Tsunami_Risk

CLIENT II
Internationale Partnerschaften für nachhaltige Innovationen

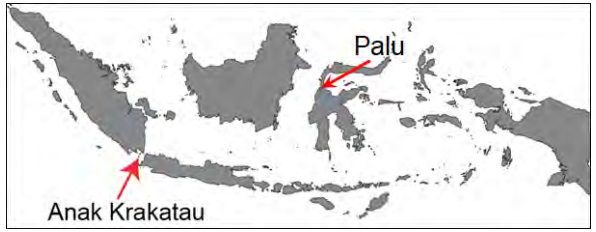
GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

# TSUNAMI_RISK

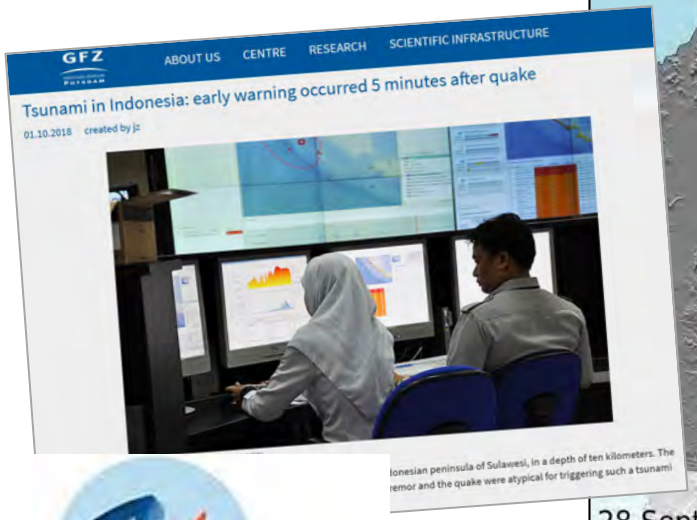
## Multi-Risk Assessment and Cascading Effects Analysis in cooperation between Indonesia and Germany – Joint Research on Volcanic and Landslide induced Tsunamis

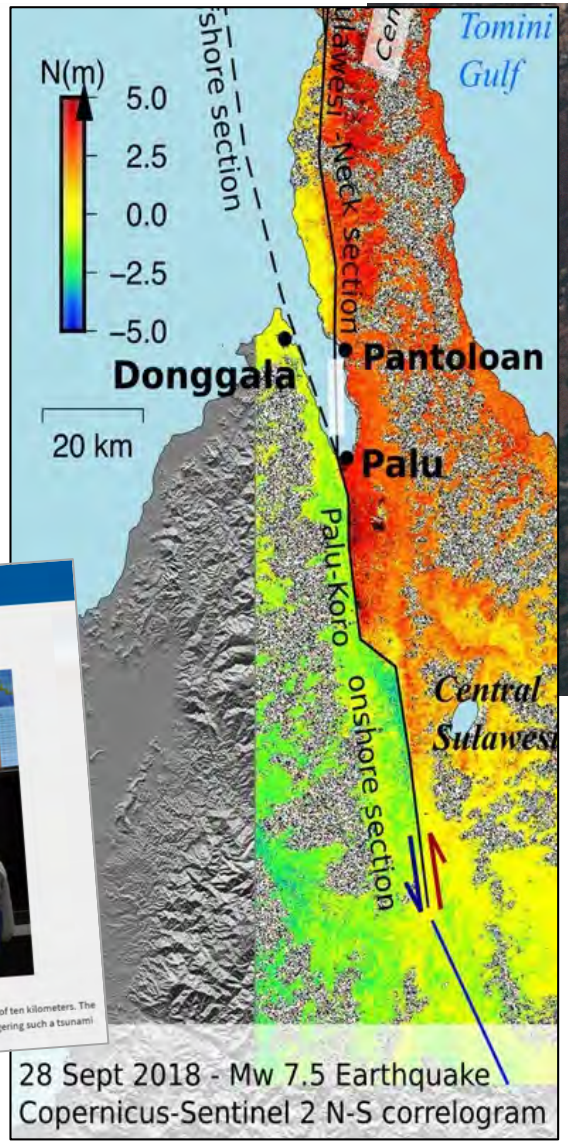
GFZ Helmholtz-Zentrum Potsdam
DLR Deutsches Zentrum für Luft- und Raumfahrt German Aerospace Center
Technische Universität Braunschweig
Technische Universität Berlin
Freie Universität Berlin
Bundesanstalt Technisches Hilfswerk
gempa
BNPB Badan Nasional Penanggulangan Bencana
LIPI
BMKG
BPPT
Institut Teknologi Bandung 1920
LAPAN
Universitas Indonesia
Universitas Gadjah Mada

# MOTIVATION: LANDSLIDE INDUCED TSUNAMI




Two events struck Indonesia in 2018
(a) Palu earthquake
(b) Krakatau collapse







Bacques et al. (2020) Nature

Heidarzadeh et al. (2019) Geophys. J. Int.

# MOTIVATION: LANDSLIDE INDUCED TSUNAMI

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Two events struck Indonesia in 2018
(a) Palu earthquake
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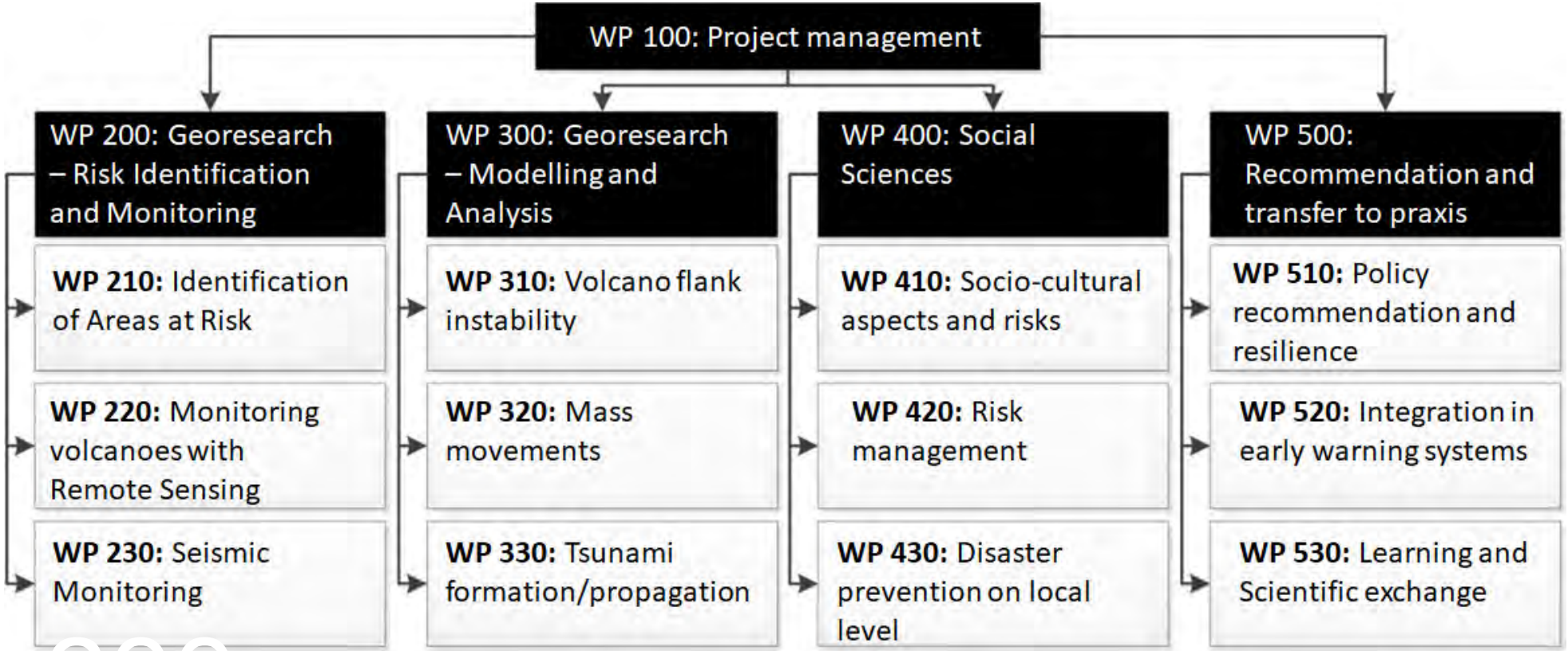
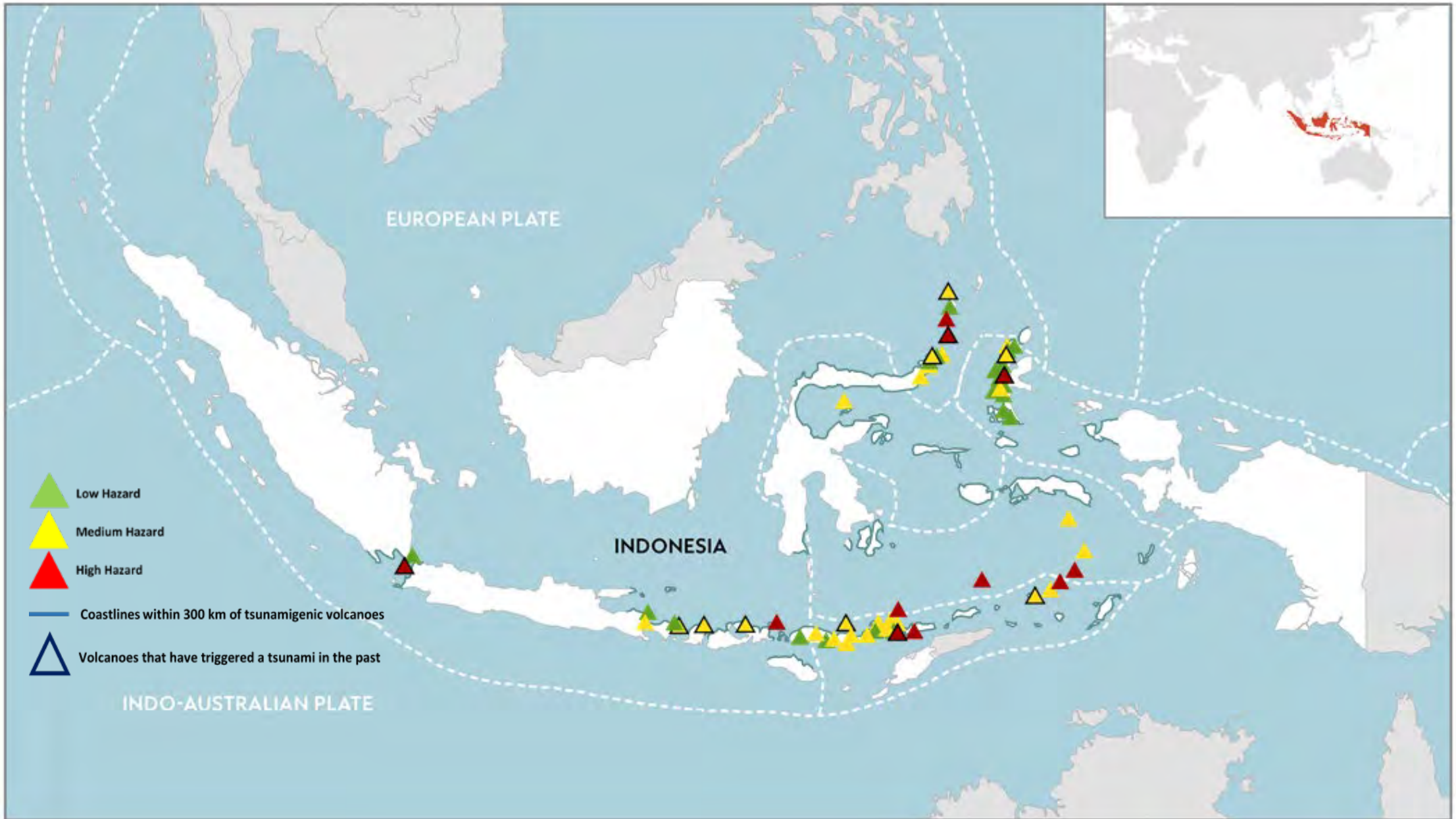
Satellite radar observations by German satellite TerraSAR-X

Anak Krakatau in December 2018

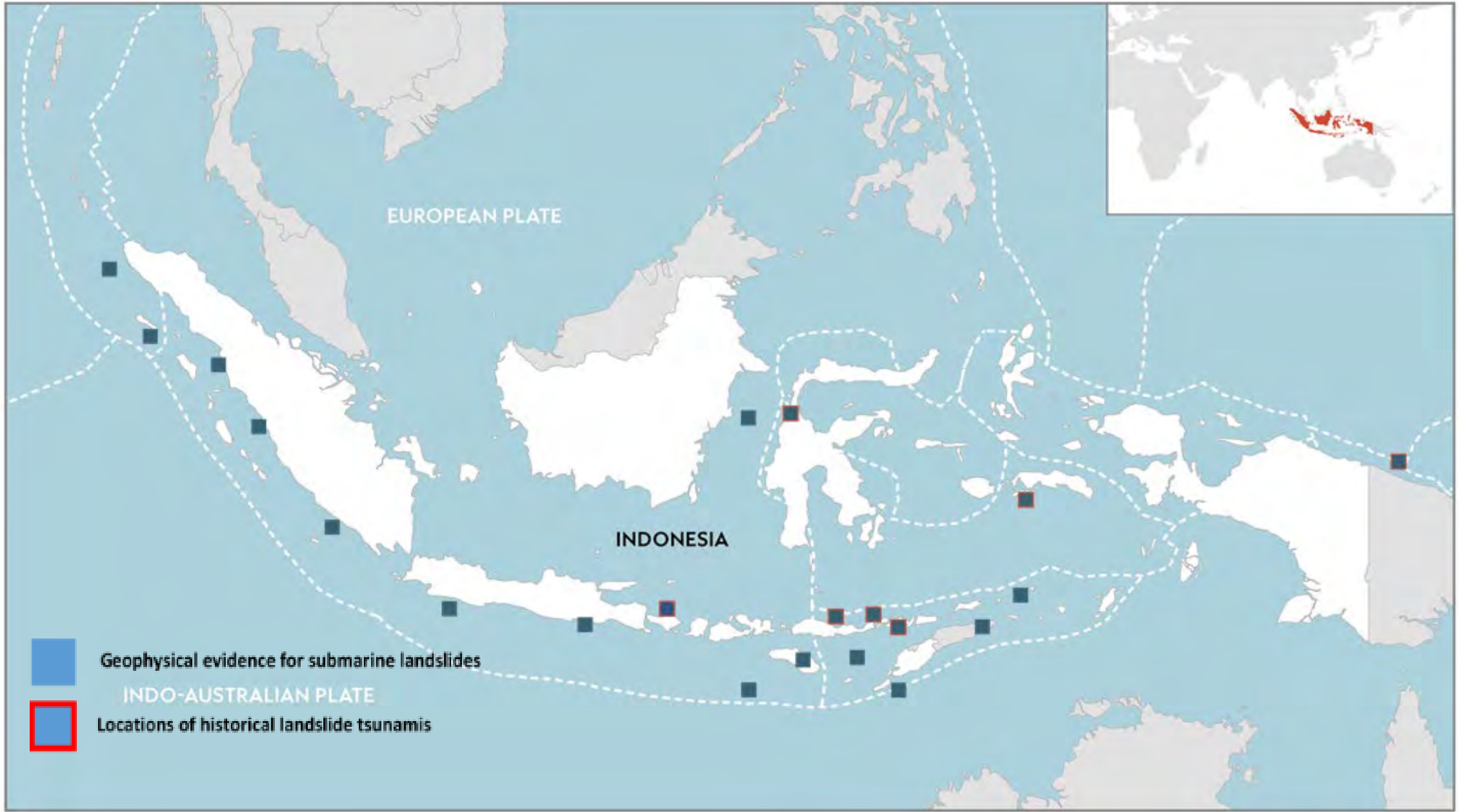
Tsunami damage in December 2018


WP 100: Project management
WP 200: Georesearch – Risk Identification and Monitoring
WP 300: Georesearch – Modelling and Analysis
WP 400: Social Sciences
WP 500: Recommendation and transfer to praxis
WP 210: Identification of Areas at Risk
WP 220: Monitoring volcanoes with Remote Sensing
WP 230: Seismic Monitoring
WP 310: Volcano flank instability
WP 320: Mass movements
WP 330: Tsunami formation/propagation
WP 410: Socio-cultural aspects and risks
WP 420: Risk management
WP 430: Disaster prevention on local level
WP 510: Policy recommendation and resilience
WP 520: Integration in early warning systems
WP 530: Learning and Scientific exchange

# Identification of Areas at Risk (Volcanoes)

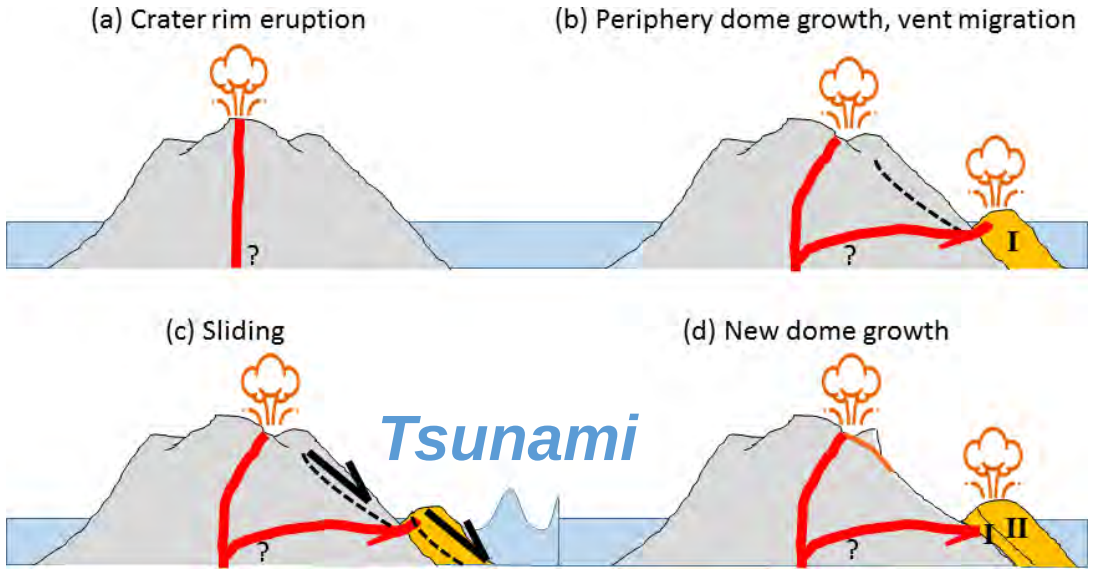


# Identification of Areas at Risk (Landslides)



# Monitoring volcanoes with Remote Sensing

- **Preliminary work:**
  - Joint analysis of SAR, multispectral and thermal satellite data
  - Analysis of the growth and collapse of a littoral lava dome
  - Dome collapse caused a **tsunami**


Contents lists available at ScienceDirect
Journal of Volcanology and Geothermal Research
journal homepage: www.elsevier.com/locate/jvolgeores

Growth and collapse of a littoral lava dome during the 2018/19 eruption of Kadovar Volcano, Papua New Guinea, analyzed by multi-sensor satellite imagery

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# Seismic monitoring

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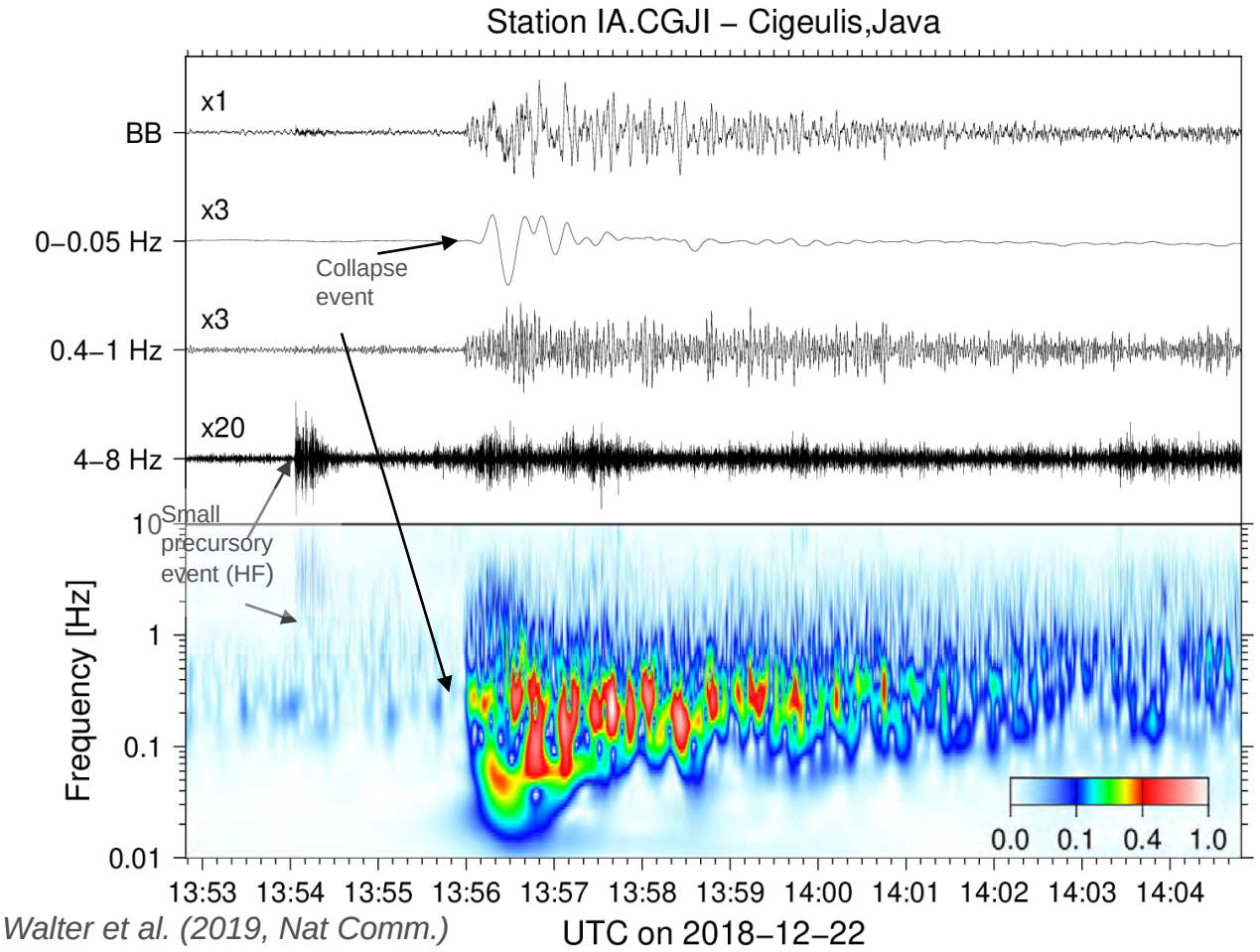
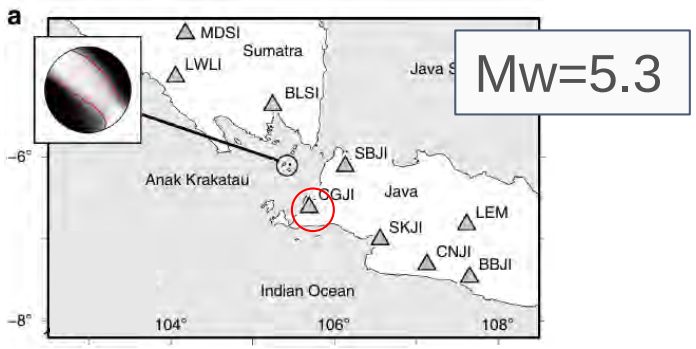
GFZ Helmholtz-Zentrum Potsdam

BMKG

## Aim: Develop concepts for seismic early warning for volcanic collapse & landslide tsunami triggers




*Walter et al. (2019, Nat Comm.)*




Mw=5.3

- Collapse easily seismically detected on broad frequency range
- The challenges:
  - distinguish collapse events from tectonic earthquakes
  - provide fast location and source estimate
  - is existing network dense enough?

# Summary

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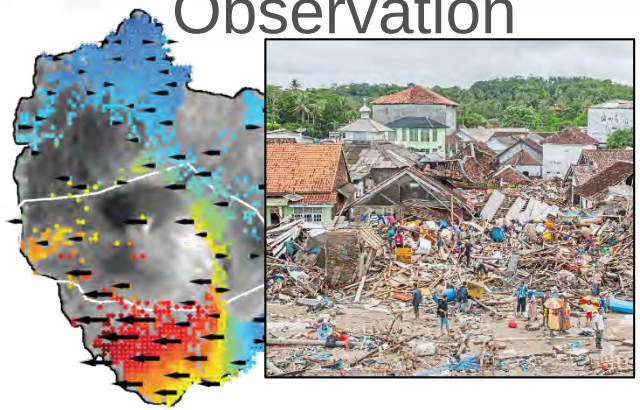
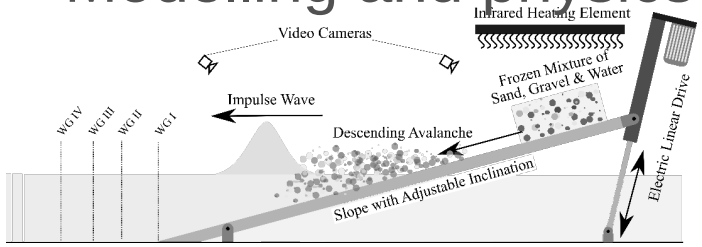
## Observation



## Modelling and physics




## Sociology and Solution


## Risk identification and monitoring

- Which areas are at risk
- Monitoring with satellites
- Seismic monitoring

## Modelling and Analysis

- Volcano flank instability
- Mass movements
- Tsunami propagation

## Social sciences

- Socio-cultural aspects
- Risk management
- Disaster prevention

## Transfer to praxis

- Recommendations and resilience
- Integration in EWS
- Learning and exchange