Sentinel Asia Tsunami Working Group

Co-Chairman:
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Abdul Muhari, PhD

4th Joint Project Team Meeting (JPTM 2017):
Sentinel Asia STEP 3

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Ministry of Marine Affairs and Fisheries
Republic of Indonesia
January 2016

Outline

- Brief overview of Tsunami WG

- Proposed activities for 2017

- Summary

Tsunami WG:

Purpose/Goal (concluding remark of the 2015 meeting in Bali)

Contribution to enhancing capabilities of tsunami disaster management in Asia-Pacific countries

- – Tsunami Risk Assessment
- – Tsunami Forecasting/Warning
- – Mapping Tsunami Inundation/Impact
- – Tsunami Evacuation Plan
- – Emergency Observation
- – Tsunami Risk Awareness/Education
- – Training Program/capacity building

Integrating satellite data and technology with other engineering and educational tools such as tsunami model to provide comprehensive tsunami disaster impacts for mitigation, emergency response and post disaster actions

- Contribute to provide more specific 'value added' on the SA product in tsunami cases.

Tsunami WG:

Activities (concluding remark of the 2015 meeting in Bali)

- Review of tsunami disaster response protocols of each country (including forecasting, early warning, emergency observation, monitoring, mapping) | What are the roles of satellite data and technology in developing system for tsunami disaster risk reduction in Asia Pacific countries?
- Review of past tsunami events and the use of satellite data and technology in understanding past tsunamis.
- Making plan (SOP) of emergency observation for mapping impact in disaster response
- Making plan (SOP) of using archive data for disaster response and recovery
- Making plan of success story (Definition of success story)
- Web-based information sharing (Activities/Efforts/Outcomes) in Sentinel Asia web site

Tsunami WG:

To do list (concluding remark of the 2015 meeting in Bali)

- To invite related inst. to be the Tsunami WG members
- Be more comprehensive (increasing members from different organization, but needs to nominate at least one focal point from each country)
- Define Users of the information, more specific. Each member should define the users. Sentinel Asia's definition … User is basically national organization.
- Keep in mind "User-oriented approach", not "Providers-oriented" | 'value added product' → we have to know exactly that things we add on the map is 'valuable'
- Collaboration with developing agencies (ADB, JICA) and national project
- Classifying the implementation phases.
- Sharing information including slides via Sentinel Asia Server
- Exchange, collaborating with other organizations, groups
- Next web-meeting, beginning of 2016 (not all members).
- Needs WG webpage for outreach.

Tsunami WG:
Member (updated January 2017)

No.	Organization	Country	Name	Affiliation	E-mail	Phone	Role in WG	Org. Attributes
1	ESCAP	Thailand	Mr. Alf Ivar Blikberg	Programme Officer, IDD	Blikberg@un.org	(+)66-2288-2700	User	JPT
2	Global Geodetic Observing System/IAG	USA	John L. LaBrecque	Lead Geohazard Monitor	JLABRECQ@mac.com	(+)1 (202) 431-9546	observer	-
3	Ministry of Marine Affairs and Fisheries, Indonesia	Indonesia	Dr. Abdul Muhari	Directorate of Coastal and Ocean Directorate General for Marine Area Management Ministry of Marine Affairs and Fisheries, Republic	abdul.muhari@gmail.com	(+)61 21-3522059	User	Co-chair, JPT, DAN
4	NARLabs	Taiwan, China	Dr. Franz Ming-Chih Cheng	Research Fellow NARLabs, Mission Oriented Projects Office National Space Organization (NSOP)	franz.cheng@narlabs.org.tw	(+)886-916.989.987, (+)886-(3)-578.4208 ext. 9487	Data Provider, GIS analyst	JPT, DPN, DAN
5	Symbiosis Institute of Geoinformatics	India	Prof. T. P. Singh	Director, Symbiosis Institue of Geoinformatics (SIG) Symbiosis International University (SIU)	tarunsingh@rediffmail.com, tpsingh@sig.ac.in	(+)91 9890294412	mapping	JPT
6	Tohoku University	Japan	Prof. Shunichi Koshimura	Professor International Reserch Institute of Disaster Science Laboratory of Remoto Sensing and Geoinformatics	koshimura@irides.tohoku.ac.jp	(+)81-22-752-2084	researcher	Co-chair, JPT
7	University of Tokyo	Japan	Prof. Ryosuke Shibasaki	Center for Spatial Information Science	shiba@csis.u-tokyo.ac.jp	(+81-90-1265-1000)	researcher	JPT, DAN
8	VAST	Vietnam	Mr. Truyen The Pham	Researcher, Earthquake Information and Tsunami Warning Center, Institute of Geophysics	truyenpt@igp.vast.vn	(+)84-437918273	researcher	JPT, DAN
9	University of Tokyo	Japan	Dr.Hiroyuki Miyazaki	Project Assistant Professor Earth Observation Data Integration & Fusion Research Initiative	heromiya@csis.u-tokyo.ac.jp	(+)81-3-5452-6415	researcher	JPT, DAN
10	Organzation National Research Institute for Earth Science and	Japan	Mr. Koji Suzuki	Executive Director	suzuki-k285@bosai.go.jp	(+)81-29-863-7287	researcher	JPT
11	NARLabs	Taiwan, China	Mr. Bo Chen	Researcher Satellite Image Division National Space Orgnization (NARL)	bochen@nspo.narl.org.tw	(+)886-3-5784208 ext.1592	Data provider, researcher	JPT, DPN
12	National Disaster management Authority (BNPB)	Indonesia	Mr. Agus Wibowo	Deputy Director for Data and Information Center of Data, Information and Public Relaqtions	agus.wibowo@bnpb.go.id	(+)62811800241	User, GIS specialist	JPT
13	JAXA/AIT	Thailand	Dr. Shiro Ochi	JAXA Visiting Scientist, Geoinformatics Center	ochi@ait.asia	+66 2 524 5599		
14	National Central University, Taiwan	Taiwan, China	Dr. Li-Yu Chang	Center for Space and Remote Sensing Research	lychang@csrsr.ncu.edu.tw			
15	Department of Environment and Natural Resources	Philippines	Mr. Marcelo M. Alilio	Marine Geological Division, Mines and Geosciences Bureau	maralilio@gmail.com	+63 921 571 3154		

Activities for 2017

Already done and proposed activities

- WG web meeting | 20 Feb 2017
  - Explore the needs and expectation from the member to Tsunami WG

- Capacity building and technology dissemination
  - Tsunami model and inundation mapping

- Set up information and knowledge portal
  - Tsunami WG website

- Establish a standardized methodology and guideline for tsunami inundation mapping and the mapping product it self

Activities for 2017

Web meeting 20 Feb 2017

What are the participants needs for tsunami WG?

- John La Brecque (Global Geodetic Observing System) was interested in SA's plan of Tsunami early warning system and expected GNSS to be a part of the system.

- Li-Yu Chang (National University of Taiwan) they needed Tsunami forecasting information which tells them the areas in Taiwan to be affected by Tsunami to supplement information from the National Science and Technology Center for Disaster Reduction (NCDR), such as potential inundation zone, for satellite data acquisition and analysis.

Activities for 2017

Capacity building and technology dissemination

Tsunami model and inundation mapping

- Tsunami modeling
  - To share the technology of Tsunami modeling with the members through tutorials and seminars
    - Consider the minimum computer requirement so it can be done by and at any countries in Asia Pacific.
    - The aim is to provide semi advance skill to do and analyze tsunami inundation model
- Mapping of inundation areas
  - To share the methods of mapping using optical and SAR satellites
    - The aim is to provide methodology that can be operated by Tsunami WG members
    - Long term goal is to develop standard method for rapid tsunami inundation mapping to be used by WG members
- Proposed time: APSRAF 2017 or JPTM 2018

Activities for 2017

Set up information and knowledge portal

Tsunami WG web page (under the SA website)

- To make and share the list of tsunami WG members and the focal point in each country (name and institution will be published on the website after getting permission from the members)
- To create knowledge portal contains the tutorials and training data on tsunami model and inundation mapping
- Portal for webinar and web meeting as well as its results.
- Toward a standardized methodology for rapid tsunami inundation mapping endorsed by the SA.

Summary

- Two main activities is proposed on 2017:
  - Set up knowledge portal web page
  - Capacity building for tsunami WG members

- Targeted success story in 2017:
  - Establishing a guideline/standardized methodology for tsunami inundation mapping

- Special session of SA in some International conference to share achievement and scientific product/methodology → idea from U Tokyo.

Critical information since the aftermath

What will be the most important values should be added on the map?

~minutes

~hours

~days

~weeks

❖ How extensive the tsunami penetrates? Where is the most affected areas?

❖ How many people are exposed, killed, and injured ?

❖ How many structures/infrastructures are damaged ?

❖ How extensive disaster relief activities should be deployed ?

❖ How much amount of tsunami debris need to be removed ?

❖ How much economic losses are ?

Integration between satellite data and technology and tsunami model

Determine EQ parameters
- Topography data
- Bathymetry data
- Additional data

Running tsunami model

Tsunami inundation map
- Tsunami wave height
- Tsunami wave velocity
- Tsunami wave force

Satellite data/imageries

Data analyses and processing
- Building footprint data
- Building material
- Population data

Damage estimation map
- Building damage estimation
- Debris location and amount
- Coastal infrastructures damage estimation

Tsunami warning:
a problem on earthquake determination

Calculated **Mj (JMA magnitude) = 7.9** in 3 minutes to disseminate the first tsunami warning by using strong motion data.

⬇

Failed to calculate Mw (Moment magnitude) automatically in 15 minutes due to waveform data over-scale for most of the domestic broadband seismometers, and consequently, could NOT update the warning.

⬇

Collected unsaturated oversea broadband waveform data, and calculated **Mw = 8.8** in 54 minutes. That was too late for the warning update based on the seismic data.

Strong motion data

日立変位_佐渡広帯域_ESK

Broadband data

Data length necessary for Mw calculation

Broadband waveform data used f...

14:46   14:51   14:56   15:01   15:06

JST   (20...

Eq.   Mj7.9
(14:46:18)   (14:49)

Time = 00:00:00

000 s

40°N

38°N

36°N

Height(m)

−5 −4 −3 −2 −1 0 1 2 3 4 5
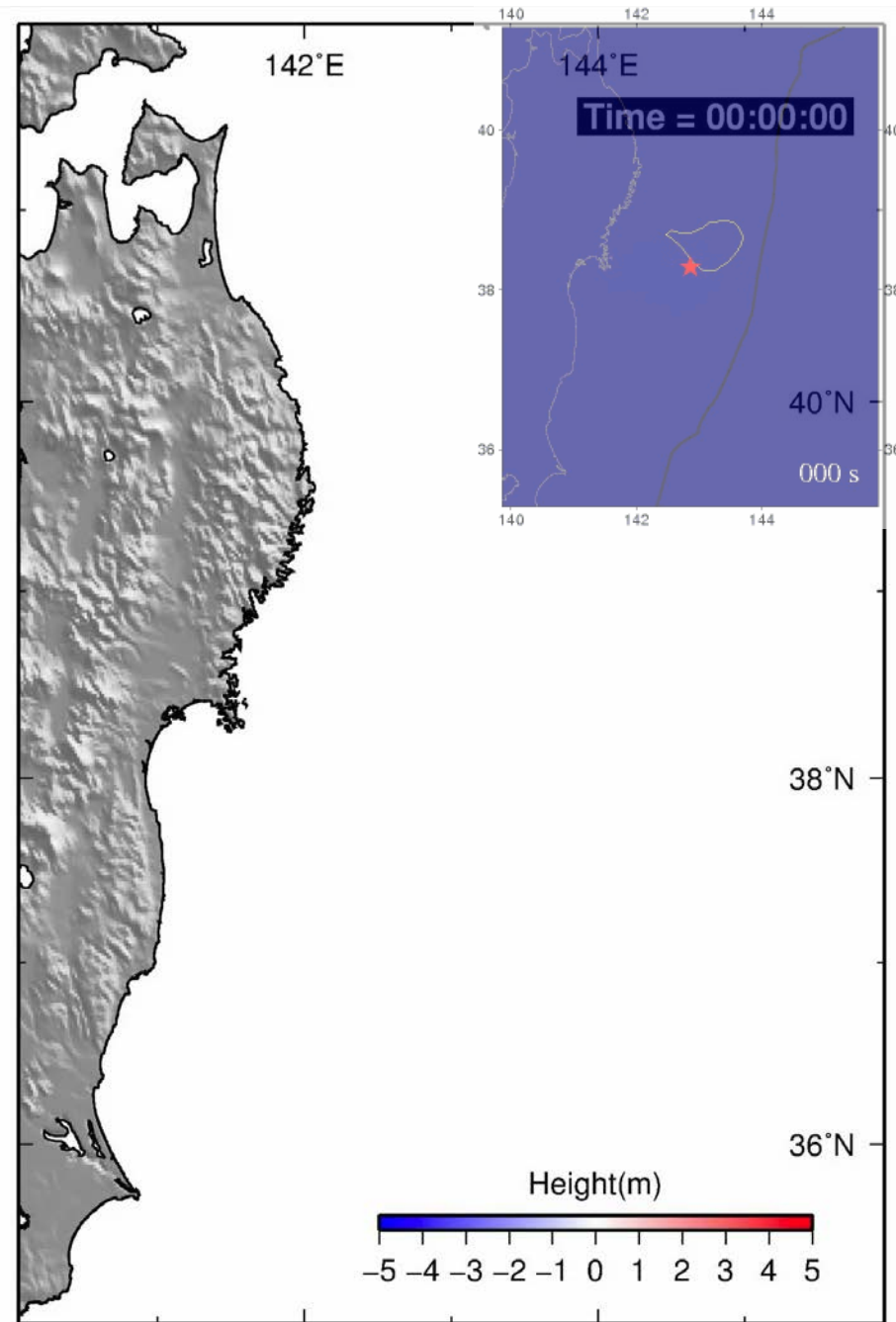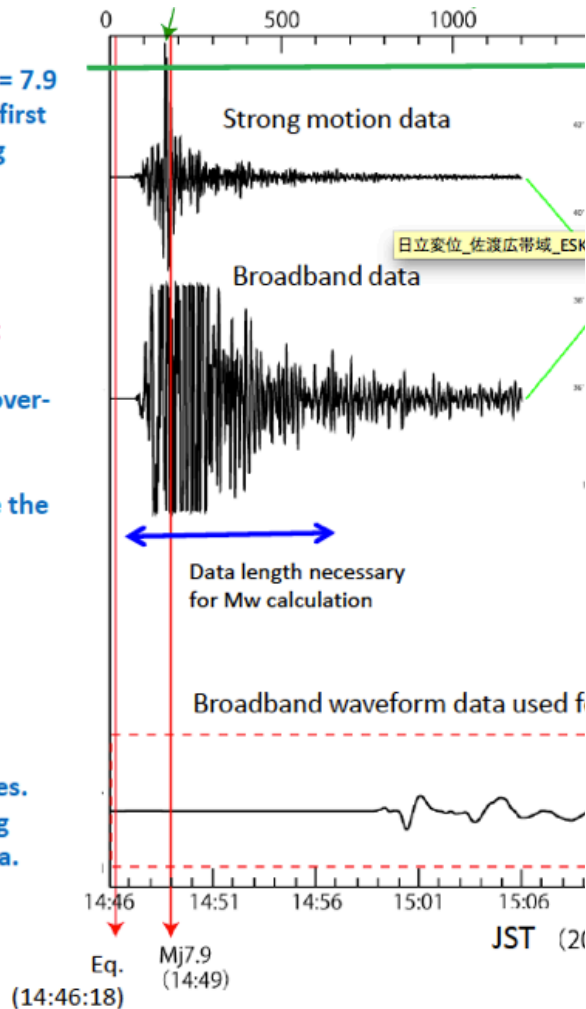
Tsunami Modeling
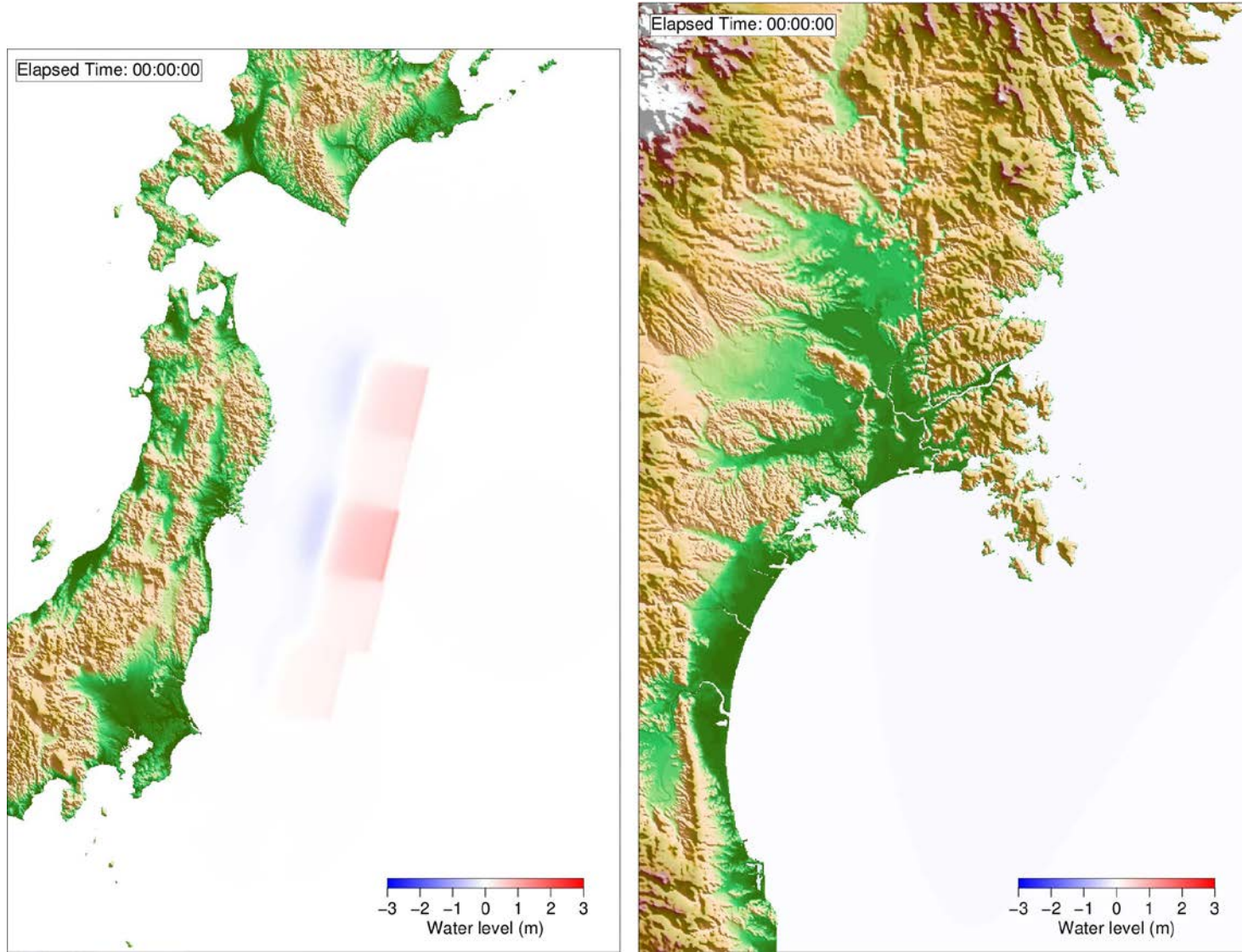
How extensive the tsunami penetrates ?
Optical satellite remote sensing (JAXA ALOS/AVNIR-2)

Koshimura et al. (2012)
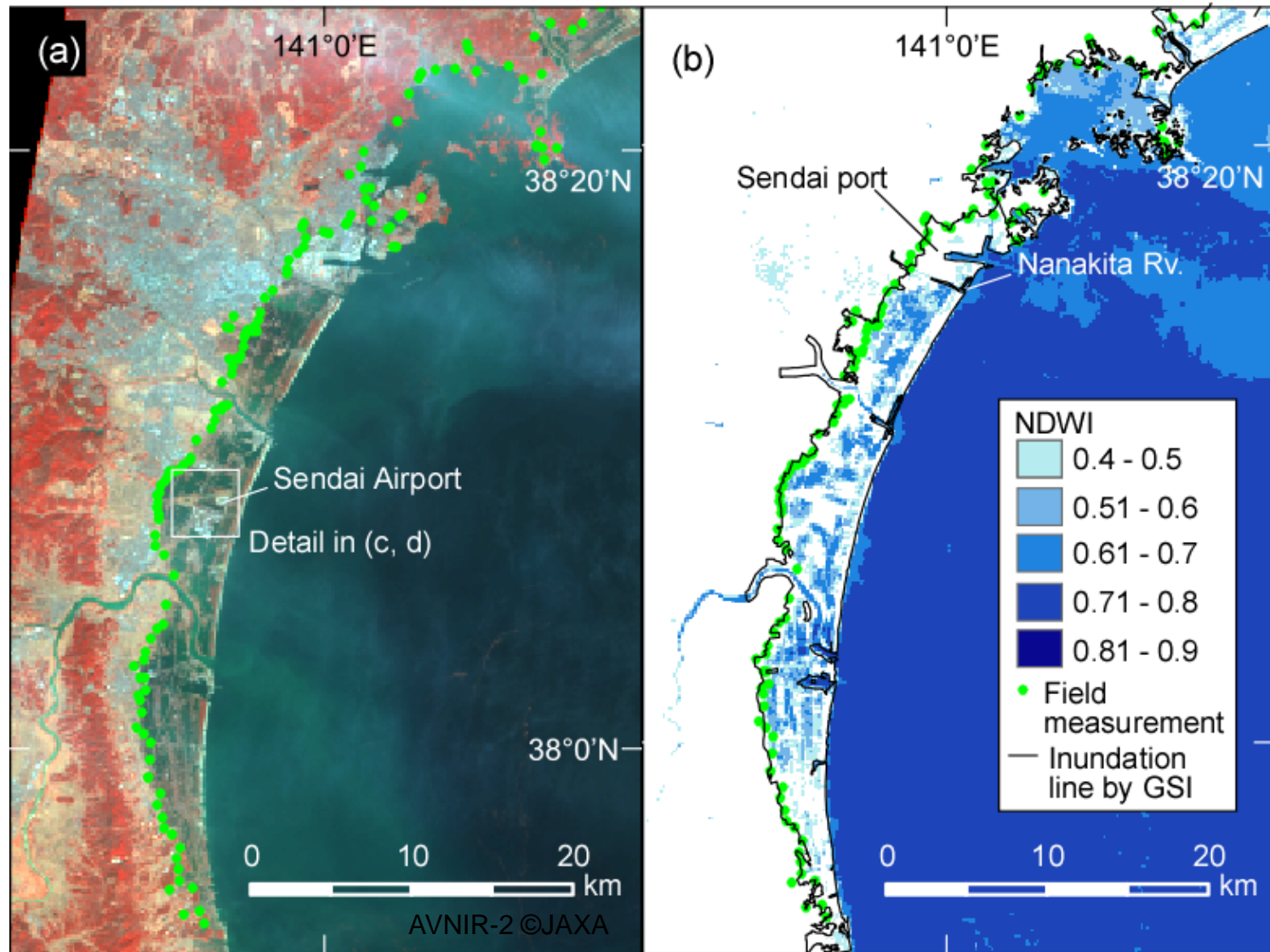
How extensive the tsunami penetrates ?
Optical satellite remote sensing (FORMOSAT2)

12 March 2011   19 March 2011
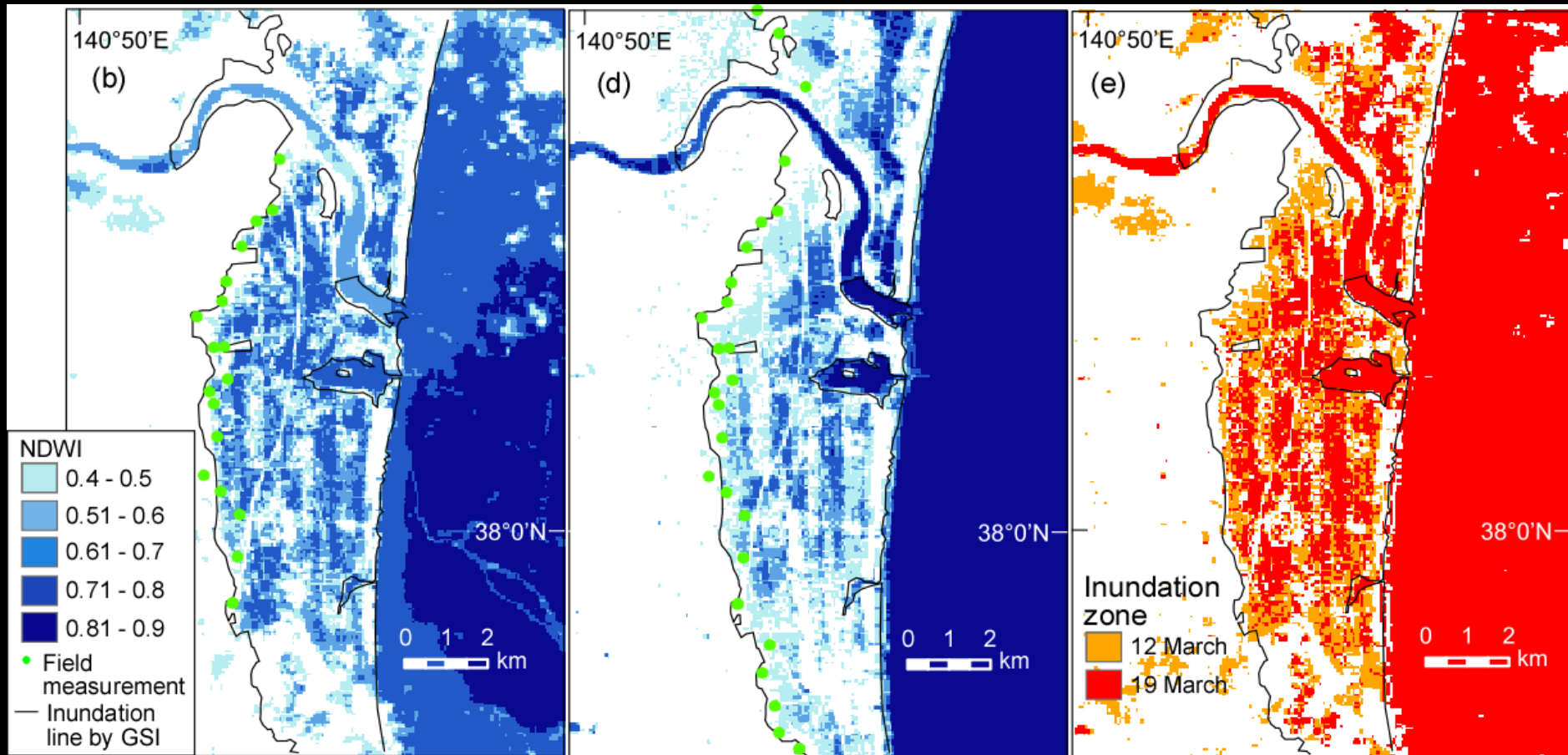
The 2011 Great East Japan Tsunami:

## Impacts on building and inland structures

Data 251, 301 buildings

Ministry Land Infrastructures and Transport. 2011
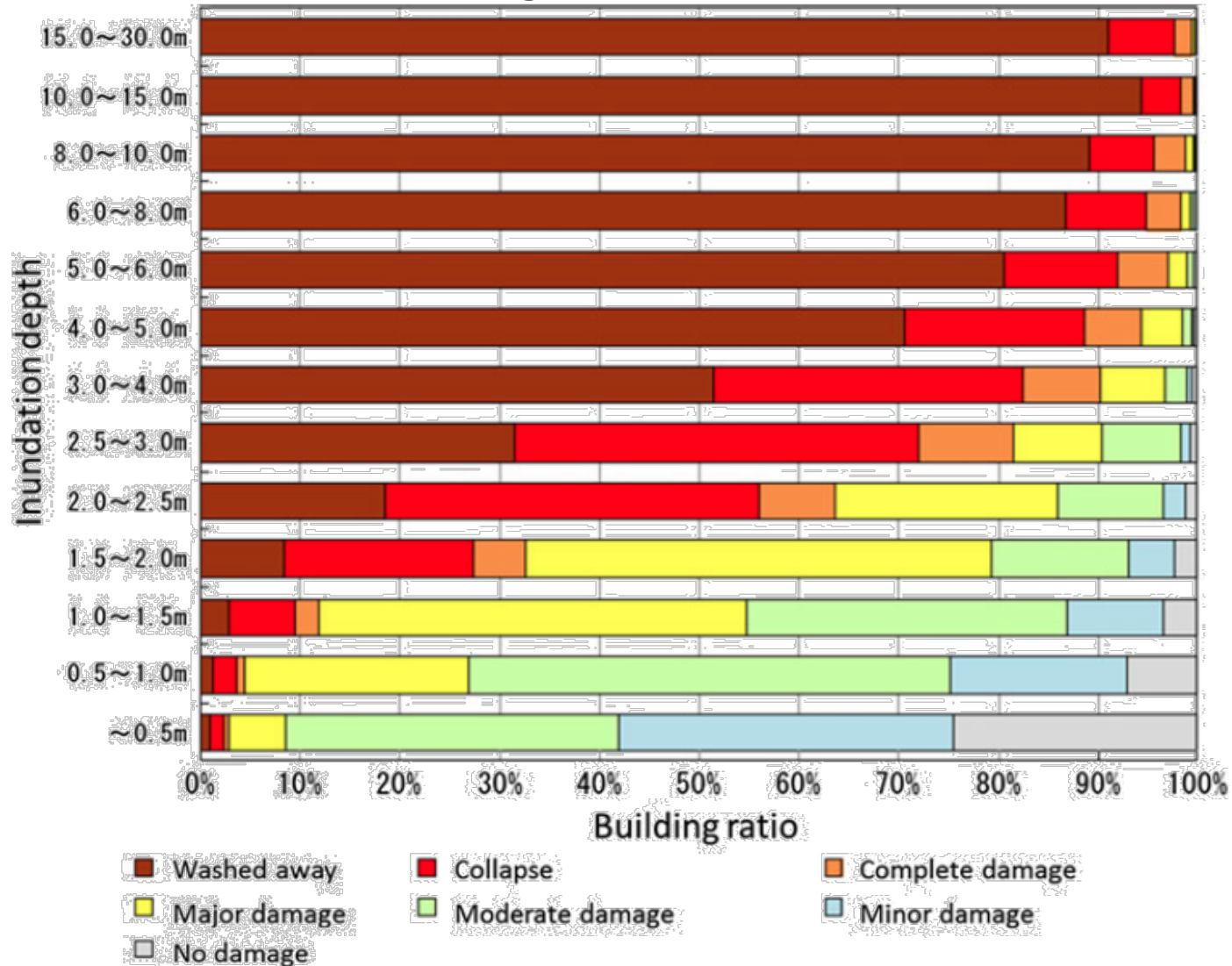
Structural damage interpretation using aerial photos
GSI (Geospatial Information Authority of Japan)

Gokon et al. (2012)

Towards Quantitative Estimation of Structural Damage using SAR data

- Pre and post event satellite data (TSX, CSK, RS-2, PALSAR-2, ...)
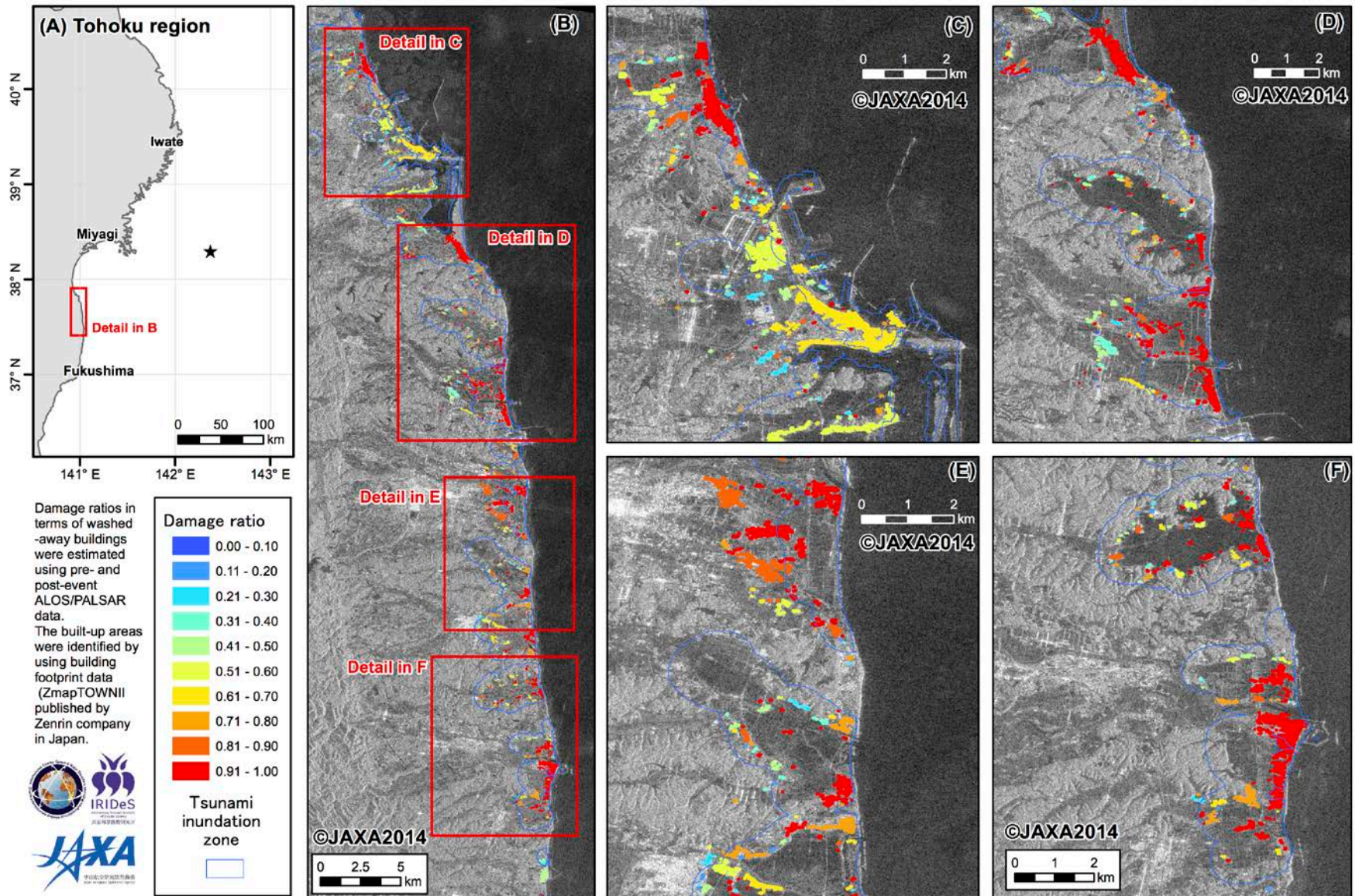- Digital elevation models (ASTER GDEM, SRTM)
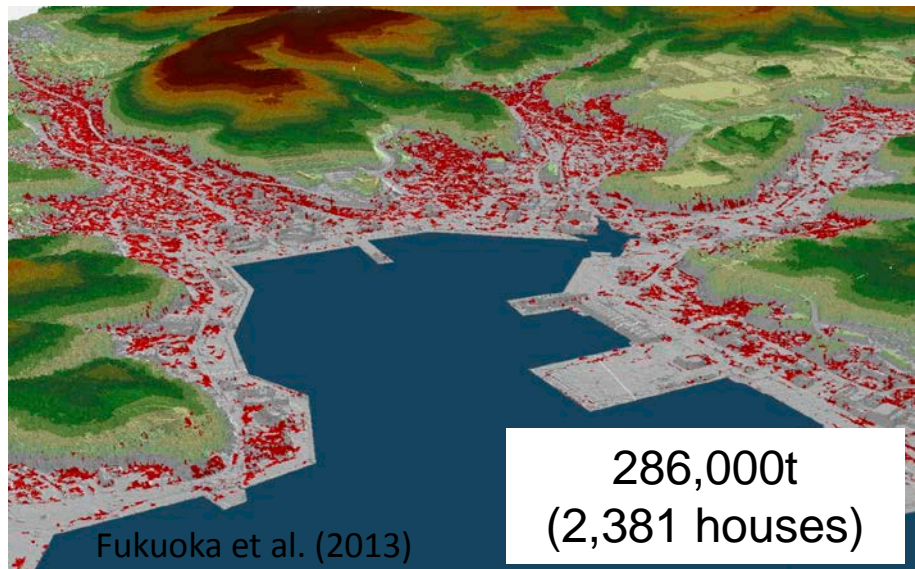- Building footprints

Gokon et al. (2014)
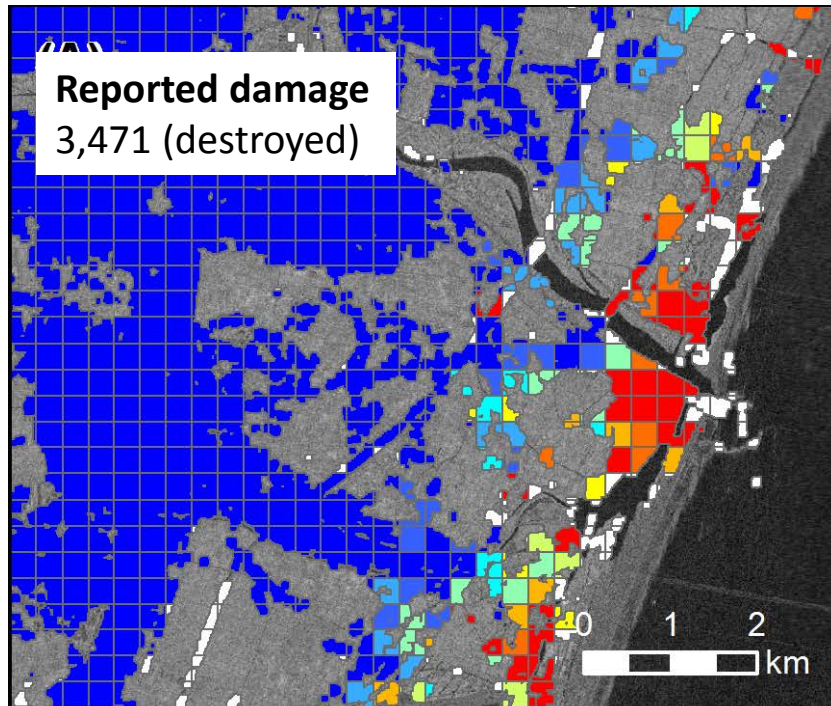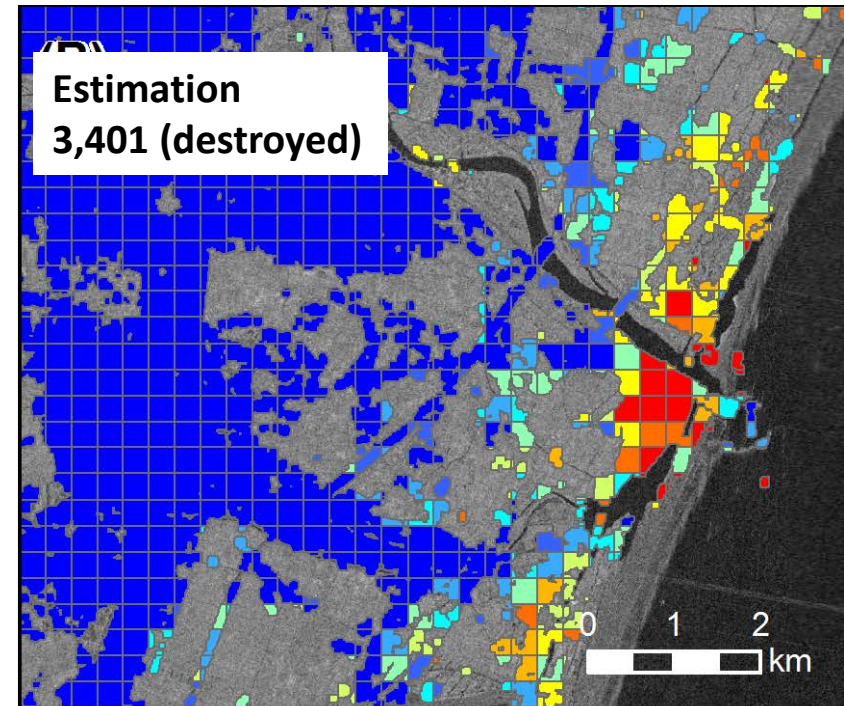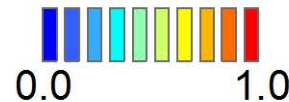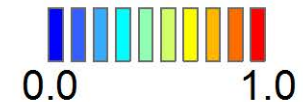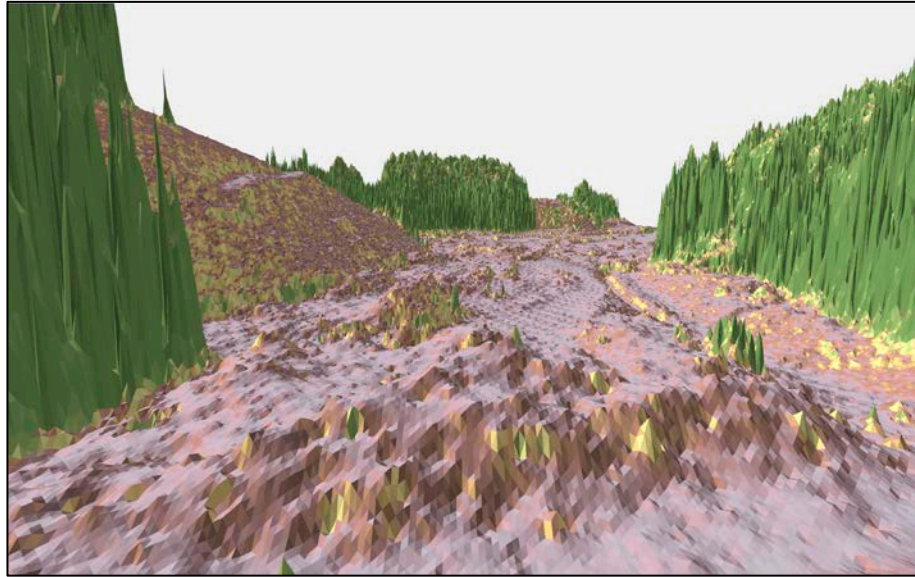
Tsunami Damage Detection using PALSAR

Tsunami Debris Mapping using LiDAR (Light Detection and Ranging)

286,000t
(2,381 houses)

Fukuoka et al. (2013)

Questions?