ITST
2018 PALU TSUNAMI FIELD SURVEY
7-11 November 2018

12 November 2018 BPPT Jakarta

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Sponsors and Supporters (Europe)

- Middle East Technical University, Ankara, Turkey
- Yüksel Project International Co., Turkey
- Turkish Chamber of Civil Engineers, Turkey
- Tsunami hazard research funds of Prof. Tinti, University of Bologna, Italy
- European Commission Joint Research Centre (EC JRC), Disaster and Risk Management Unit, Ispra, Italy
- Portuguese Institute for Sea and Atmosphere, Lisbon, Portugal
- Dom Luiz Institute, Faculty of science, University of Lisbon, Portugal
- Special Research Bureau for Automation of Marine Researches, Russia
- Nizhny Novgorod State Technical University n.a. R.E. Alekseev, Russia
- Austrian Embassy in Jakarta
- Fundaçao de Ciencia e Tecnologia (FCT)
- Kneissl Touristik GmbH

- Condolences for the loss of lives in Palu and other tsunamis and disasters in Indonesia and all over the world.

- Deep sorrow for Indonesian scientists who passed away in 2018. They are our bellowed friends and colleagues Dr. Subandono Disposaptono and Dr. Fauzi.

Objectives

- Previous Surveys (Imamura, Arikawa, Muhari, Synolakis, Fritz, Liu, Shibayama, others)
- Filling the gaps of data before it is lost
- Collection of data to use in computational tools for better understanding of the event for Preperadness and mitigation
- Sharing experience and develop collaboration with Indonesian scientists and authorities

DATES

04 November 2018, Sunday: Arrival of participants to Jakarta

05 November 2018, Monday: Presurvey meeting at BMKG

06 November 2018, Tuesday: Travel to Palu

07-11 November 2018, Wednesday-Sunday: Field survey

11 November 2018, Sunday: Travel to Jakarta

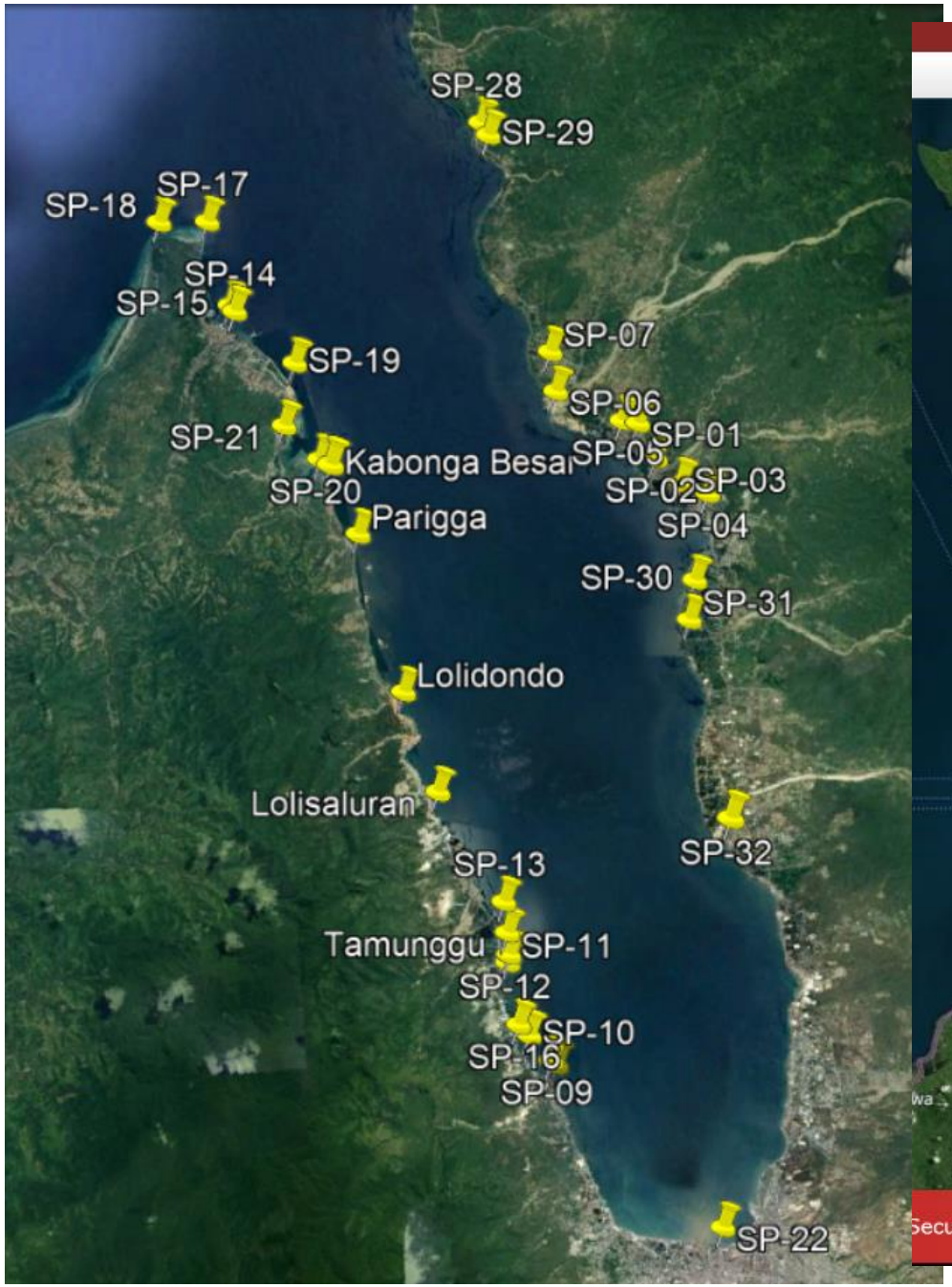
12 November 2018, Monday: Postsurvey meeting and briefing at BPPT

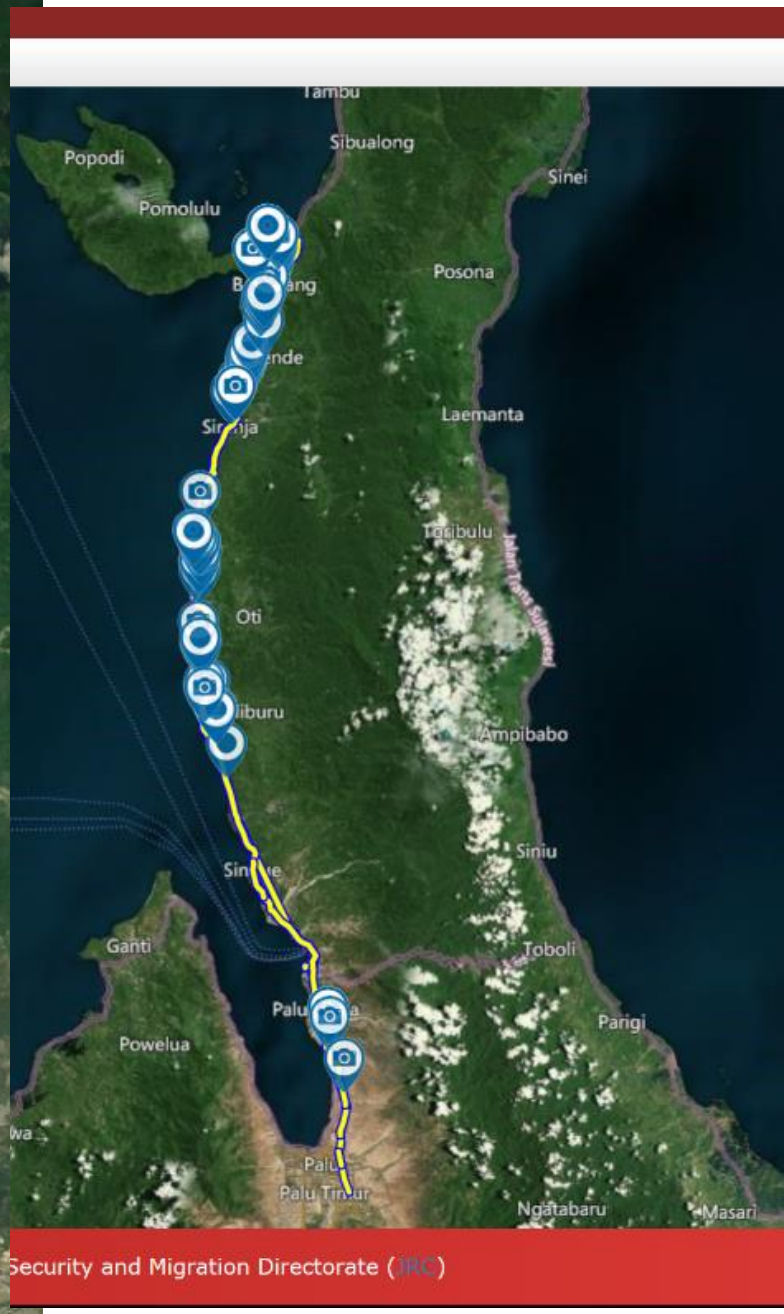
Special Thanks

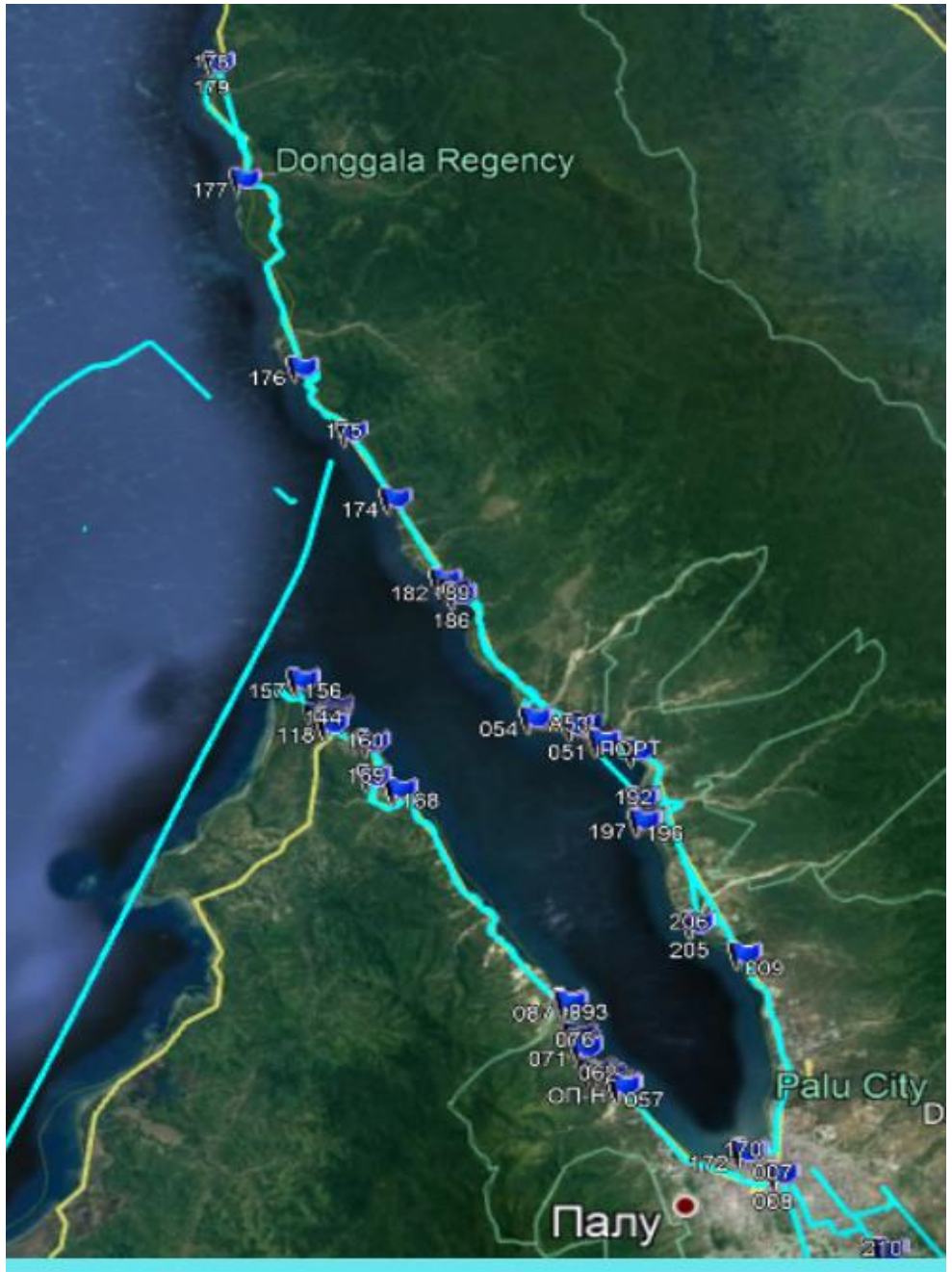
UNESCO-IOC,
BMKG,
MORTHE (Ministry of Research Technology and Higher Education),
CMMA-RI,
MMAF-RI,
LIPI Indonesian Institution of Science,
IATSI Ikatan Ahli Tsunami Indonesia (Indonesian Tsunami Scientific Community)

Survey Team

Survey Points







30 measurement points
for period 7/11/18 – 10/11/18

Runup height
Flowdepth
Inundation distance
Topography profiles

Bamba


Palu City
Палу_Palu

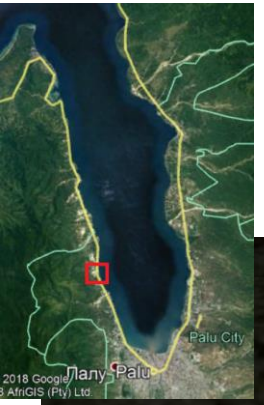

1.3 m

Detided Runup: 3.1m
Runup 3.5 m (time 16 : 00)
Flowdepth 1.3
Flowdepth - 2 m.
inundation distance 203 m
© 2018 Google
Image © 2018 CNES / Airbus
Google Earth
2005
Дата съемки: 9.27.2018 шир. -0.741062° долг. 119.855118° Высота над уровнем моря: 11 м обзор с высоты 380 м


here was a statue 2 m high.
The wave has reached
completely has closed


here was a statue 2 m high.
The wave has reached
completely has closed it
STAY
COOL

SP-16 Between Benteng and Watusampu (North Benteng)



Detided Runup: 8.5m

flowdepth 7 m

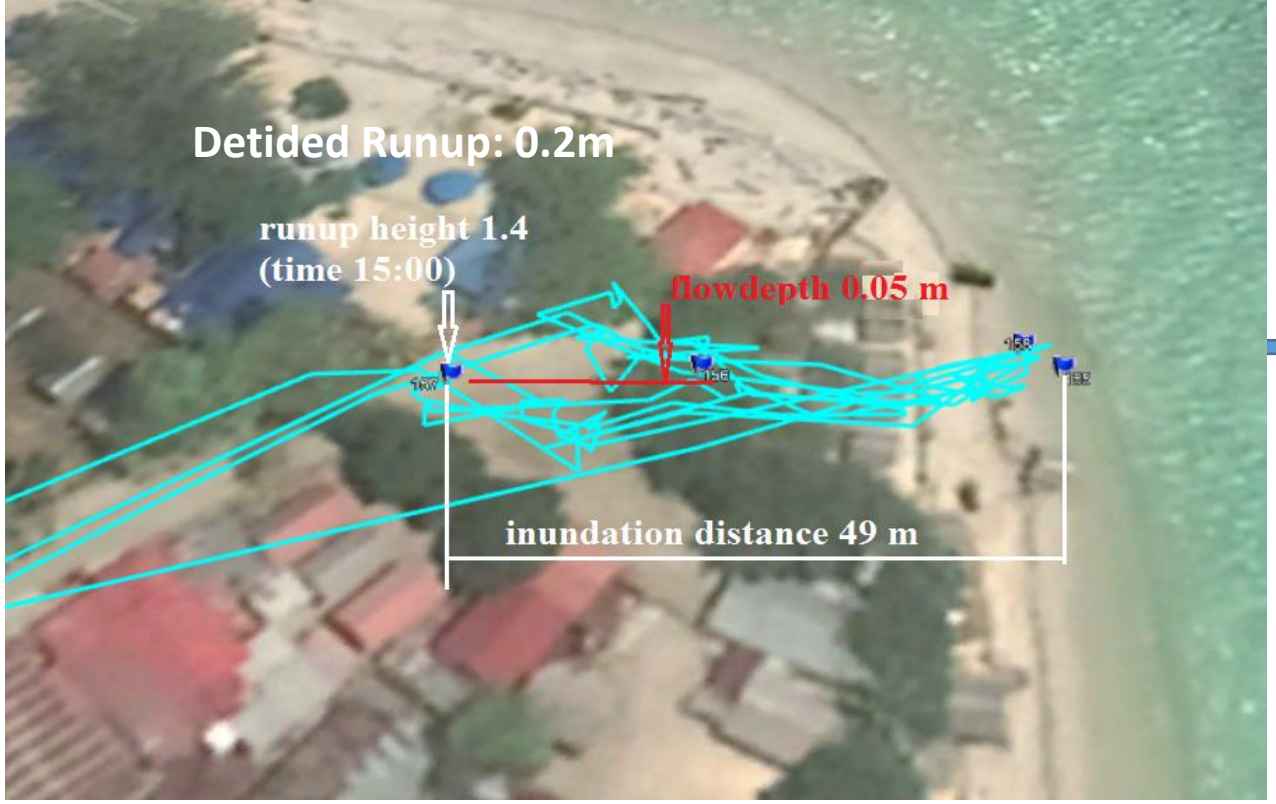
inundation distance 280 m

Runup 9.5 m

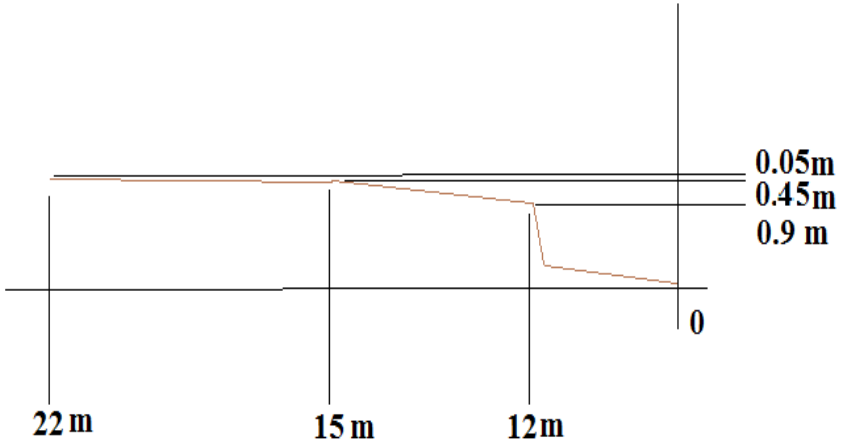
time 9:35

flowdepth 4 m

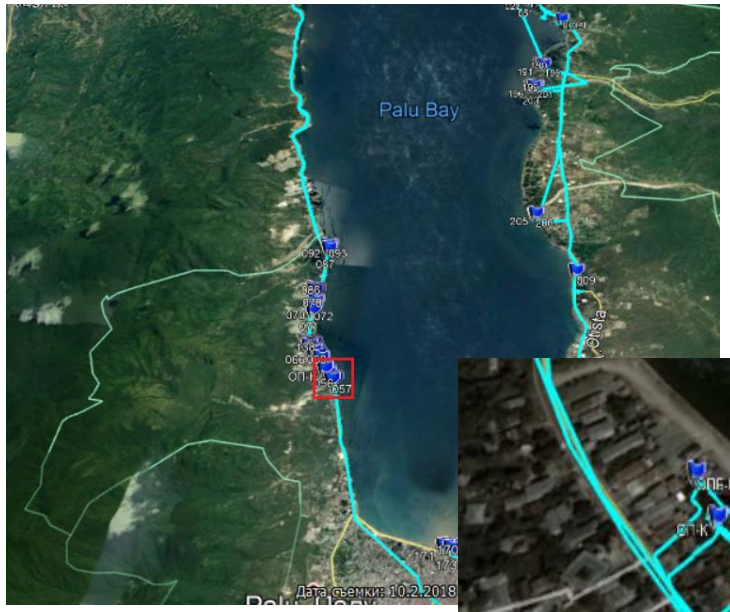
corals

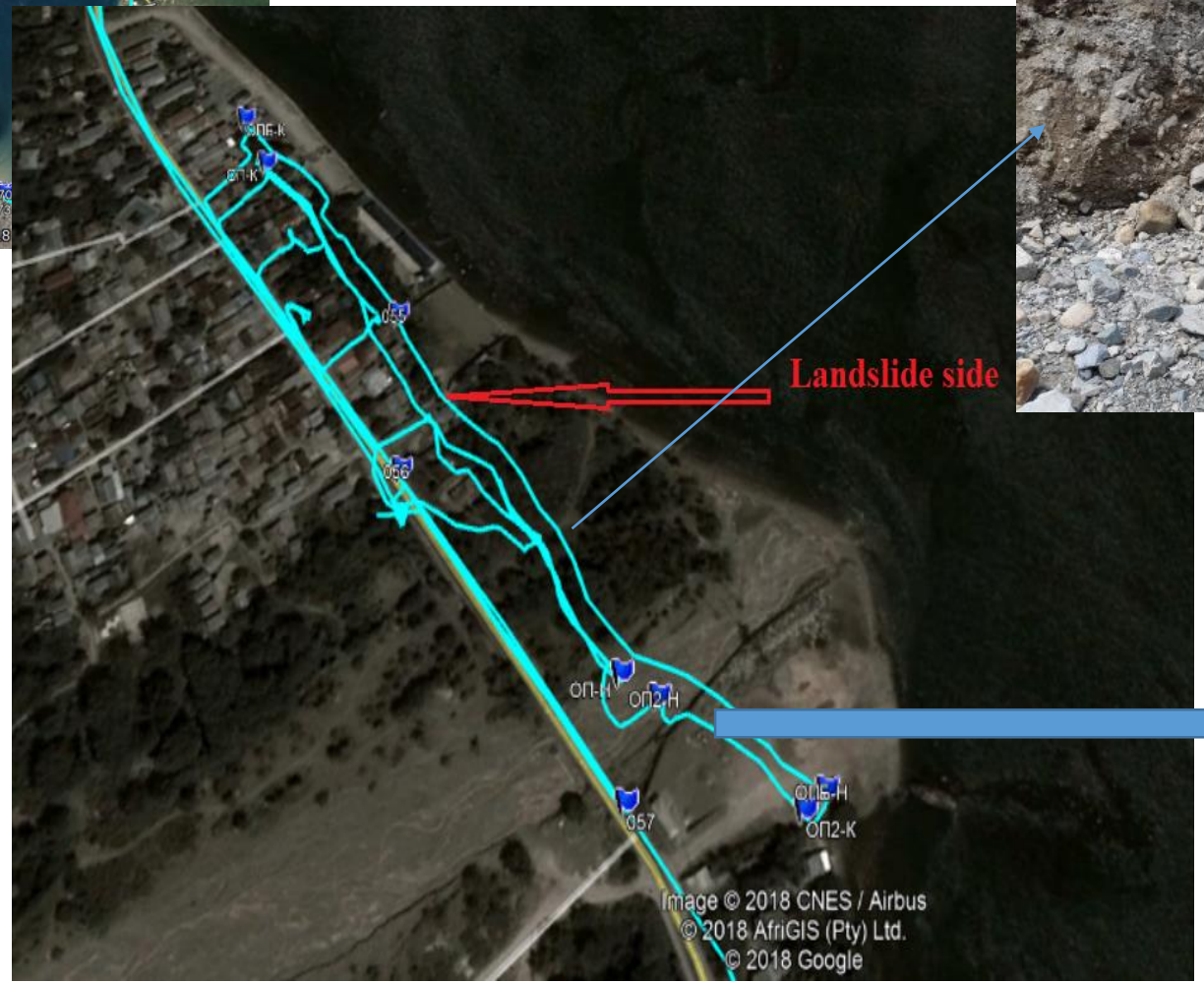


Tanjung Karang



SP-09 Benteng



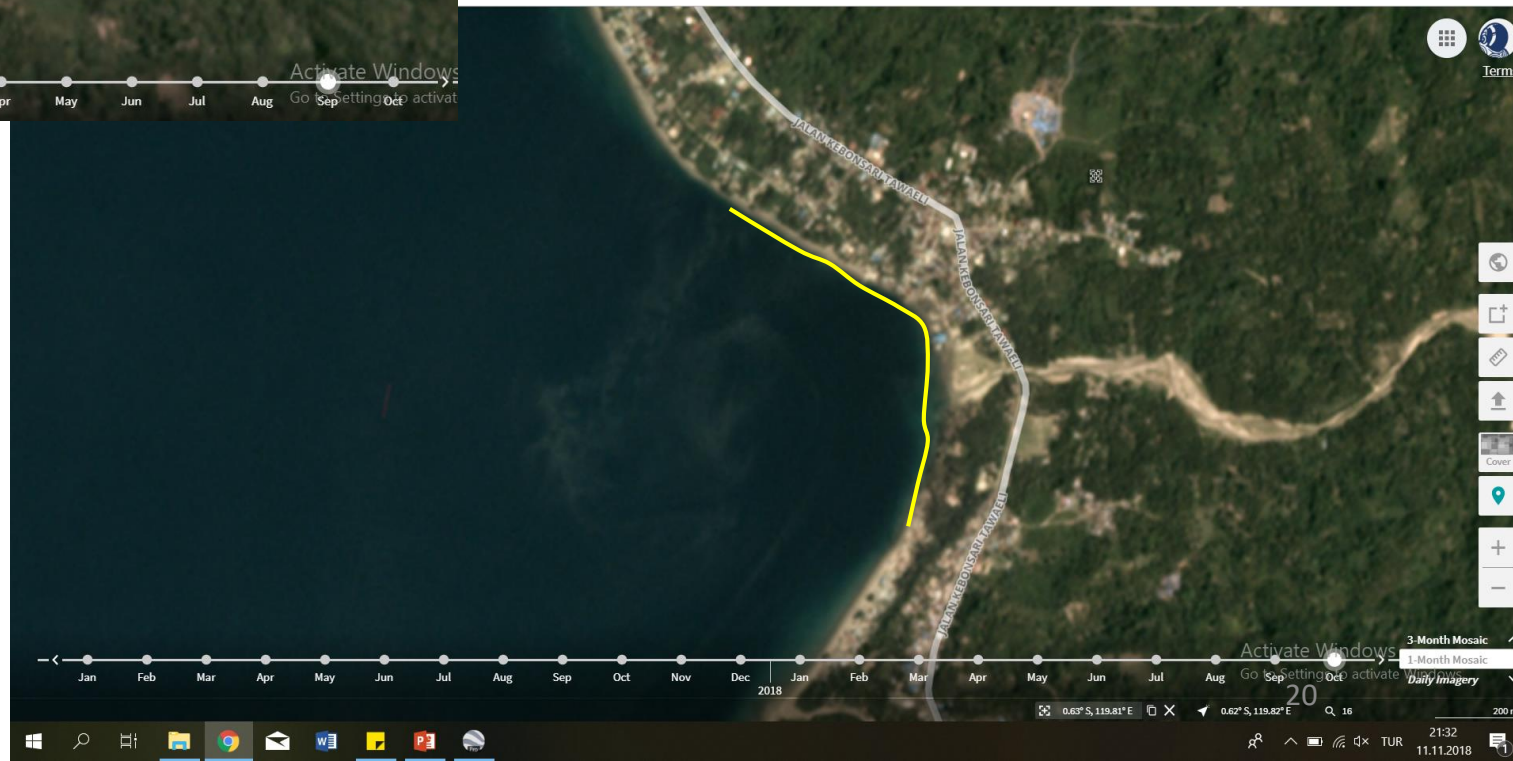


SP-02: Wani (Day-1)

SP-06: North Ngapa (Day-1)

SP-08 (Katoyo) and SP-09 (Benteng) Day-2: Eyewitnesses: some houses disappeared

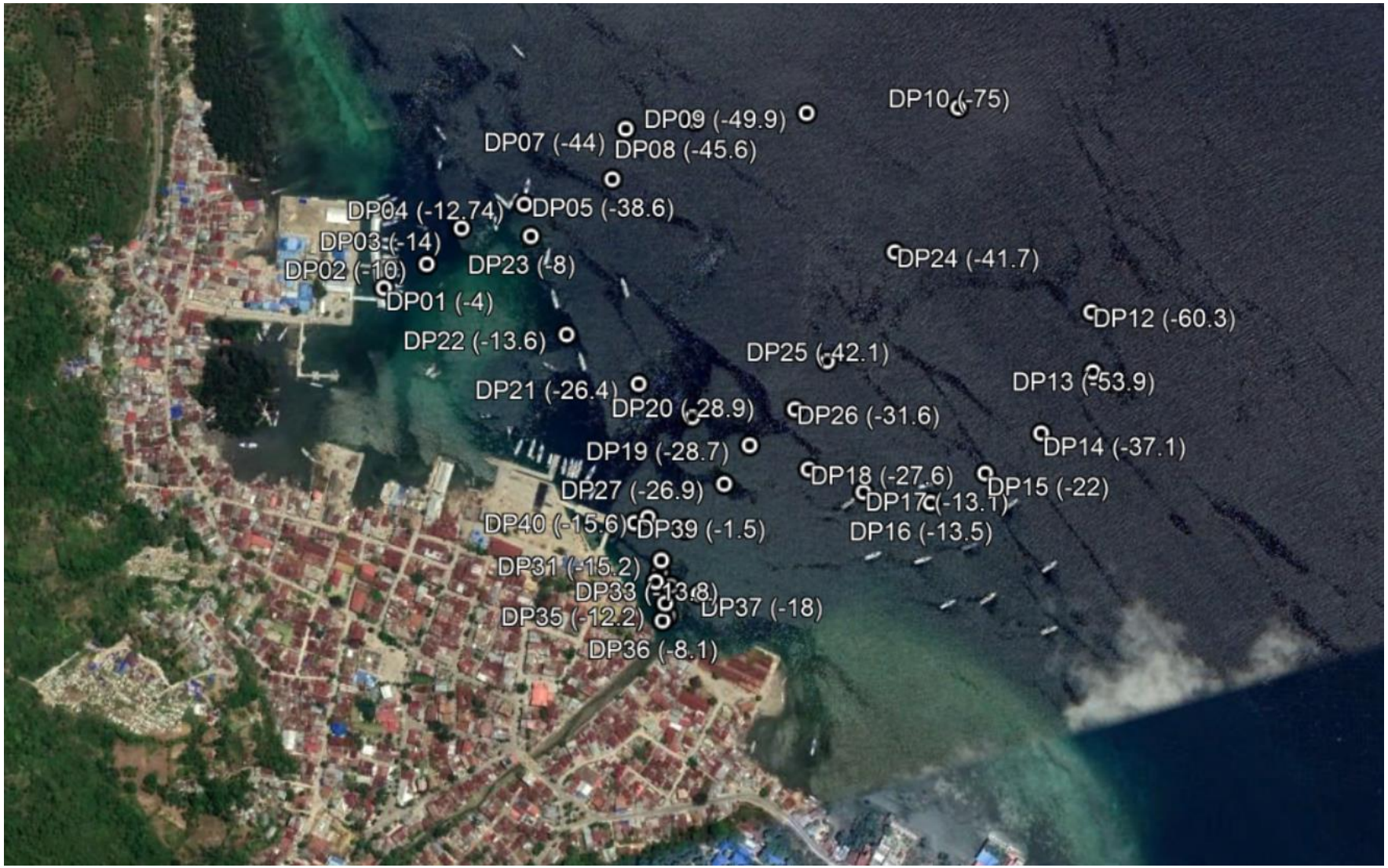
SP-29:
Eyewitnesses: Around 1.5km landslide



Day-2: Donggala Port, coastal subsidence

Day-2: Donggala Port, coastal subsidence

Day-3:
Bathymetry measurement at the Fisheries Port of Donggala (TPI Donggala) and Muara Village



Day-1:WANİ

CCTV Cameras at Wani https://youtu.be/h-CAqaSOBHc

- Earthquake started at 18:02:54 (time at camera record) and ended at 18:03:40.
- Advancing flow started at 18:06:29.
- Advancing flow stopped at 18:06:51

- In the second part of the video (from another Camera) wave arrives at 18:06:32 and,
- advancing flow stops 18:06:59

Day-1:Wani

Day-1: SP-02 Tongge

- High damage and many victims
- Subsidence/landslide
- Eyewitness: Wave direction was from west or Pantoloan
- Runup 3.9m (detided),
- Flow depth 1.77m
- The trucks were moved

Day-2: SP-09 Benteng

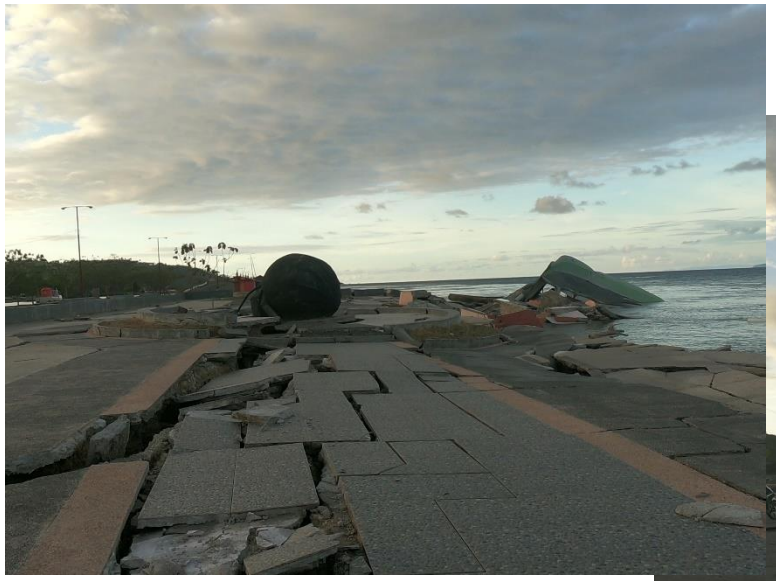
- Around 70m subsidence/landslide according to eyewitnesses
- Eyewitness: First wave recedence
- Three waves, the second one largest
- Steep bathymetry according to a fisherman
- Time interval between successive waves less than 1 min
- Runup 9.1m (detided)

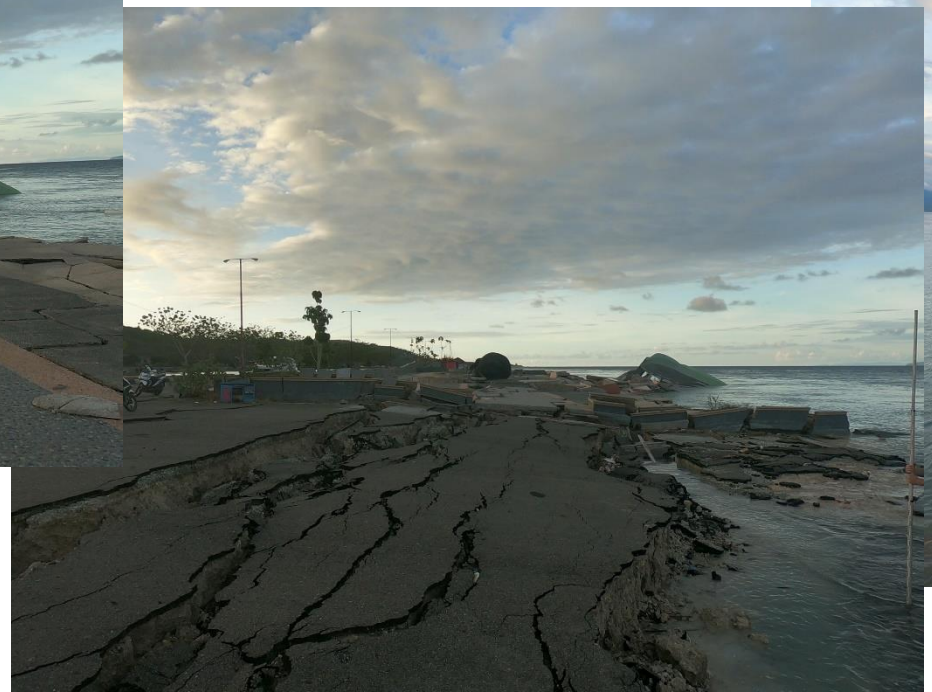
8 November 2018 – day 2

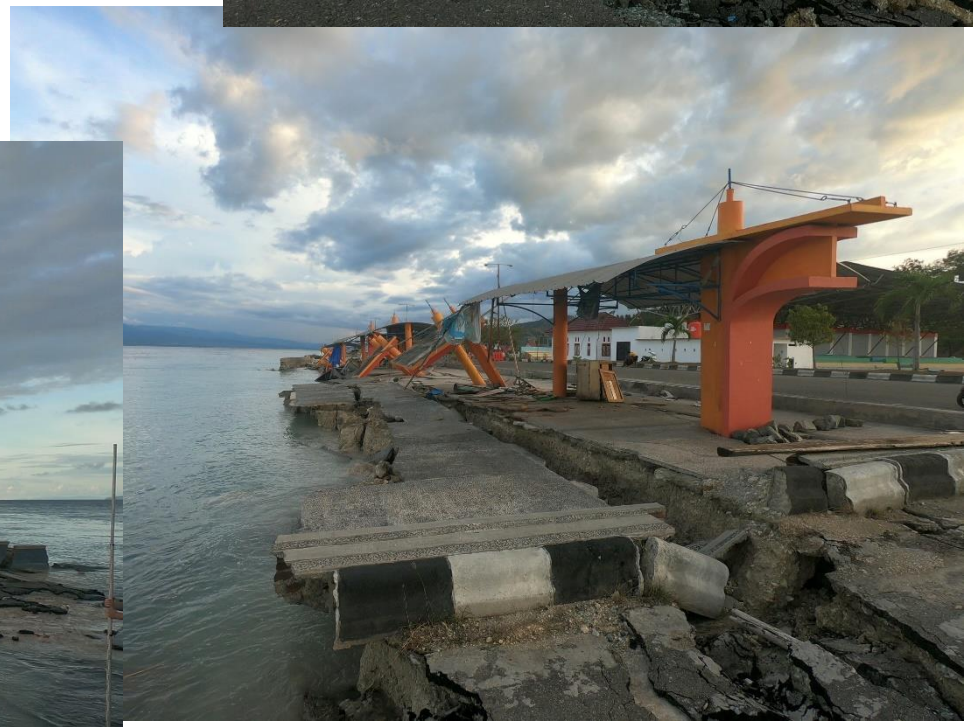
Surveyor: Maria Ausilia Paparo, Rachid Omira, Martin Wronna, Pamela Probst, Chiara Proietti

Day-3: Donggala Kota Wisata

- 30m inundation distance
- 2m runup (detided)
- Tsunami damage to the seawall structure
- Eyewitnesses:
- First the water receded,
- Quick waves just after the earthquake,
- First wave White colour, second wave dark colour

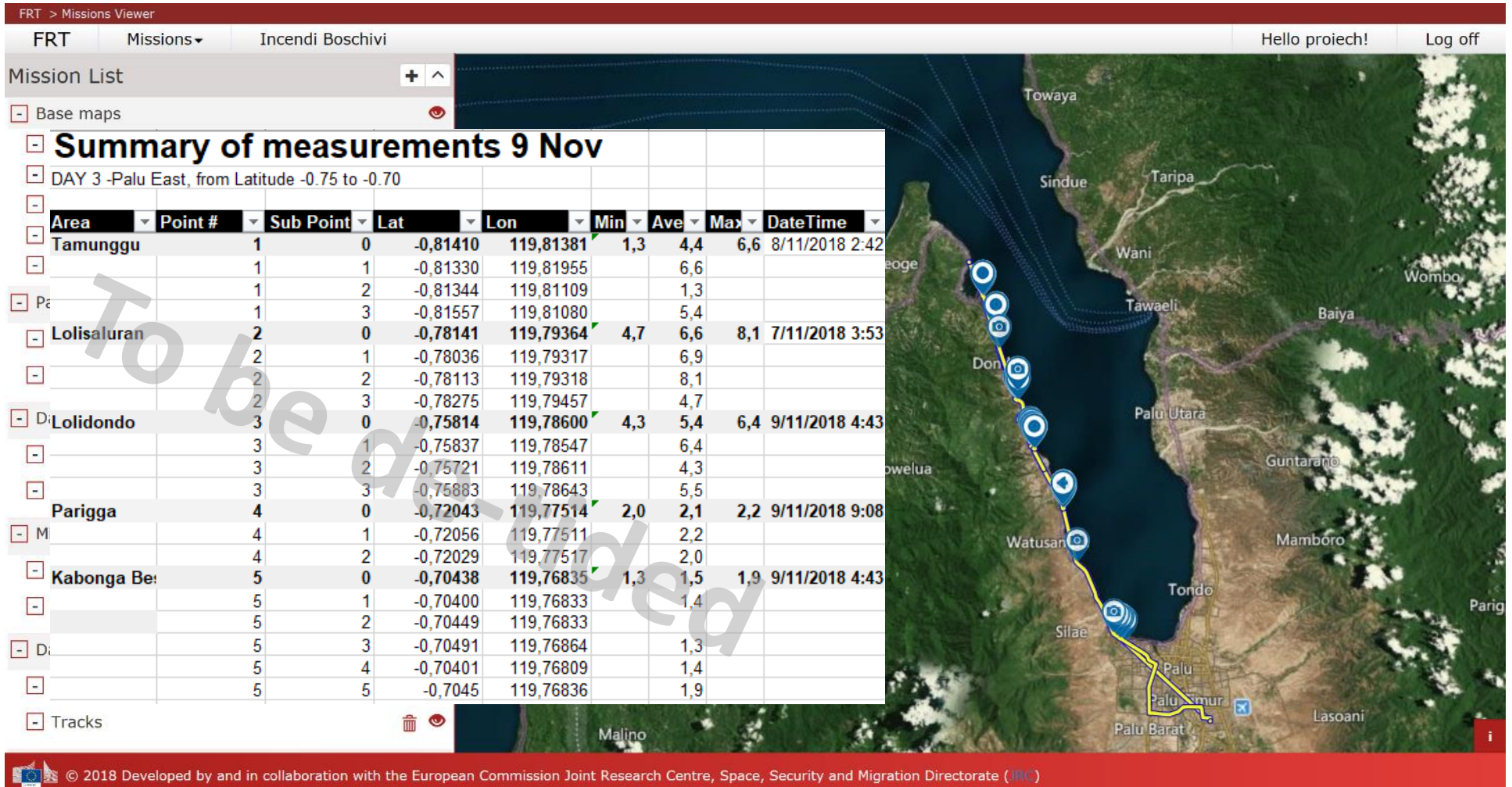






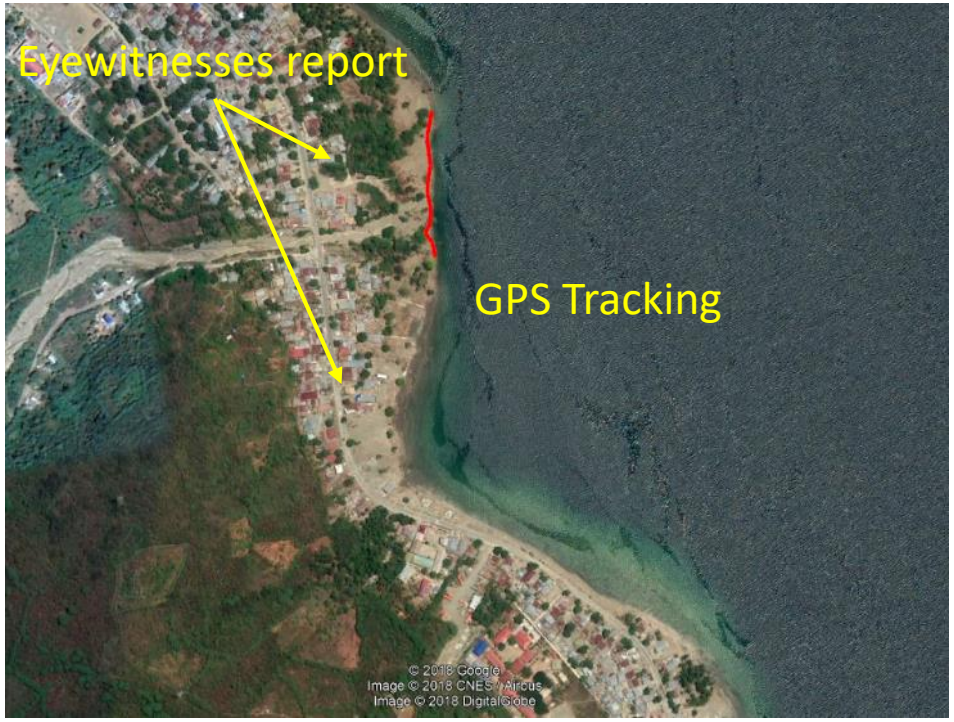
9 November 2018 – day 3

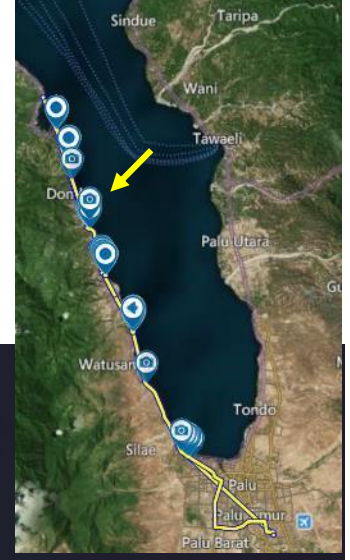
Surveyor: Maria Ausilia Paparo, Rachid Omira, Martin Wronna, Pamela Probst, Chiara Proietti, Purna S. Putra, Gian G Sudarman



9 November 2018 – day3

Coastal collapsing in North of Navy site

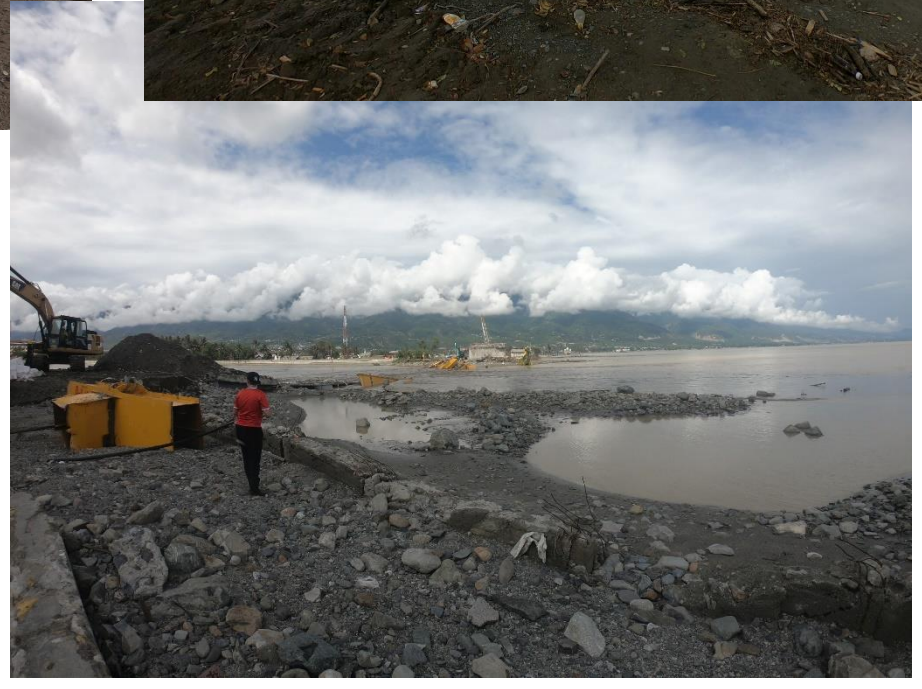




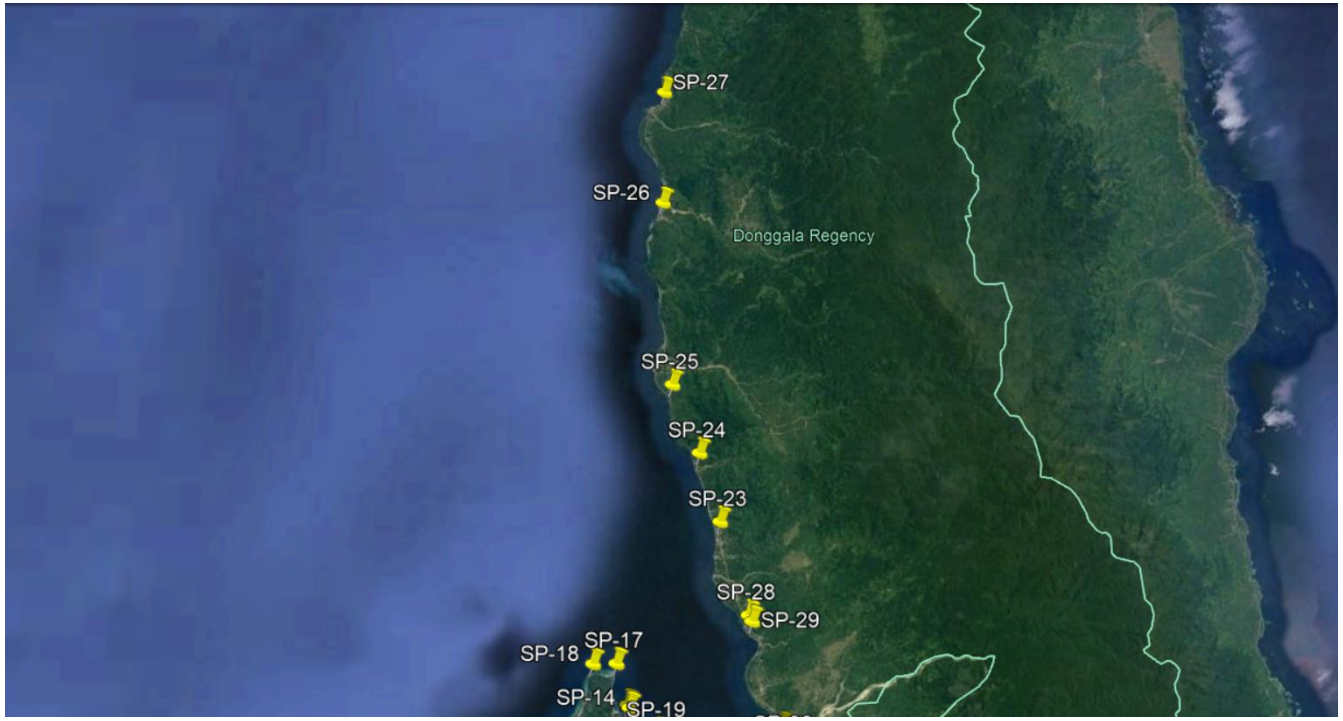
Eyewitnesses report from both side of the area:

- During the earthquake they heard like an explosion coming from the detected area
- The sea retroceded, bubbleling. They all escaped toward the hill.
- The waves arrived around 1 min after the earthquake. The main one was the second.

Day-4: Talise Beach



Day-4: North-eastern Parts of Palu Bay



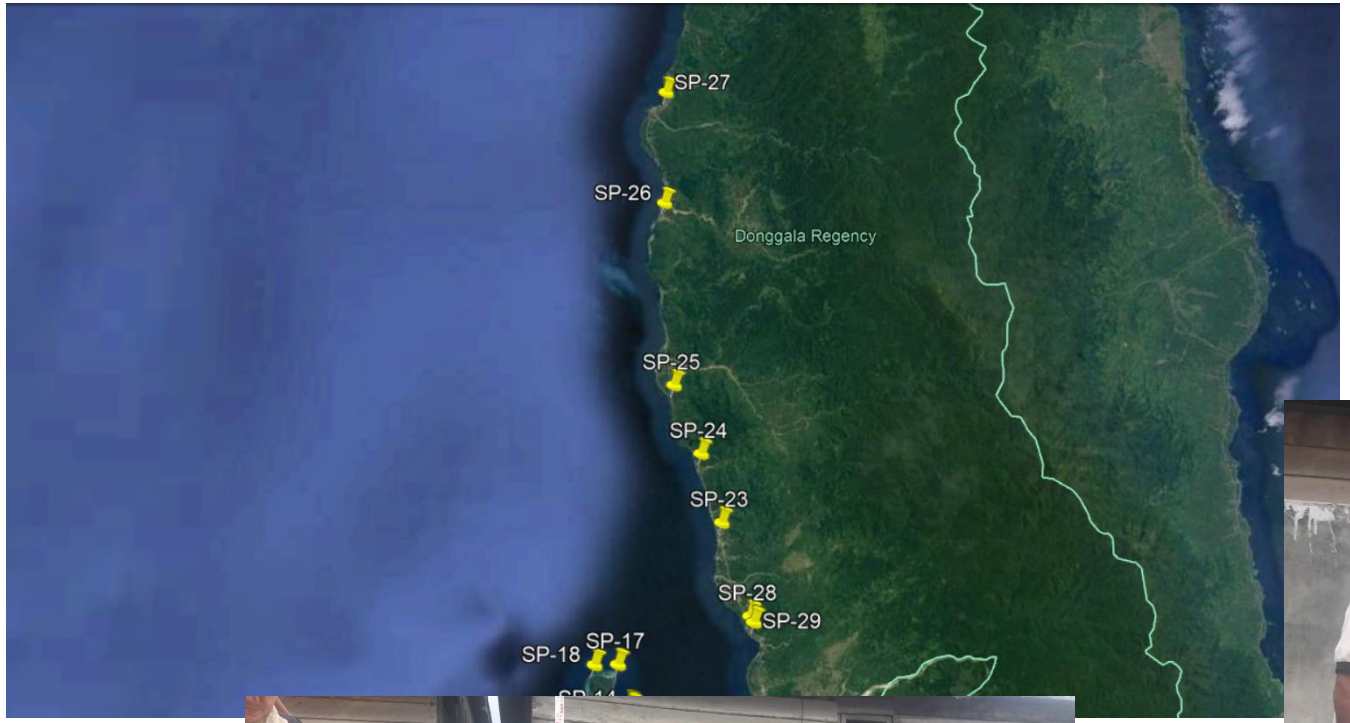
SP-23:
- No observed waves here according to the eyewitnesses
- An eyewitness saw that the waves from the center of the bay went to Palu just after the eq.
- The waves were White colour
- Subsidence: 2 hours after the eq., at night

SP-24:
- Subsidence and liquefaction
- Waves observed from the center of the bay went to Palu just after the eq.
- 0.9m runup (detided)
- 24m inundation

SP-25:
- No observed waves here according to the eyewitnesses

SP-26:
- Very small waves
- Runup may be around 0.5m

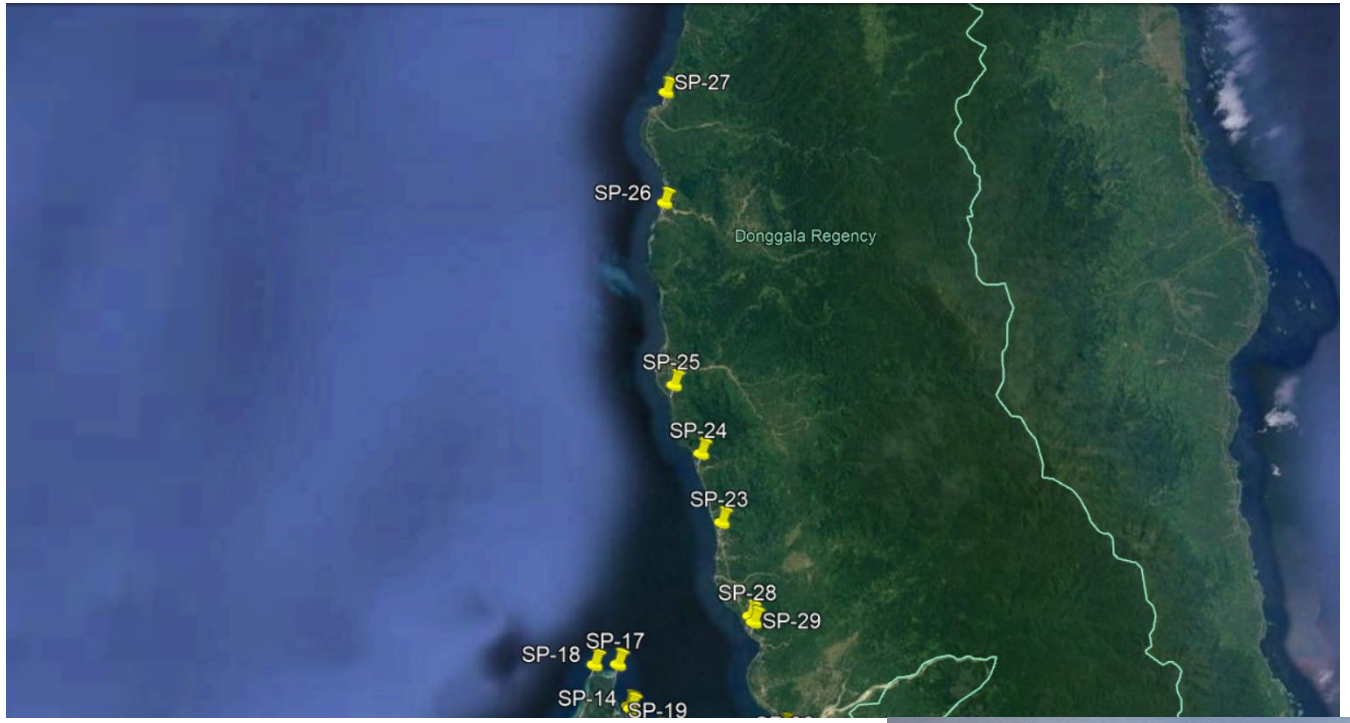
Day-4: North-eastern Parts of Palu Bay



SP-27:

- Liquefaction
- The water subsided and came to its normal position.
- Eyewitnesses reported no tsunami observation
- Sea subsidence occurred just after the earthquake (in less than 1 minute)
- The land moved down 90cm

Day-4: North-eastern Parts of Palu Bay



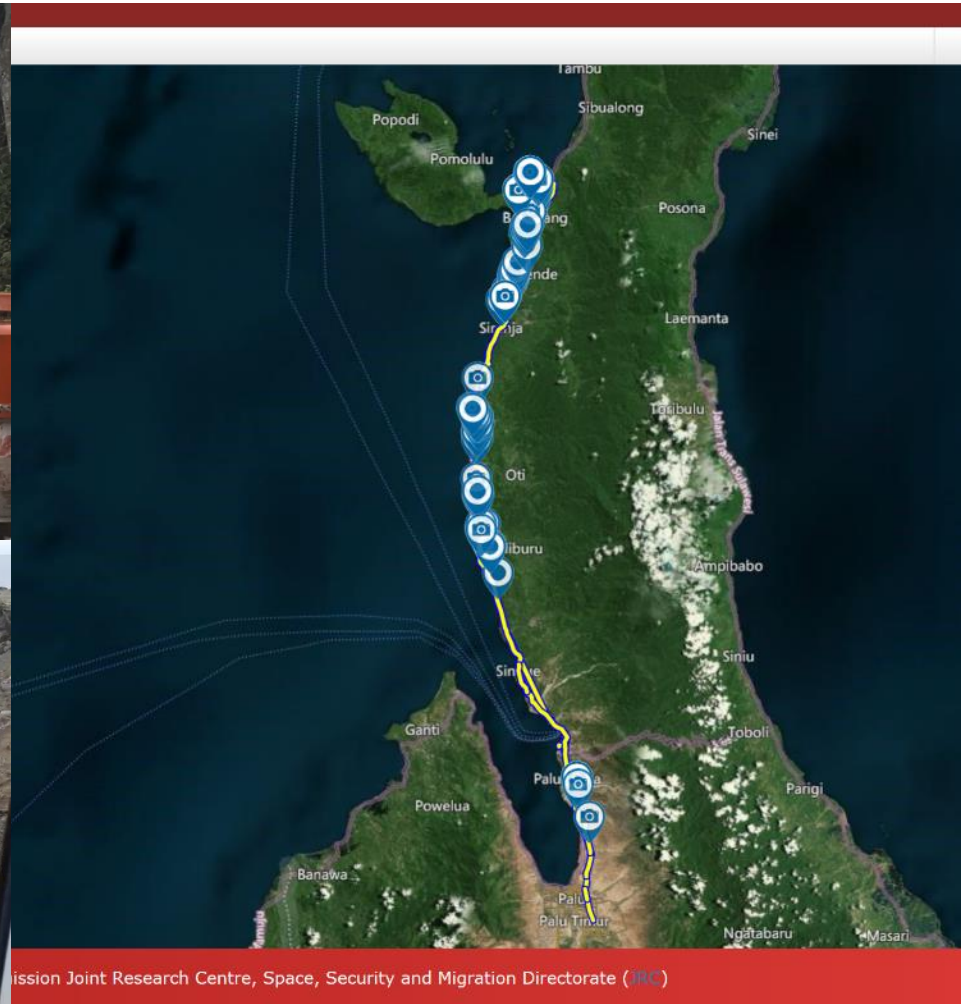
SP-28:

- Eyewitness in his boat at the time of the event
- First, subsidence, then 3 times up and down of water level
- Runup: 1.8m (detided)
- 38m inundation

10 November 2018 – day 4

Surveyor: Maria Ausilia Paparo, Rachid Omira, Martin Wronna, Pamela Probst, Chiara Proietti, Purna S. Putra, Gian G Sudarman

Difficulties to reach the area



10 November – day 4

Variation of the sea level height: - 1.3 m*

Pre-EQ max tide level

Post-EQ max tide level

Report from eyewitnesses of both bays

- Slow increasing of the sea level few mins after the earthquake
- Oscillation of the max tide height for 3 days
- The level of the high tide is still 1 m above the pre-earthquake level

* previous level: based on eyewitnesses reports; actual level: based on the trace on the external wall of the house

10 November – day 4

South of Port of Pantaloan – North of Wanii

Run up height: 4 m (detided)

Inundation distance: 96 m

SCIENTIFIC CONTRIBUTIONS

This survey enabled

General Assembly of American Geophysical Union AGU 2018, Washington DC, USA, 10-14, December 2019 https://fallmeeting.agu.org/2018/

General Assembly of European Geoscience Union EGU 2019, Vienna, Austria, 7-12 April 2019, https://egu2019.eu/

International Tsunami Symposium, IUGG General Assembly, July 2019, Canada, July 8-18, 2019 http://iugg2019montreal.com/

Two or more papers in high impact scientific journals

International Collaboration

STATUS

- Recent tsunamis indicate that tsunamis are not rare events
- Indonesia is one of the most frequent tsunami experienced country
- Palu tsunami is a complicated event
- Submarine landslides played major role on tsunami generation in Palu event
- Small or large size coastal landslides are observed at all river or stream mouths
- Another clear example of combination of strike slip shaking and underwater landslide in regard to tsunami generation (1999 Izmit and Palu events)

WE WOULD LIKE TO DRAW WORLDWIDE ATTENTION TO THE UNCERTAINTY AND CERTAINTY AFTER PALU EVENT

- UNCERTAINTY

The tsunami generation mechanism(s)

- CERTAINTY

The necessity of urgent action with great support from the world for the reduction of the effects of social and structural damages in Palu and also for the preparedness for future events

FUTURE

Palu scale

- High resolution bathymetry and topography data (GIS, GPS, Sonar, Multibeam)
- Geotechnical data at Palu Bay area
- Assessment of tsunami generation and propagation in Palu bay by the help of tsunami numerical modeling
- JRC proposal (Last Mile Project)
- More funding to Tadulako University for research on tsunami and marine related hazards
- Societal preparedness against marine related hazards by educational and training programs
- Tsunami exercises

FUTURE

National scale

- Collection of bathymetry and topography data
- Ocean observation and monitoring systems
- More funding to research on tsunami and marine related hazards
- Support to Indonesian scientists for closer and wider international collaboration
- Faster process for research permit under emergency conditions
- Improvement of Early Warning Systems
- Societal preparedness against hazards by education
- Structural preparedness against hazards by engineering guidelines
- Tsunami exercises

THANKS FOR YOUR KIND ATTENTION