisory	0.2 m ≤ *h* ≤ 1.0 m	—