Tsunami waveform inversion of the 2007 Bengkulu, southern Sumatra earthquake

\# Yushiro Fujii[1]; Kenji Satake[2]

[1] IISEE, BRI; [2] ERI, Univ. Tokyo

http://iisee.kenken.go.jp/

We have performed tsunami waveform inversion for the 2007 Bengkulu, southern Sumatra earthquake on September 12, 2007 (4.520S, 101.374E, Mw=8.4 at 11:10:26 UTC according to USGS), and found that the large slips were located on deeper part (deeper than 24 km) of the fault plane, more than 100 km from the trench axis. The deep slip might have contributed the relatively small tsunami for its earthquake size. The largest slips of 6 to 9 m were located beneath Pagais Islands, about 100-200 km northwest of the epicenter. The obtained slip distribution yields a total seismic moment of 4.7 x 10^{21} Nm (Mw = 8.4).

The tsunami generated by this earthquake was recorded at many tide gauge stations located in and around the Indian Ocean. The DART system installed in deep ocean and maintained by Thai Meteorological Department (TMD) also captured this tsunami. We have downloaded the tsunami waveforms at 16 stations from University of Hawaii Sea Level Center's (UHSLC) and National Oceanic & Atmospheric Administration's (NOAA) web sites. The observed tsunami records indicate that the tsunami amplitudes were less than several tens of cm at most stations, around 1 m at Padang, nearest station to the source, and a few cm at DART station.

For the tsunami waveform inversion, we divided the source area (length: 250 km, width: 200 km) into 20 subfaults and performed three sets of inversions to estimate the tsunami source using the 20-subfault, 15-subfault and 10-subfault models. Tsunami waveforms from each subfault (50 km x 50 km) or Greens functions were calculated by numerically solving the linear shallow-water long-wave equations. We adopted the focal mechanism of Global CMT solution (strike: 327, dip: 12, rake: 114) for each subfault, and assumed a rise time of 1 min. The computed tsunami waveforms from the estimated slip distribution explain the observed waveforms at most of tide gauges and DART station.