



ITIC TRAINING PROGRAMME HAWAII (ITP-HAWAII)
Tsunami Early Warning And Mitigation Systems ICG/PTWS Pacific Tsunami
Warning Center Enhanced Products
18 - 29 August 2014 Honolulu, Hawaii USA

SUMMARY - LIMITATIONS:

Earthquake Source Characterization for Tsunami Warning:

Dr. Gerard Fryer, Dr. Charles McCreery
PTWC

Dr. Laura Kong
ITIC

Limitations of Seismic Analysis

- **Speed of Initial Analysis Depends On**
 - Density of Seismic Network
 - Type and Quality of Seismic Stations
 - Speed of Data Transmission
 - Speed of Seismic Processing
 - Confidence in Result
- **Elapsed Time to Initial EQ Parameters**
 - 2-5 min with Regional Network
 - 5-15 min with Global Network

Limitations of Seismic Analysis

- **Accuracy of Hypocenter (Location / Depth)**
 - Bias - nearby stations only on one side
 - Latitude, Longitude error not so critical
 - But depth critical to tsunamigenesis
 - Depth constraint poor (especially if shallow)
 - Hypocenter is only the point of initial rupture
 - Tsunamigenic earthquakes have large source

Limitations of Seismic Analysis

□ Accuracy of Earthquake Magnitude

- Rapid methods underestimate great events
- Magnitude is a very limited representation of earthquake size
- No magic threshold for tsunamigenesis

Limitations of Seismic Analysis

□ Anomalous Events

■ Slow earthquakes

- Traditional magnitudes underestimate
- Enhanced tsunami potential

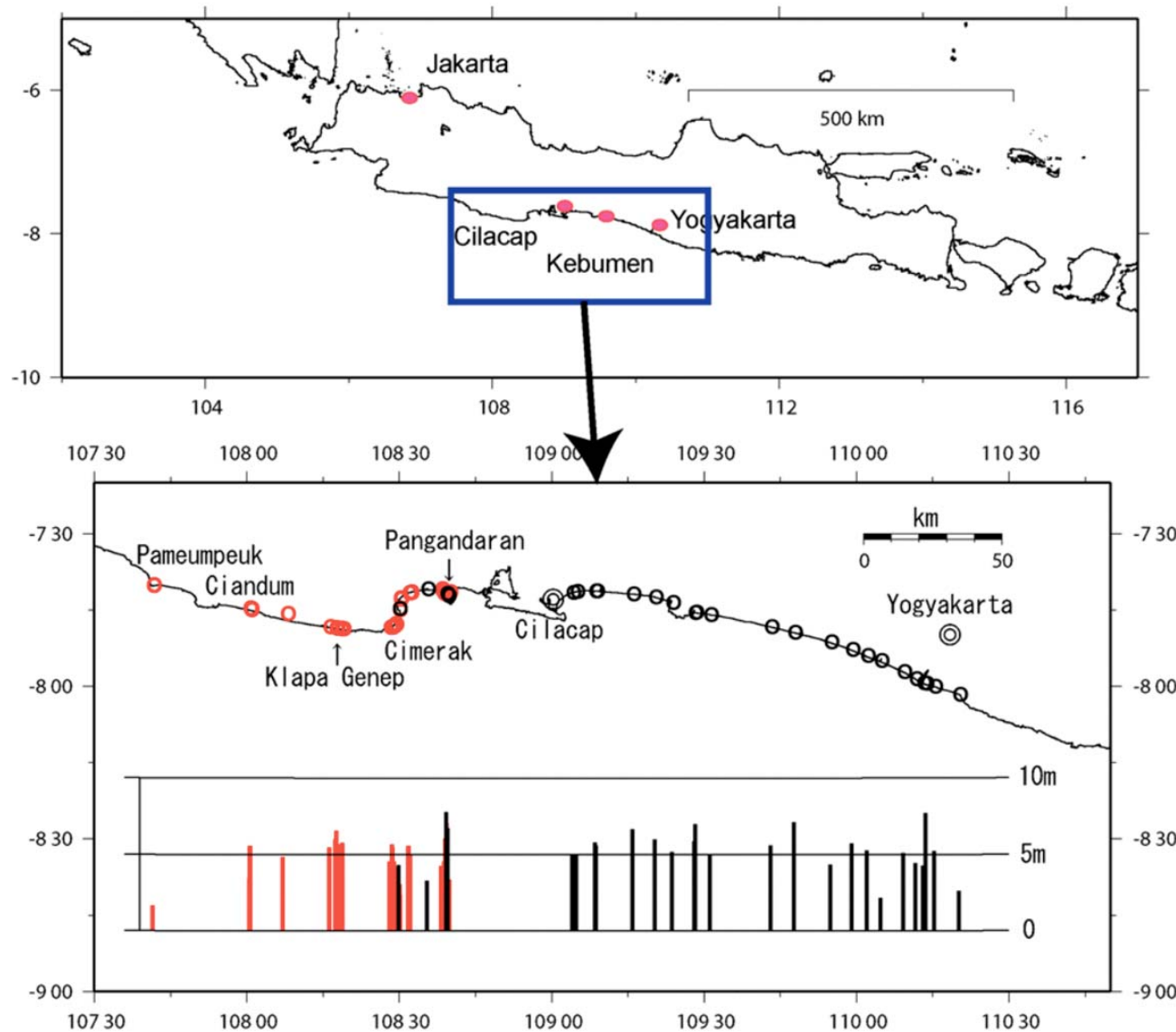
■ Landslide tsunamis

- Smaller earthquake triggers landslide
- Landslide generates tsunami
- 1998 Papua New Guinea, $M_w=7$, >2000 casualties

■ Splay faults

- Splay fault rupture accompanies main rupture
- Tsunami generated closer to shore

Slow Earthquake: 2006 Java Tsunami



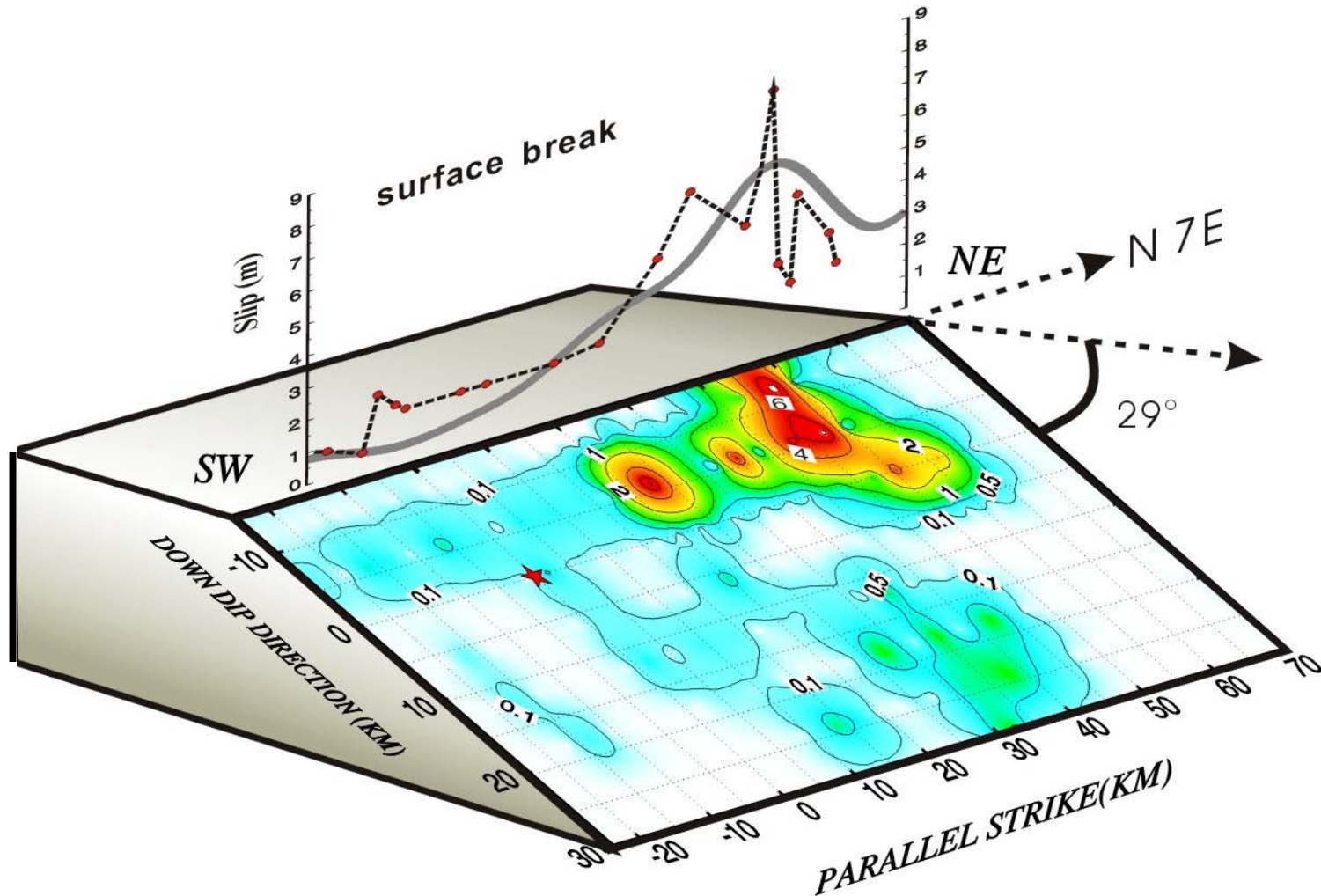
- Little apparent ground motion
- Large surf, so no clues in ocean behavior
- Death toll 730

Limitations of Seismic Analysis

□ Finite Faults

- Fault rupture over large area
- Amount of slip varies along fault
- Depth of ruptured fault varies
- Tsunamigenesis varies
- Important near the earthquake
- Finite fault analysis too slow for local warning

Complicated Slip Distributions



1999 Chi-Chi, Taiwan Earthquake

from James Mori, DPRI



ITIC TRAINING PROGRAMME HAWAII (ITP-HAWAII)
Tsunami Early Warning And Mitigation Systems ICG/PTWS Pacific Tsunami
Warning Center Enhanced Products
18 - 29 August 2014 Honolulu, Hawaii USA

Thank You

Dr. Gerard Fryer, Dr. Charles McCreery
PTWC

Dr. Laura Kong
ITIC