

Caribbean Waves, Guadeloupe, 10. Dec 2008

Observations and Modeling of the 2007 Solomon Islands and Peru tsunamis

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SOPAC



**Georgia
Tech**

Savannah
Campus

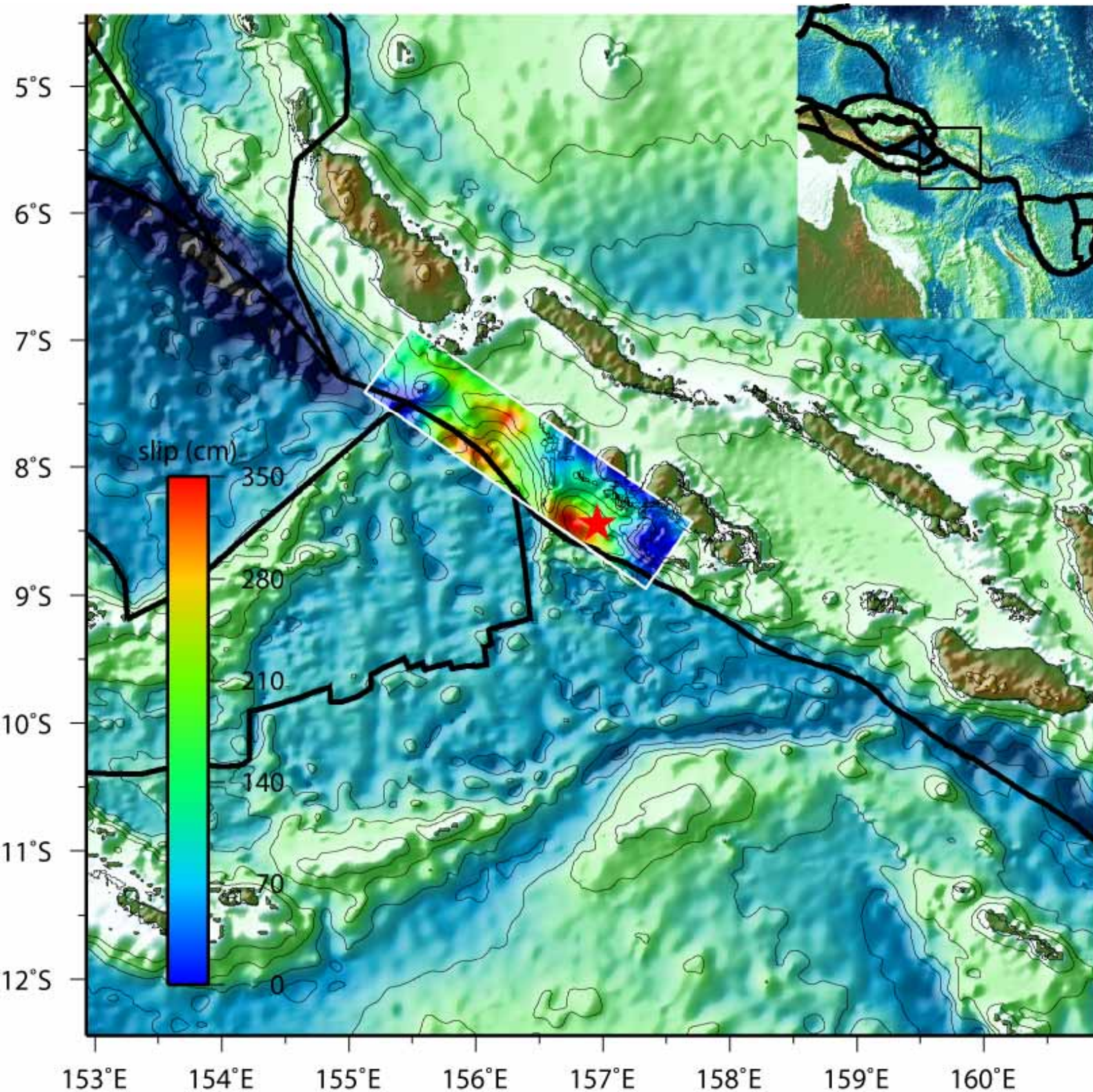
USC **Viterbi**
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National Science Foundation
WHERE DISCOVERIES BEGIN



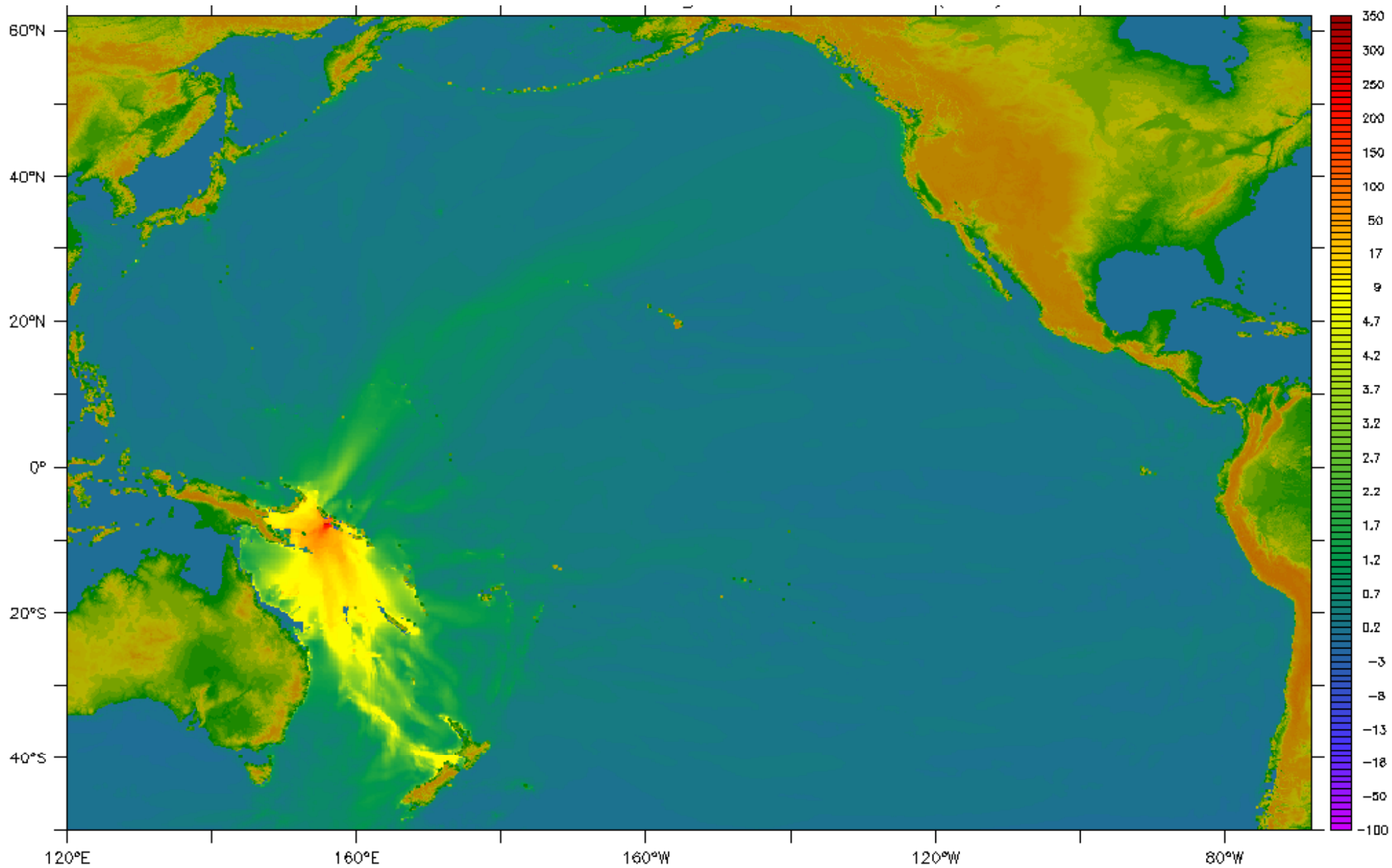
INTERGOVERNMENTAL
OCEANOGRAPHIC
COMMISSION

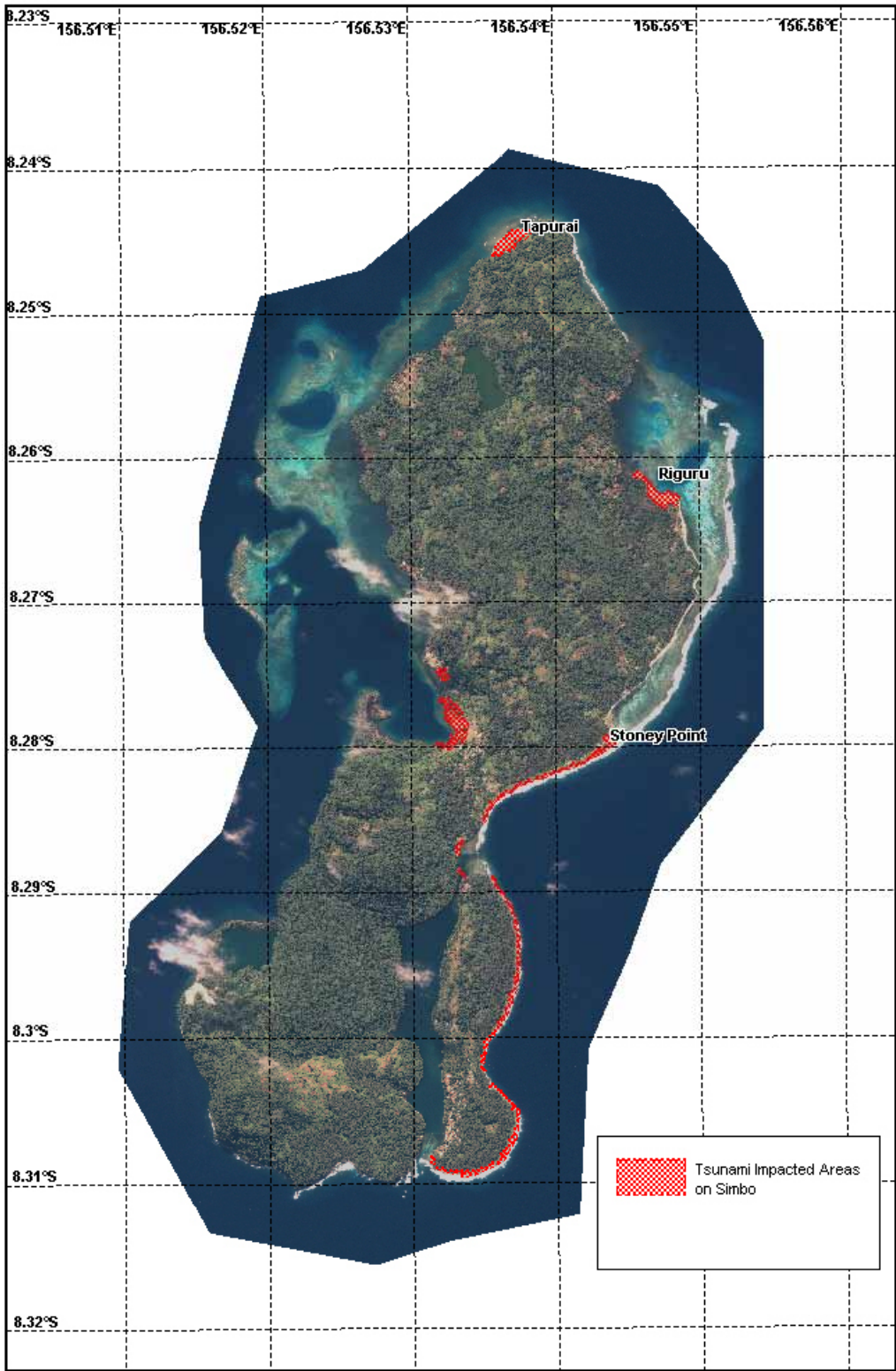



1 Apr. 2007
Solomon I.
M=8.1 slip

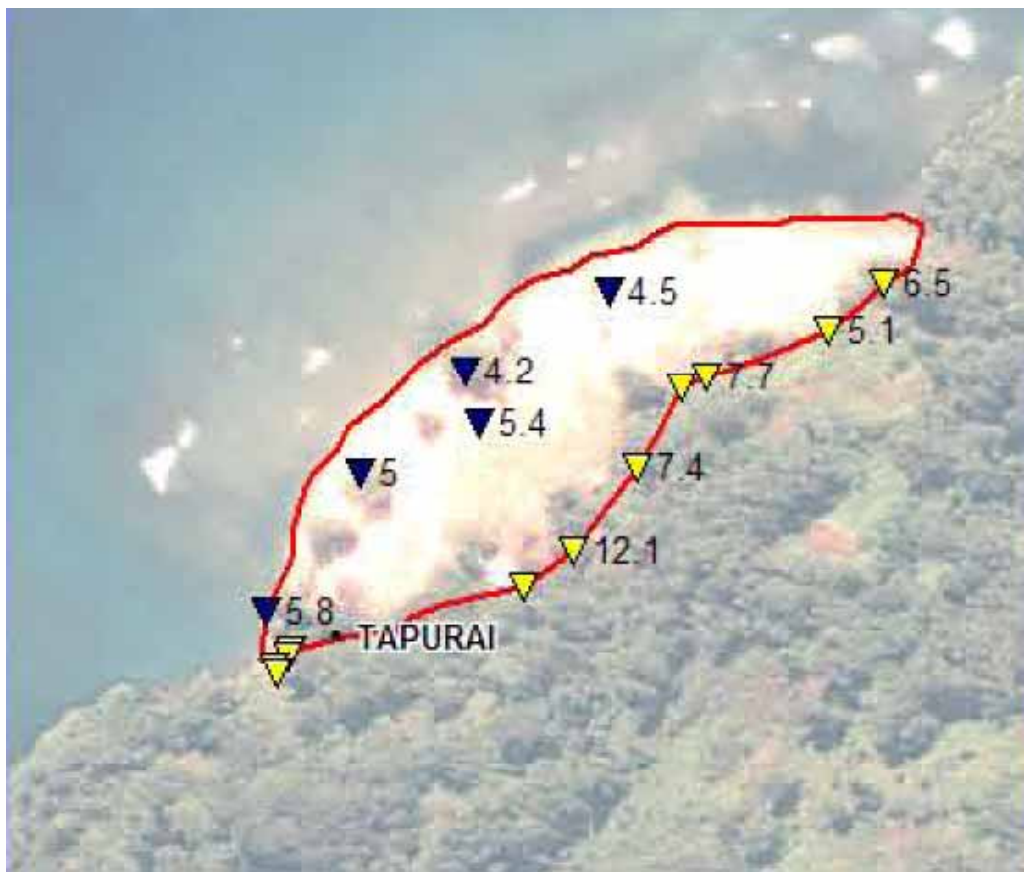
courtesy:
Chen Ji, UCSB

Max. Tsunami heights (NOAA)





 Tsunami Impacted Areas on Simbo



Simbo Island tsunami impacted areas

Tapurai Village, North Simbo

- Tsunami flow depth of 5 m and 12 m runup
- 7 fatalities, 234 inhabitants, >97% survivors
- 41 houses washed away, 58 canoes lost
- 50% of reef showed event-related damage (WorldFish)



Max. 5m Flow Depth at Tapurai



12m runup at Tapurai on Simbo Island



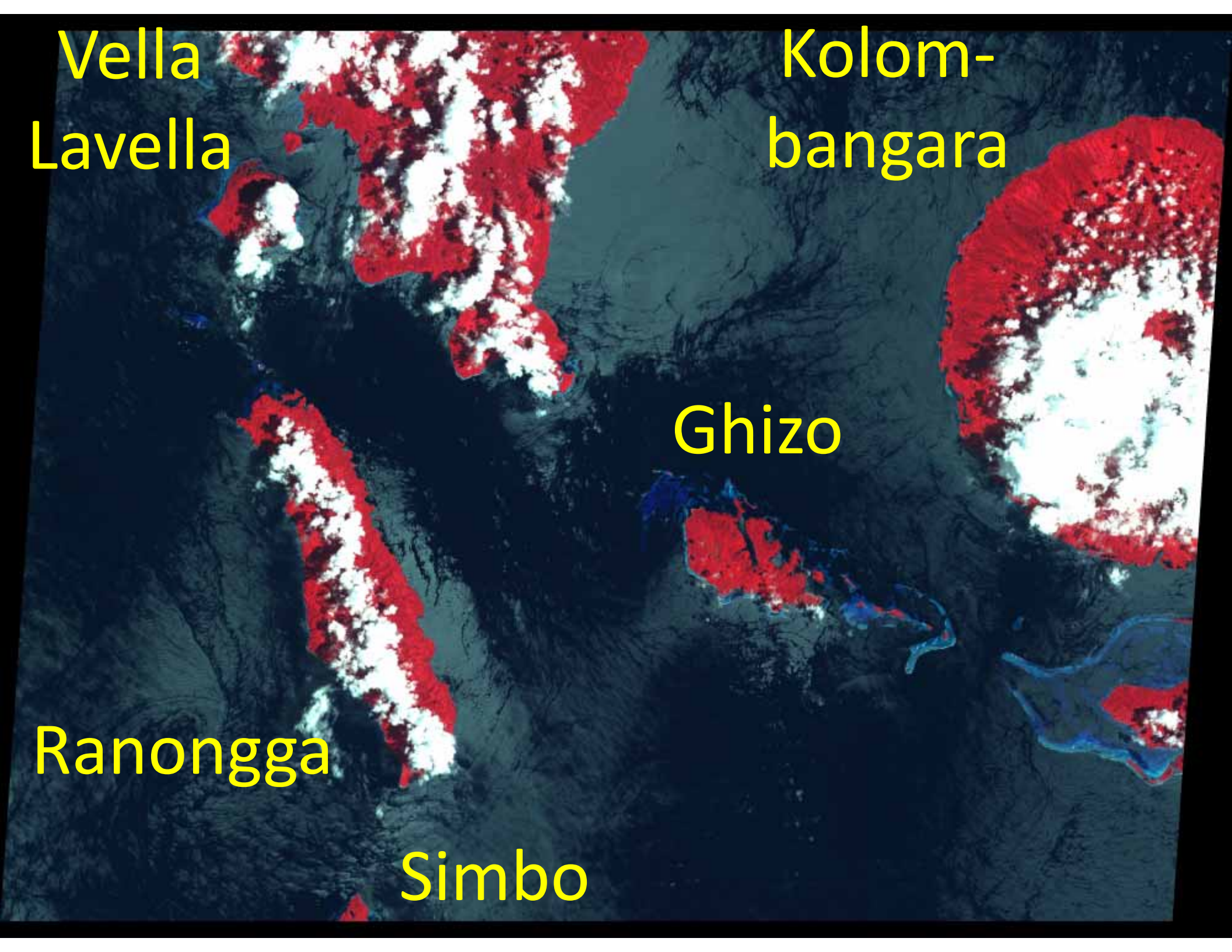
Vella
Lavella

Kolom-
bangara

Ghizo

Ranongga

Simbo

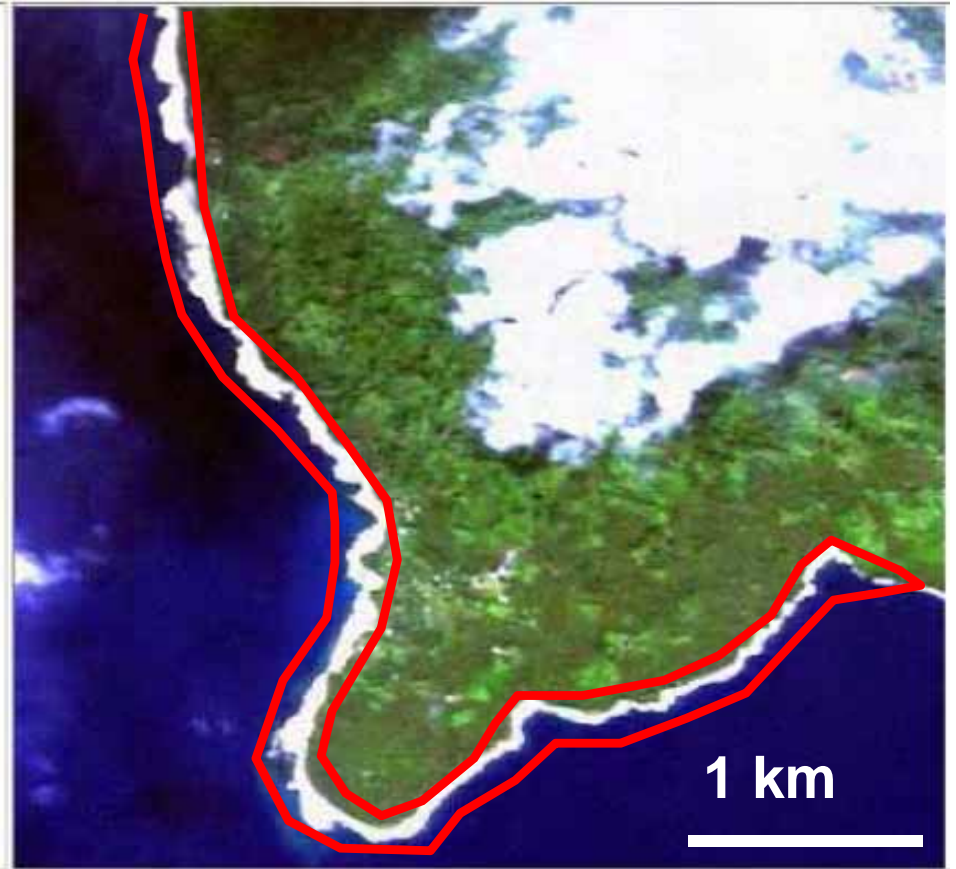


Co-seismic Uplift of Ranongga

- 82 km of uplifted coastline, predominantly fringing reef
- Uplift up to 3.5 m in the south, decreasing to 1.5 m in the north
- Exposed reef identified as high-reflectivity shore-parallel band



Pre-event ALOS, 22/12/2006



Post-event ALOS, 07/04/2007

Images courtesy of Geoscience Australia, JAXA/METI

Co-seismic Uplift on Ranongga



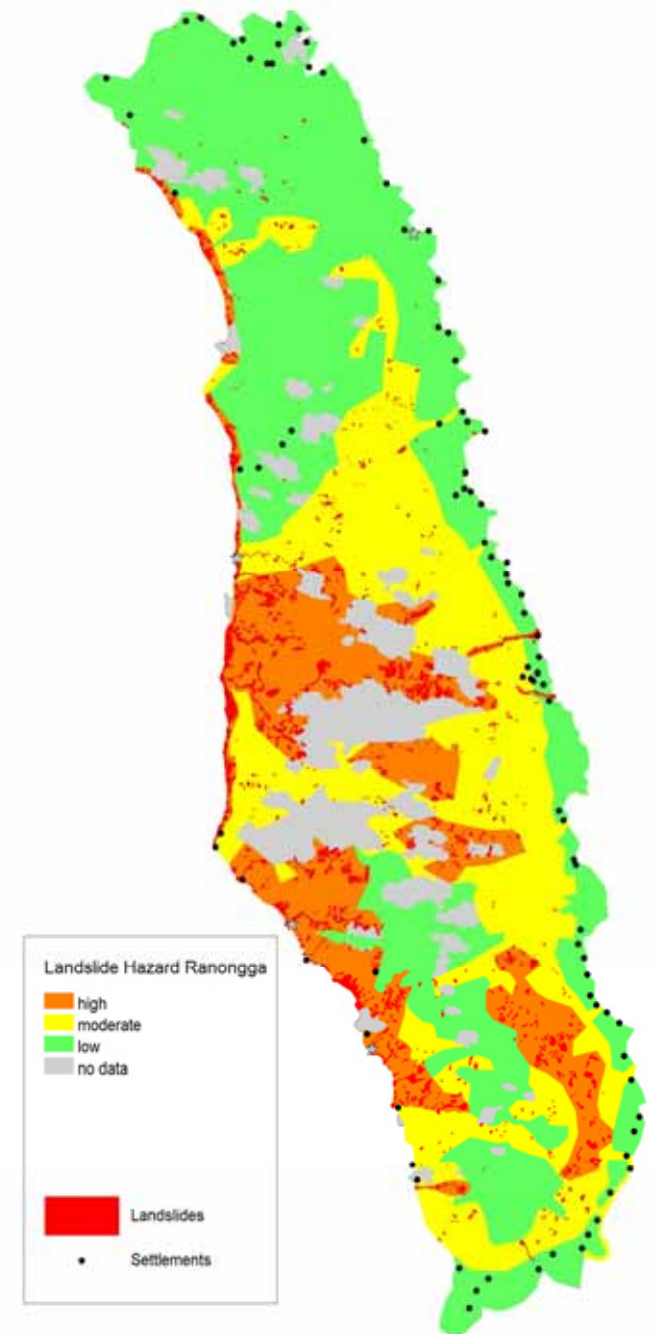
Co-seismic Uplift on Ranongga



Uplifted Reefs as Navigation Hazard



Landslides on Northwestern Ranongga Island



Landslide Hazard on Ranongga

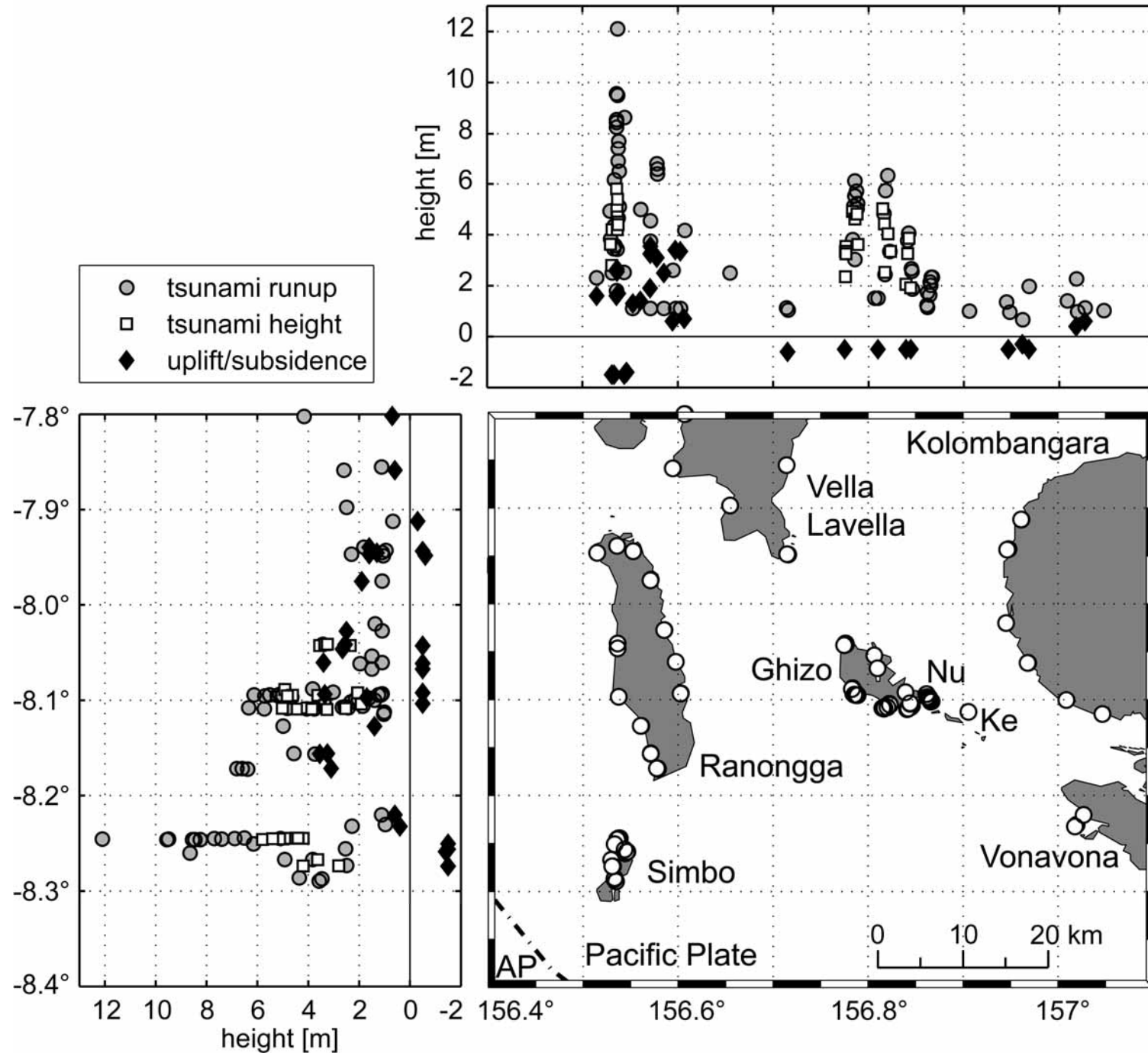


Mondo village: 60'000 m³ / 2 deaths

Obobulu relocated to high ground



1 Apr. 07 SI tsunami field measurements



Ghizo



An aerial photograph taken from the perspective of someone inside a helicopter, looking out over a coastal area. The foreground on the left shows the metal structure of the helicopter's door and a person's arm in a green uniform. The main view is a flooded fishing village. Numerous small, rectangular houses with corrugated metal roofs are scattered across a landscape that is almost entirely submerged in dark, brownish water. Some trees, including palm trees, are still standing in the water. In the background, a large body of blue water stretches to the horizon, with a few small boats visible. The sky is clear and blue.

Subsidence

Gizo

Fishing Village

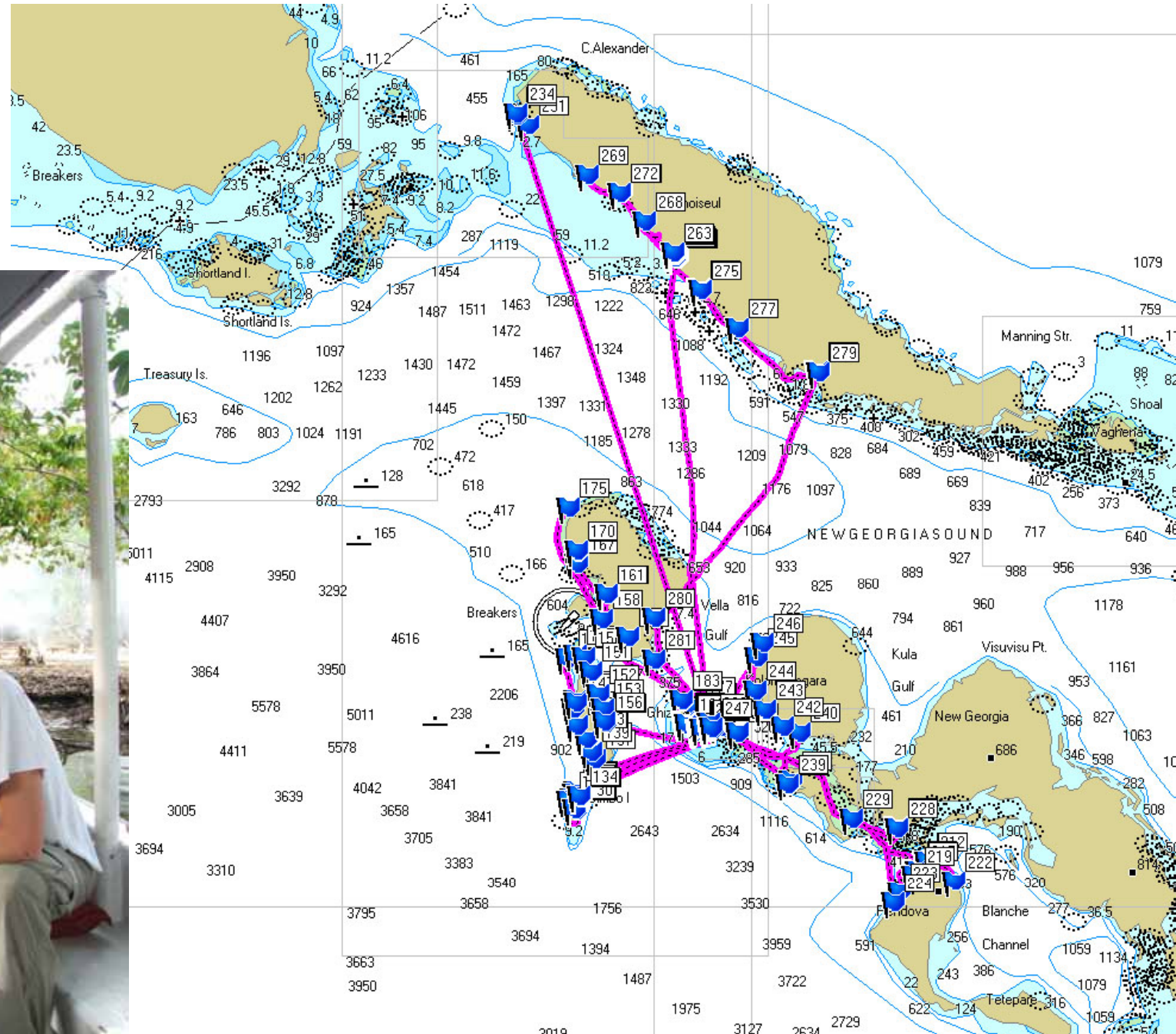
Subsidence - Gizo on Ghizo Island



Scour Collapse at Titiana on Ghizo



Across New Georgia Sound to Choiseul



Sasamunga Hospital on Choiseul

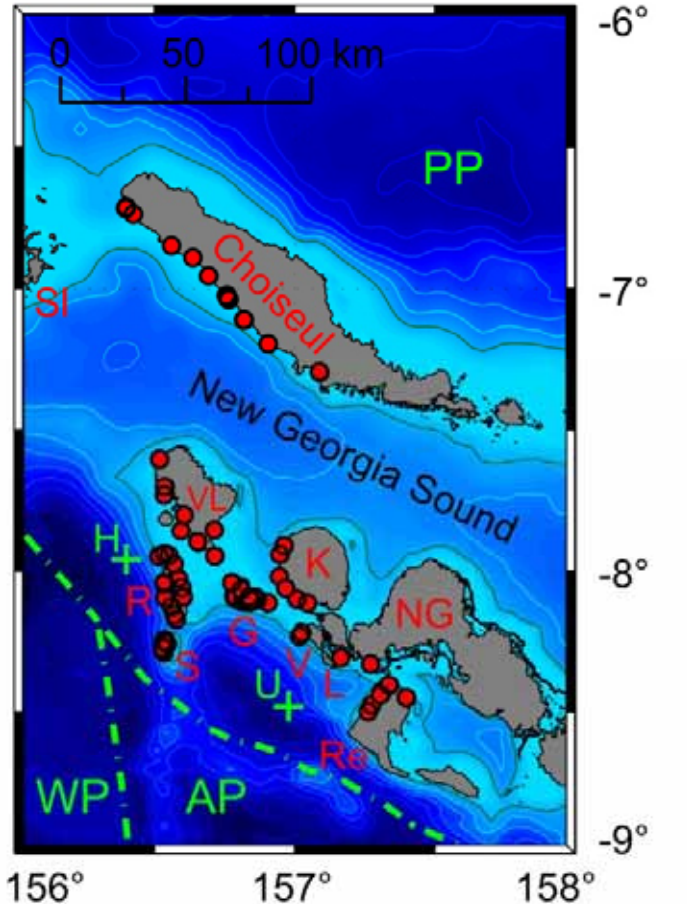
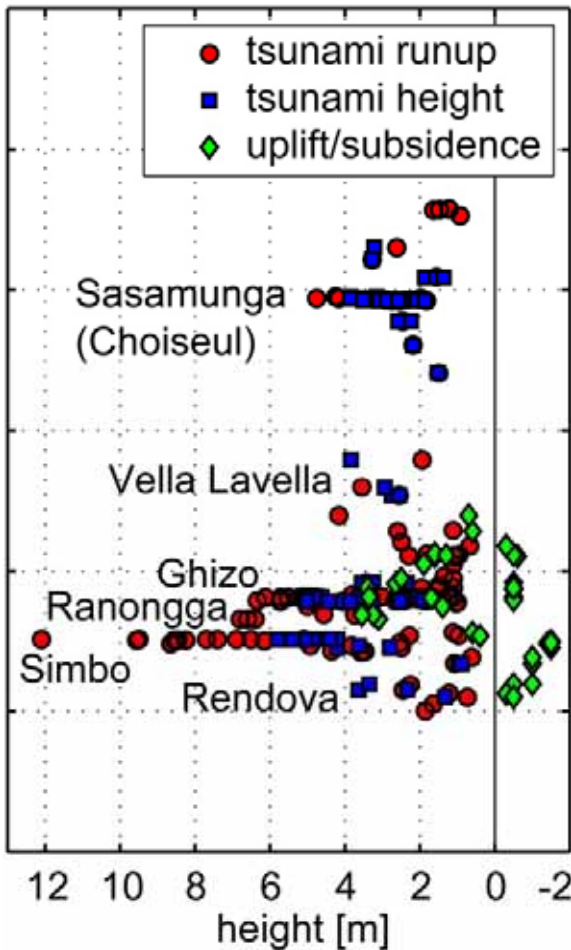
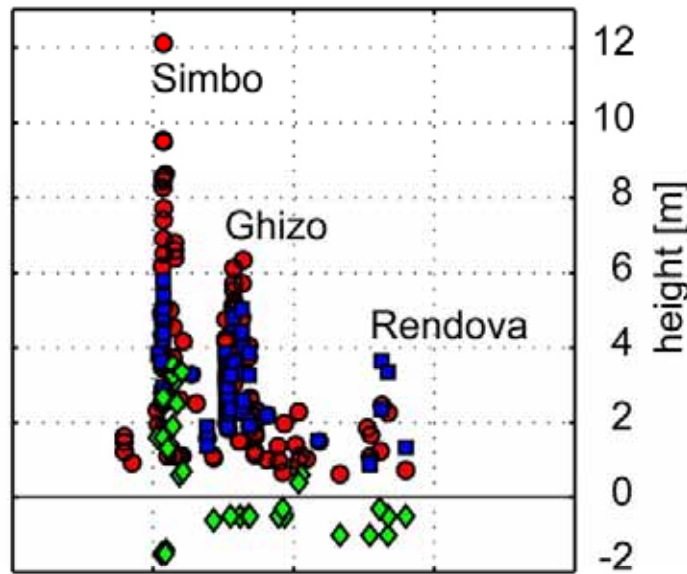
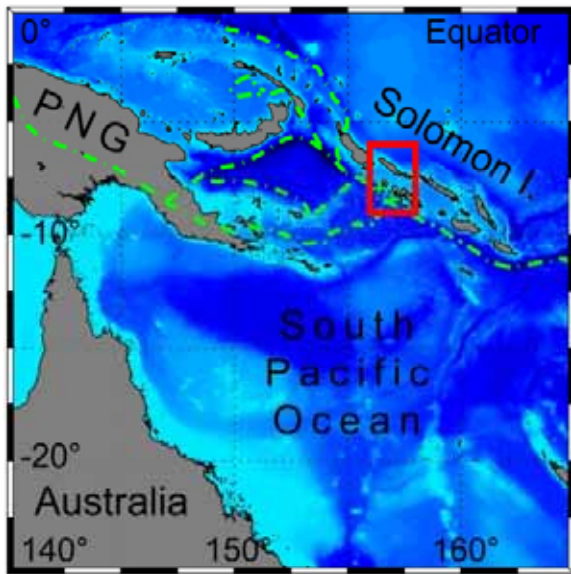


Patient transport Shortland Islands



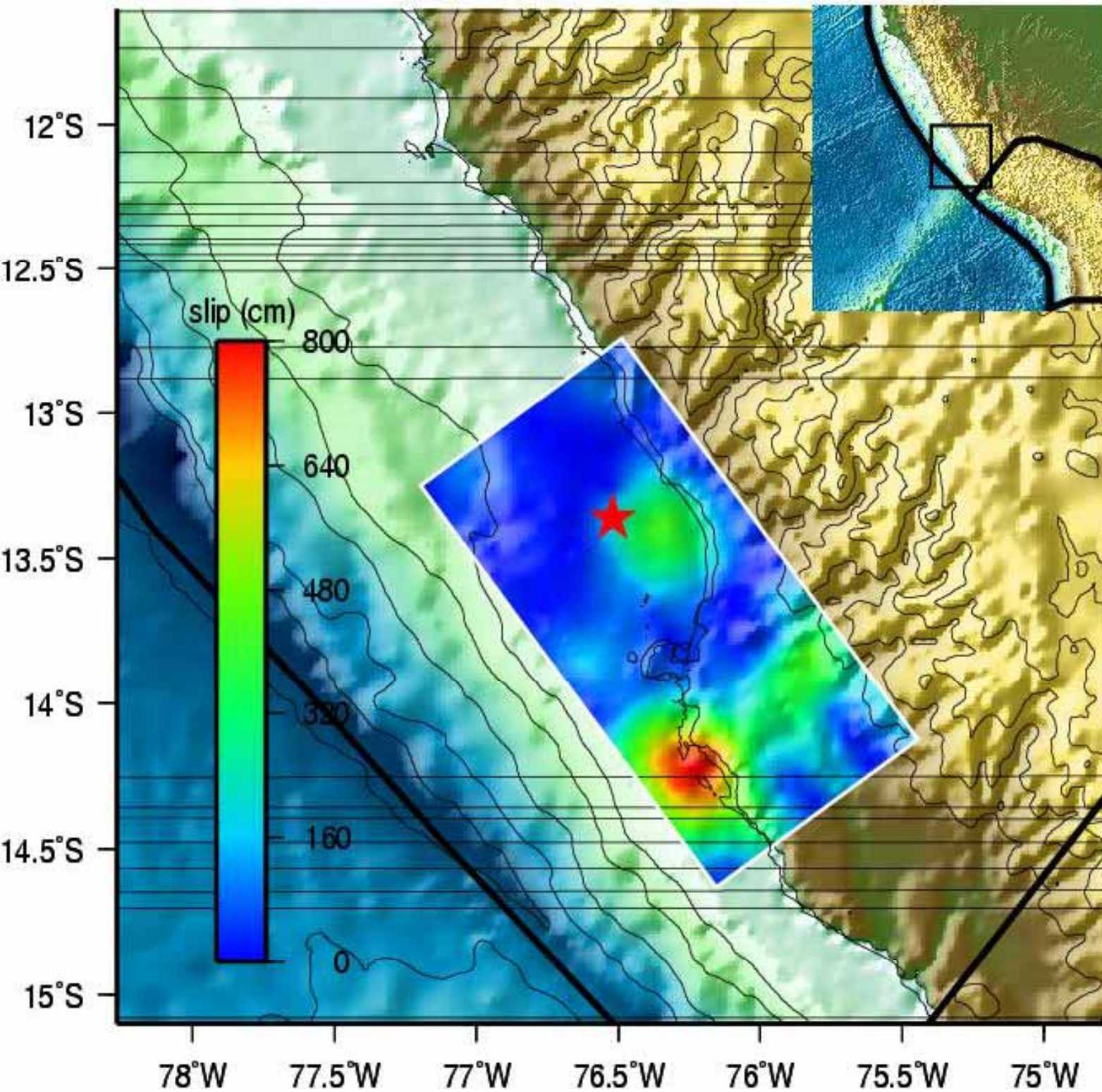
Tsunami Education on Choiseul





1 April 2007
Solomon
Islands
tsunami

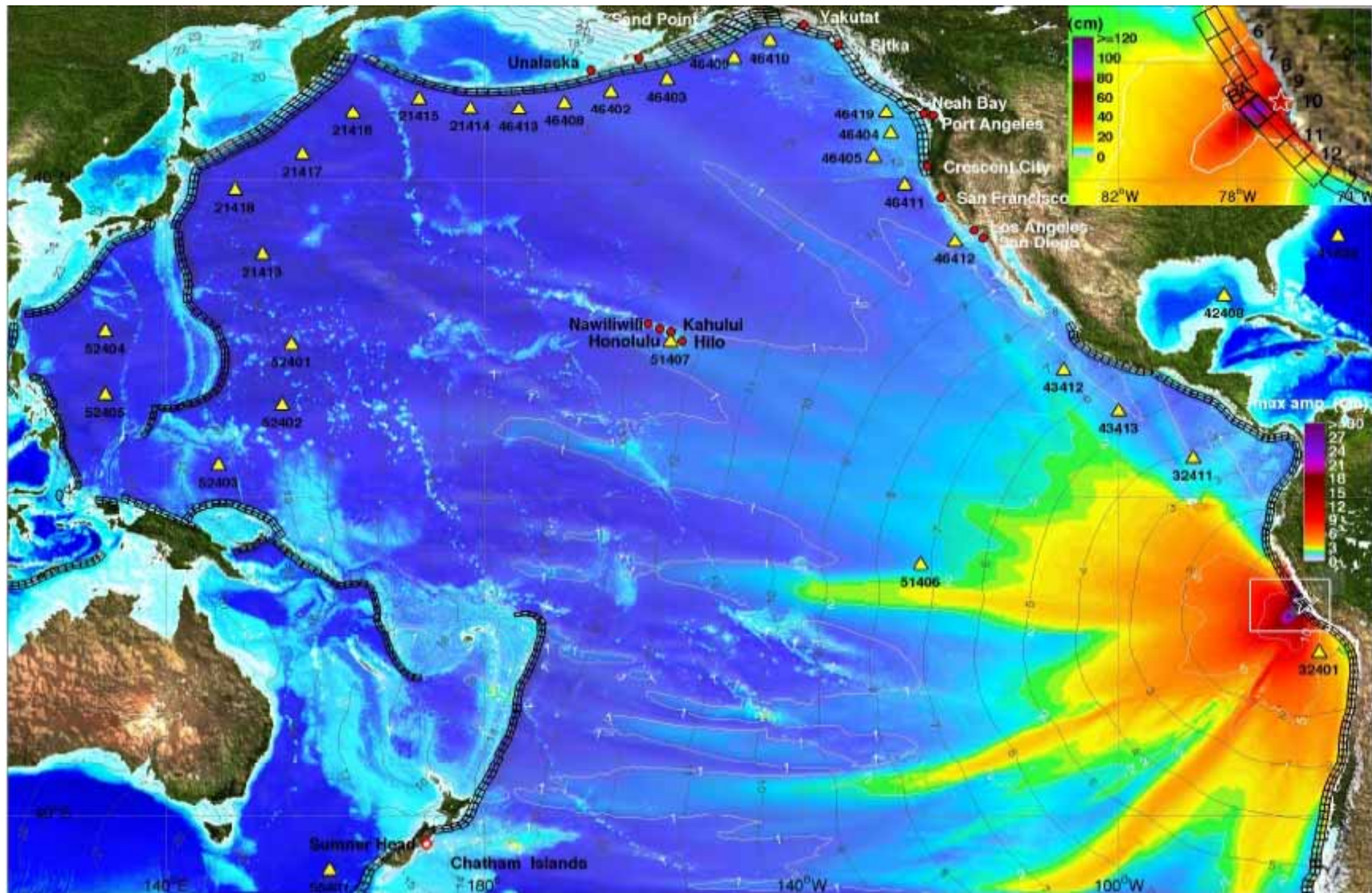
measured
heights,
runup,
landlevel



15 Aug 2007
Peru
M=8.0 slip

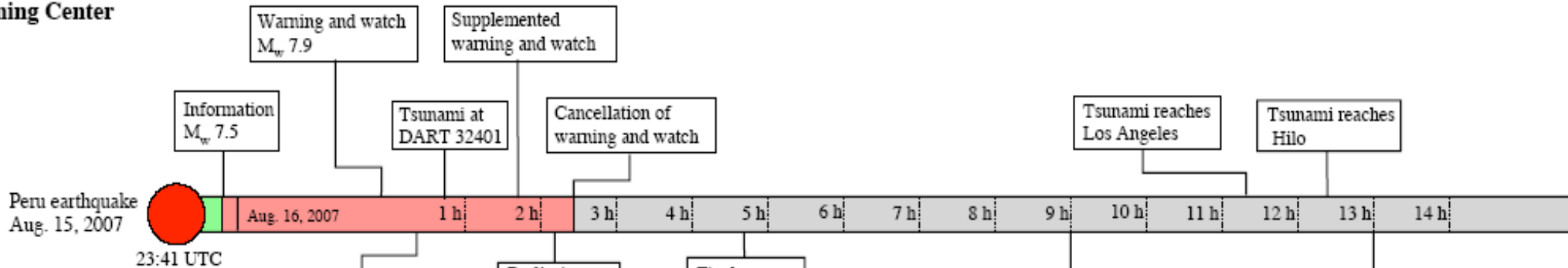
courtesy:
Chen Ji, UCSB

Max. Tsunami heights (NOAA, Y. Wei)

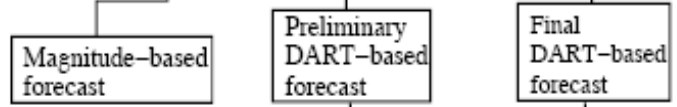


Tsunami Forecasting (NOAA, Y. Wei)

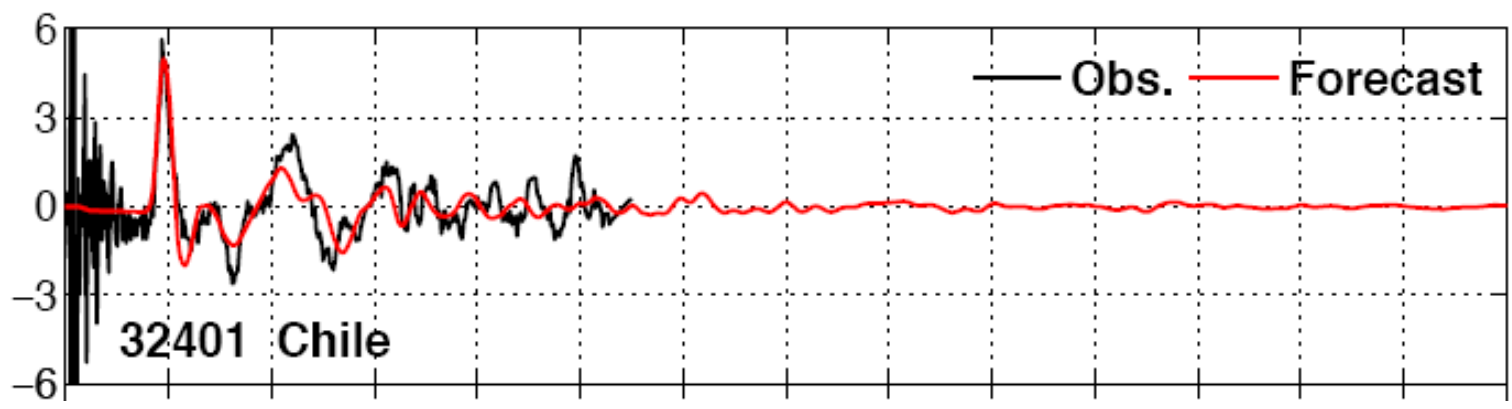
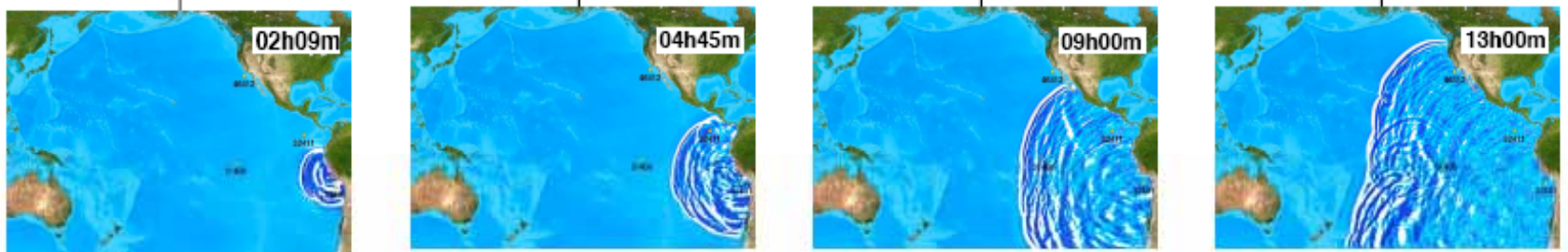
Pacific Tsunami
Warning Center



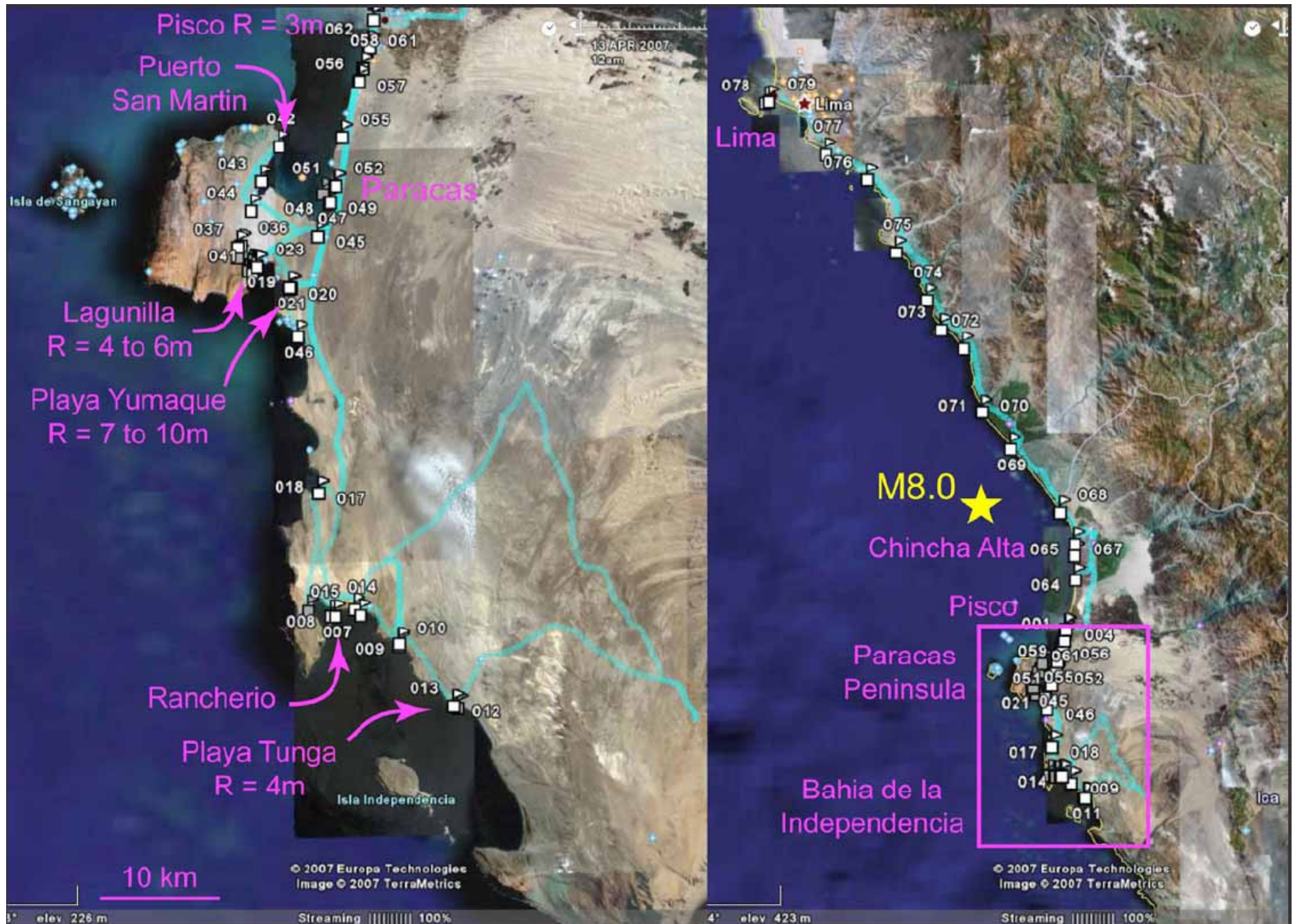
NOAA Center for
Tsunami Research



Tsunami wave
propagation



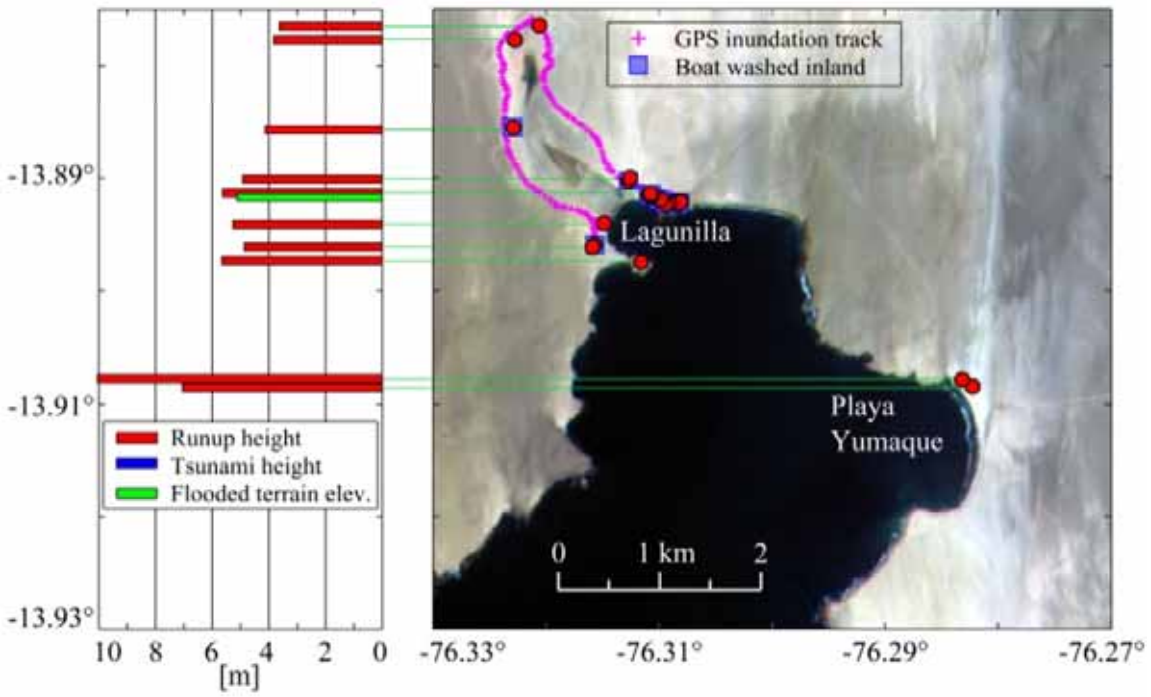
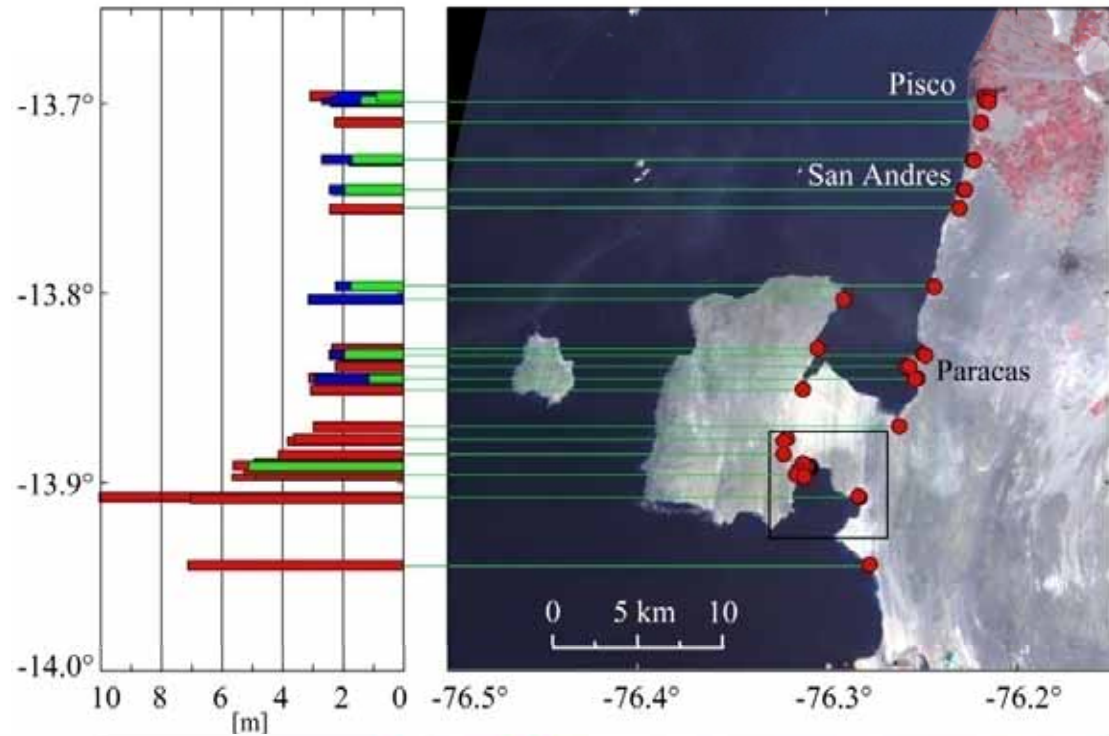
4-7 Sept. 2007 Peru tsunami field survey



15 Aug. 2007 Pisco, Peru, M8.0 Earthquake



Paracas Peninsula / Lagunilla (3 tsunami-deaths)



Lagunilla - 3 tsunami-fatalities no earthquake fatalities



Paracas Marina



24/08/2007

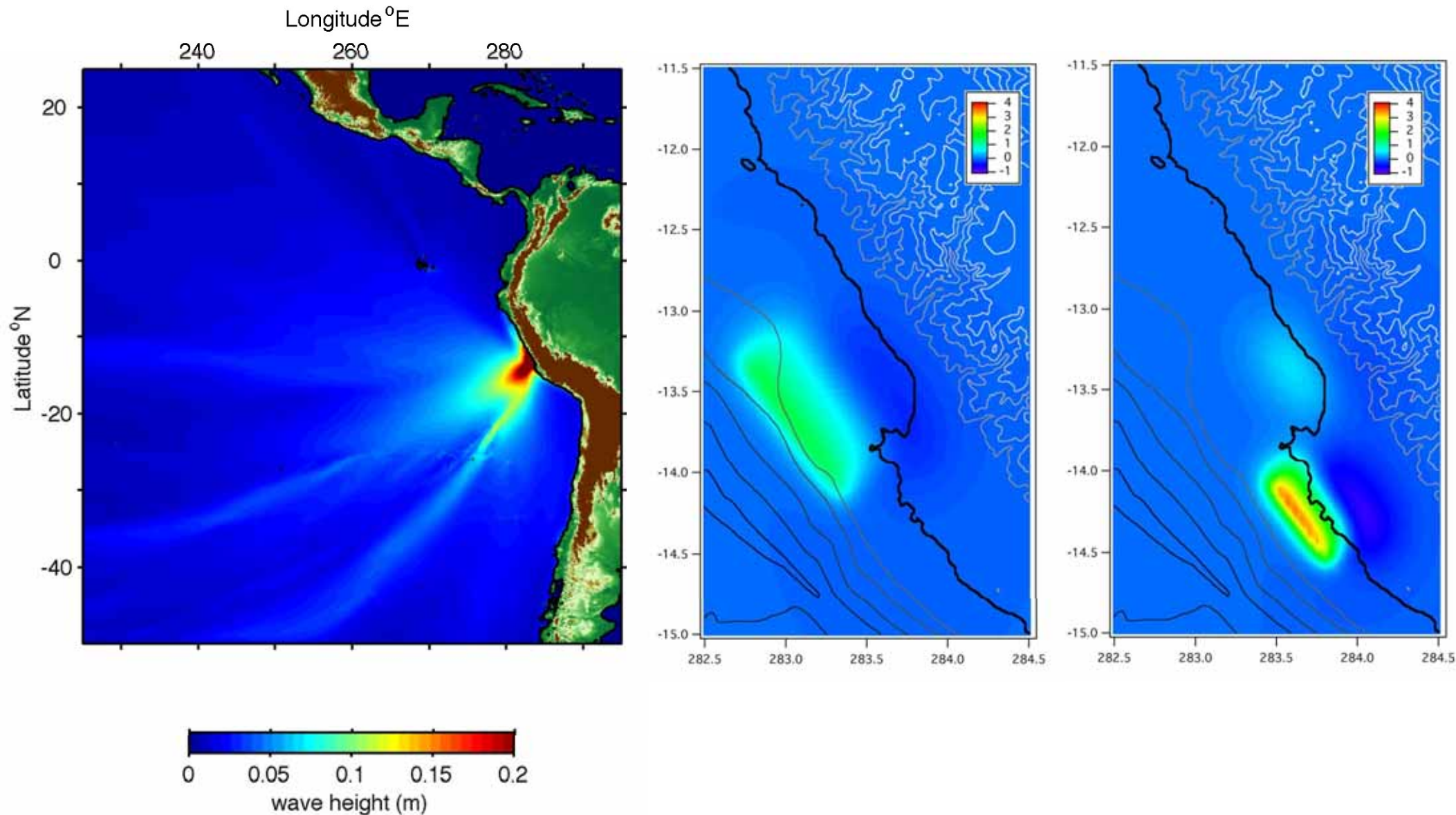
Rancherio - Eyewitness

- Coast Guard Sergeant lived in Rancherio for decades compared the tsunami events he has witnessed:
- 2007 (100%) biggest of them all
- 2001(zero)
- 1996 (30%)
- 1974 (no details but smaller)

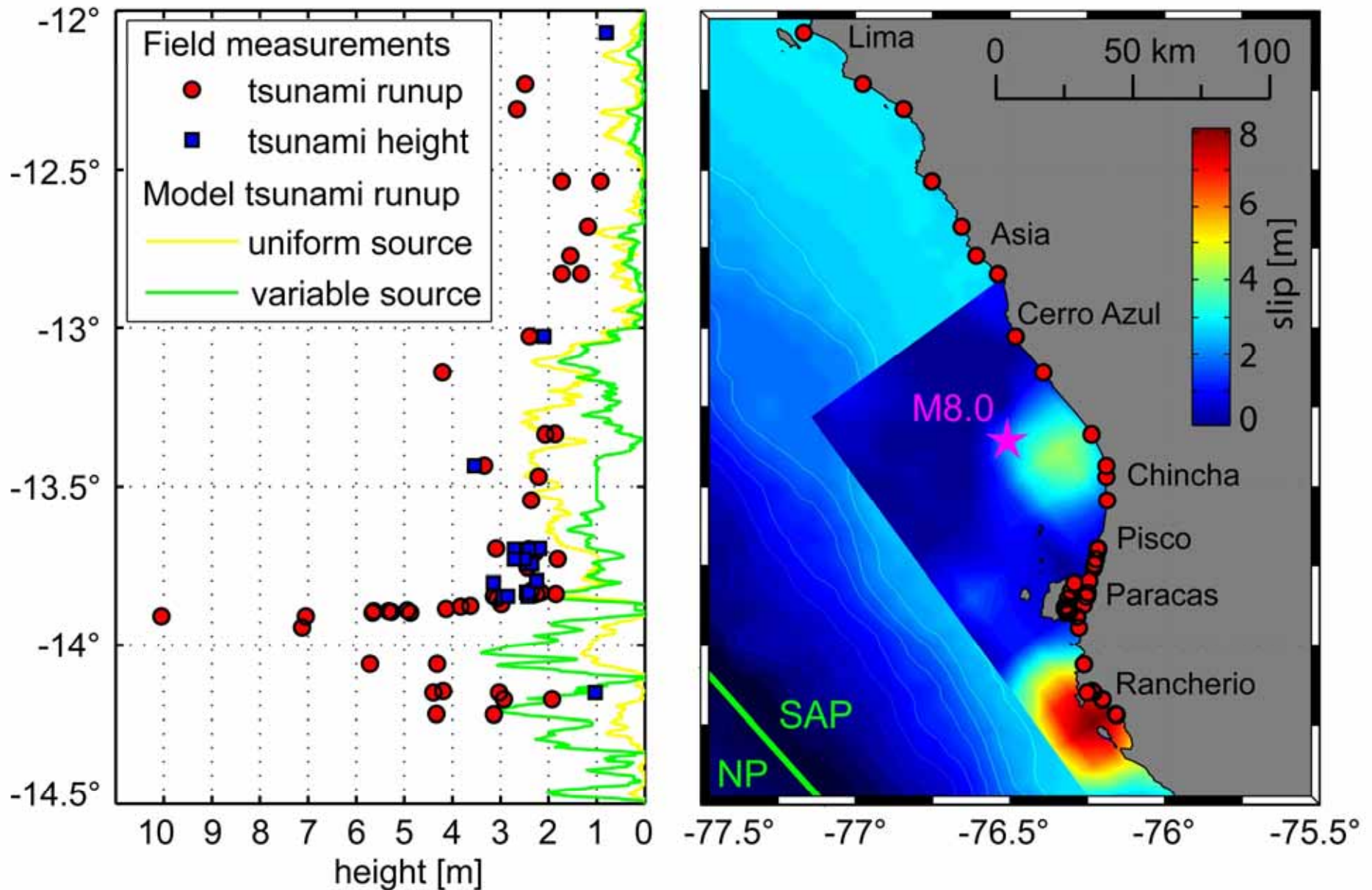


15 Aug. 2007 Peru Tsunami Modeling

(courtesy: Dr. Jose Borrero)



Model and Field Data Comparison



2007 Solomon I. and Peru Comparison

Similarities:

- Massive ground shaking as natural warning
- Spontaneous self evacuation contains fatalities
- Maximum runup order 10 m highly localized
- importance of community-based tsunami education and awareness programs.

Differences

- SI short inundation distances (< 200m except Choiseul and S Ghizo) versus Peru up to 2 km
- SI max tectonic uplift ~3.5m, subsidence < 2m
- SI reefs and mangroves do not always provide protection

Acknowledgments

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- Prof. Emile A. Okal provided the earthquake source models



Any opinions, findings, and conclusions or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of the National Science Foundation and UNESCO.



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Malo – Questions?

