

# NUMERICAL SIMULATION AS GUIDANCE IN MAKING TSUNAMI HAZARD MAP FOR LABUAN ISLAND

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## 1. Fault Parameters of Tsunami Sources

Table 1. Faults parameters for each scenario earthquake.

No.	Magnitude $M_w$	Length (L) (km)	Width (W) (km)	Strike ( $\phi$ ) ( $^\circ$ )	Dip ( $\delta$ ) ( $^\circ$ )	Rake ( $\lambda$ ) ( $^\circ$ )	Slip (u) (m)	Top Depth (H) (km)	Latitude ( $^\circ$ )	Longitude ( $^\circ$ )	
1	8.0	162.2	70.8	0	30	90	2.19	25	13.8	119.5	
2	8.1	North	162.2	70.8	0	30	90	2.19	25	13.8	119.5
		South	96	41.9	315	30	90	1.29	20	13.2	120.2
3	8.5	North	305.5	101.2	0	30	90	4.57	25	13.8	119.5
		South	96	41.9	315	30	90	1.29	20	13.2	120.2

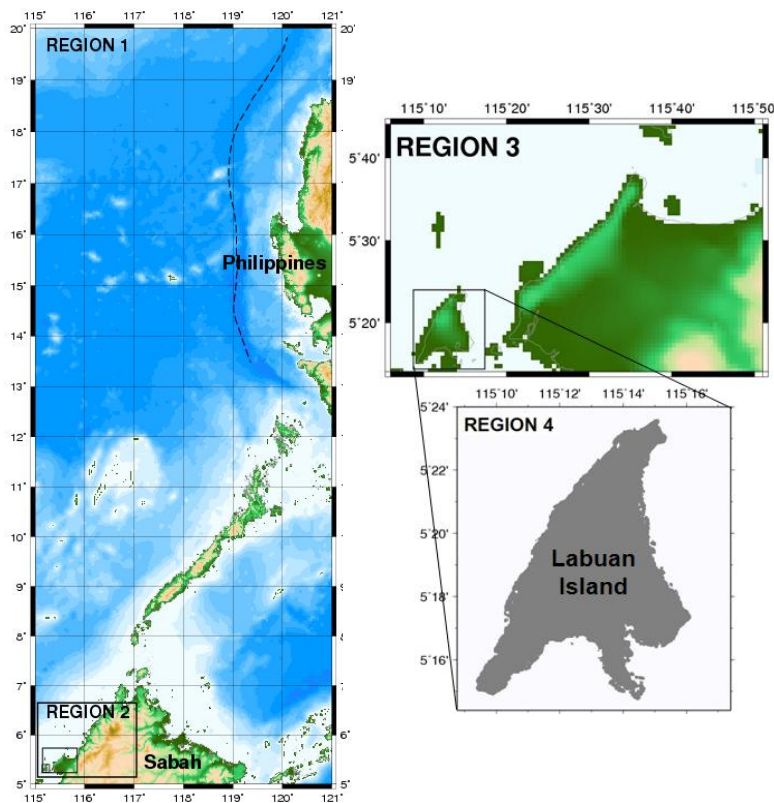


Figure 1. Areas of computation using nested grids.

## 2. Tide Gauge Stations

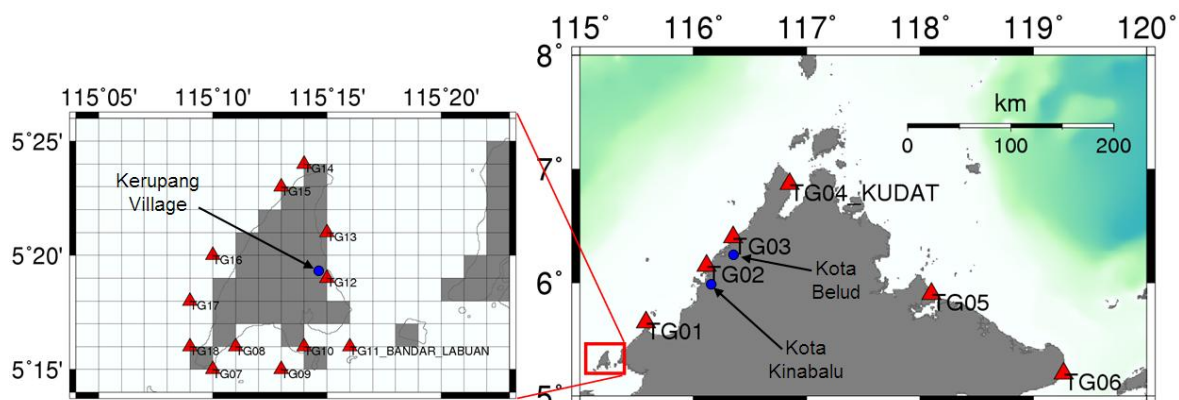


Figure 2. Location of tide gauge stations.

Table 2. Location of tide gauge stations.

Point No.	Latitude	Longitude	Depth (m) (1 arc-min bathymetry)	Depth (m) (30 arc-seconds bathymetry)	Depth (m) (Nested grid)
TG01	5°39'N	115°35'E	3.2	7.0	6.6
TG02	6°09'N	116°07'E	1.0	23.0	22.8
TG03	6°24'N	116°21'E	1.0	31.0	2.2
TG04 *(Kudat)	6°52'N	116°51'E	1.6	12.0	5.0
TG05	5°54'N	118°06'E	2.0	4.0	4.1
TG06	5°12'N	119°16'E	14.6	9.0	6.1
TG07	5°15'N	115°10'E	2.2	1.0	2.6
TG08	5°16'N	115°11'E	1.5	1.0	1.7
TG09	5°15'N	115°13'E	2.6	2.0	2.3
TG10	5°16'N	115°14'E	1.0	1.0	1.3
TG11 *(Bandar Labuan)	5°16'N	115°16'E	2.4	13.0	1.6
TG12	5°19'N	115°15'E	4.5	1.0	3.3
TG13	5°21'N	115°15'E	5.9	4.0	1.2
TG14	5°24'N	115°14'E	3.7	6.0	4.9
TG15	5°23'N	115°13'E	1.0	10.0	3.9
TG16	5°20'N	115°10'E	1.0	15.0	14.3
TG17	5°18'N	115°09'E	5.3	15.0	13.0
TG18	5°16'N	115°09'E	1.8	10.0	7.8

\* Actual tide gauge station operated by MMD.

### 3. Results (Tsunami Heights)

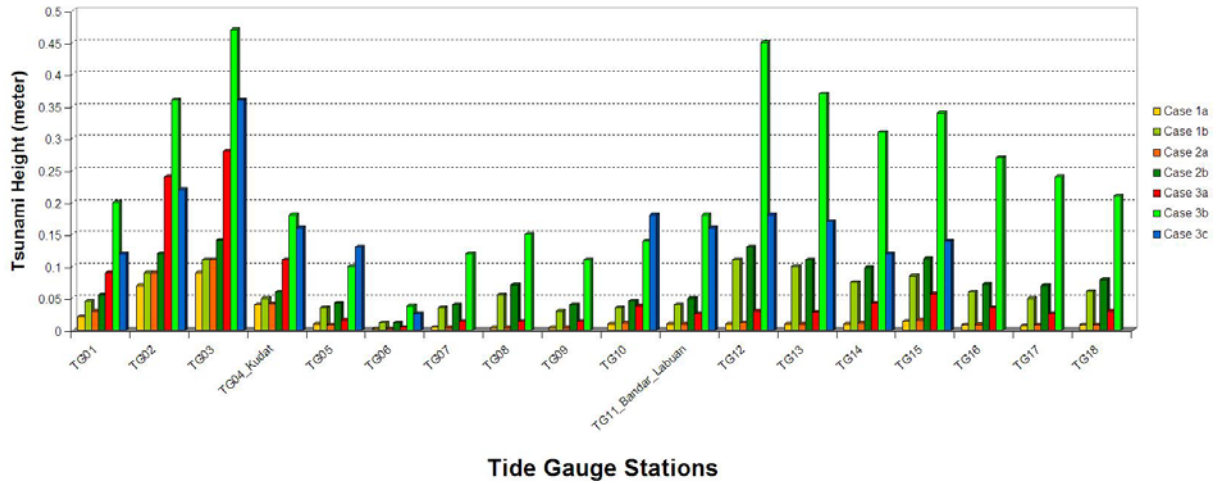


Figure 3. Maximum tsunami heights at each tide gauge station for all cases.

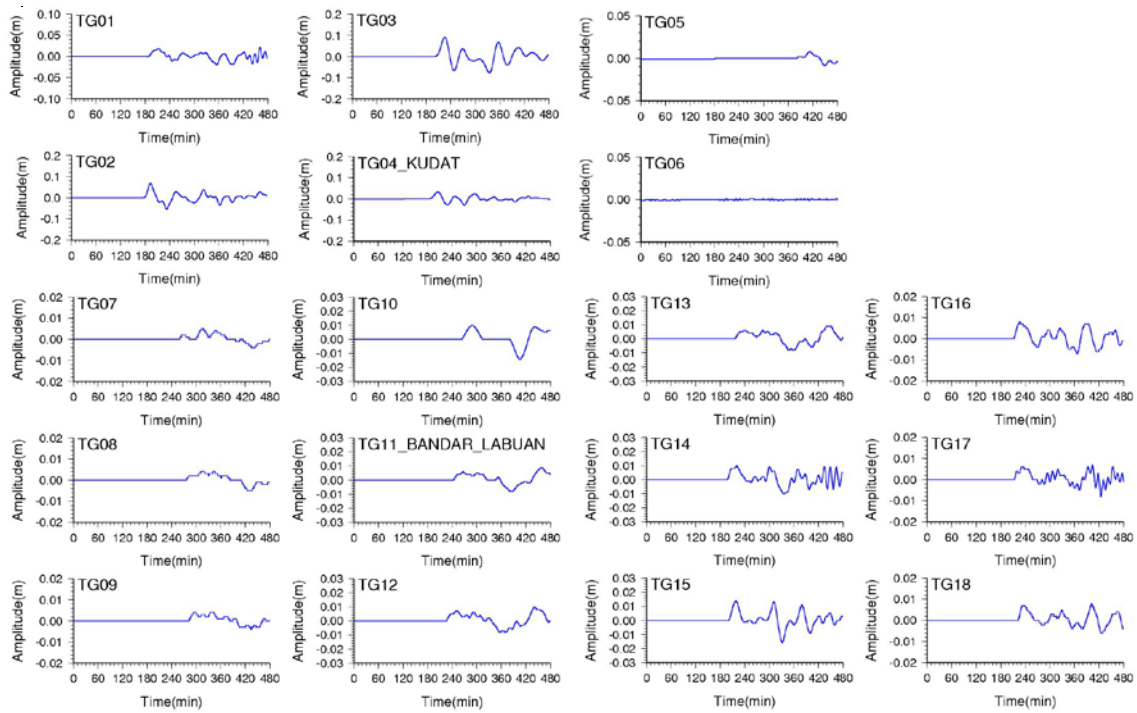


Figure 4. Tsunami waveforms at tide gauge stations for Case 1a.

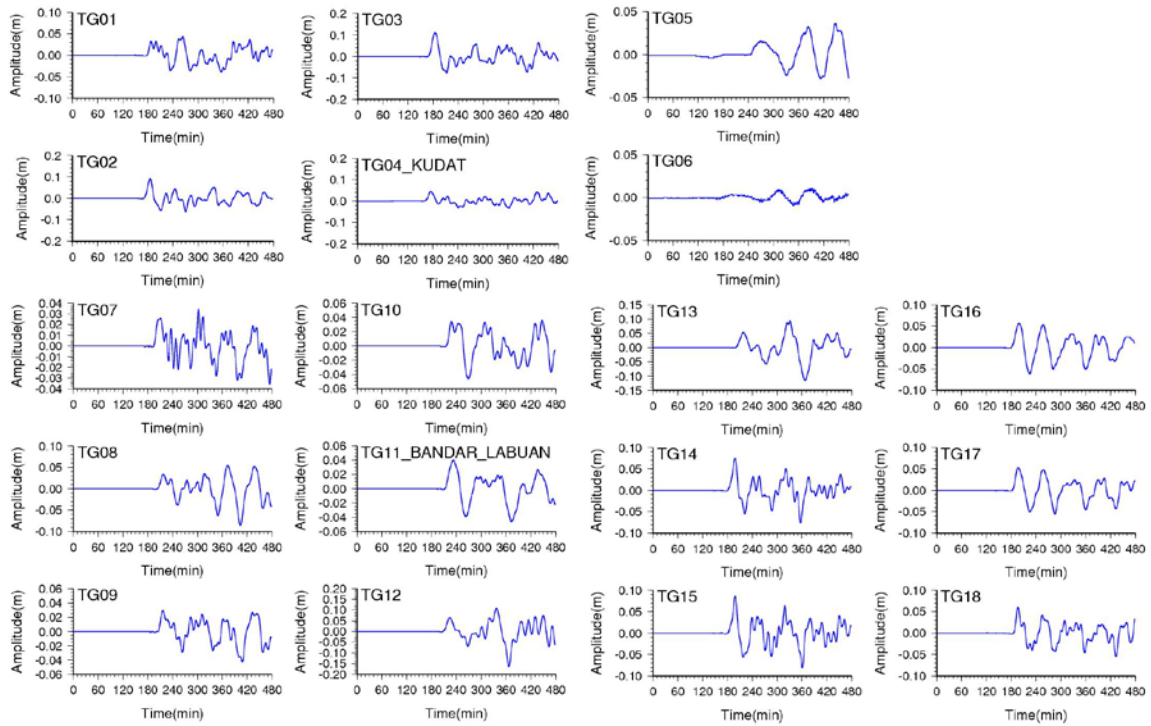


Figure 5. Tsunami waveforms at tide gauge stations for Case 1b.

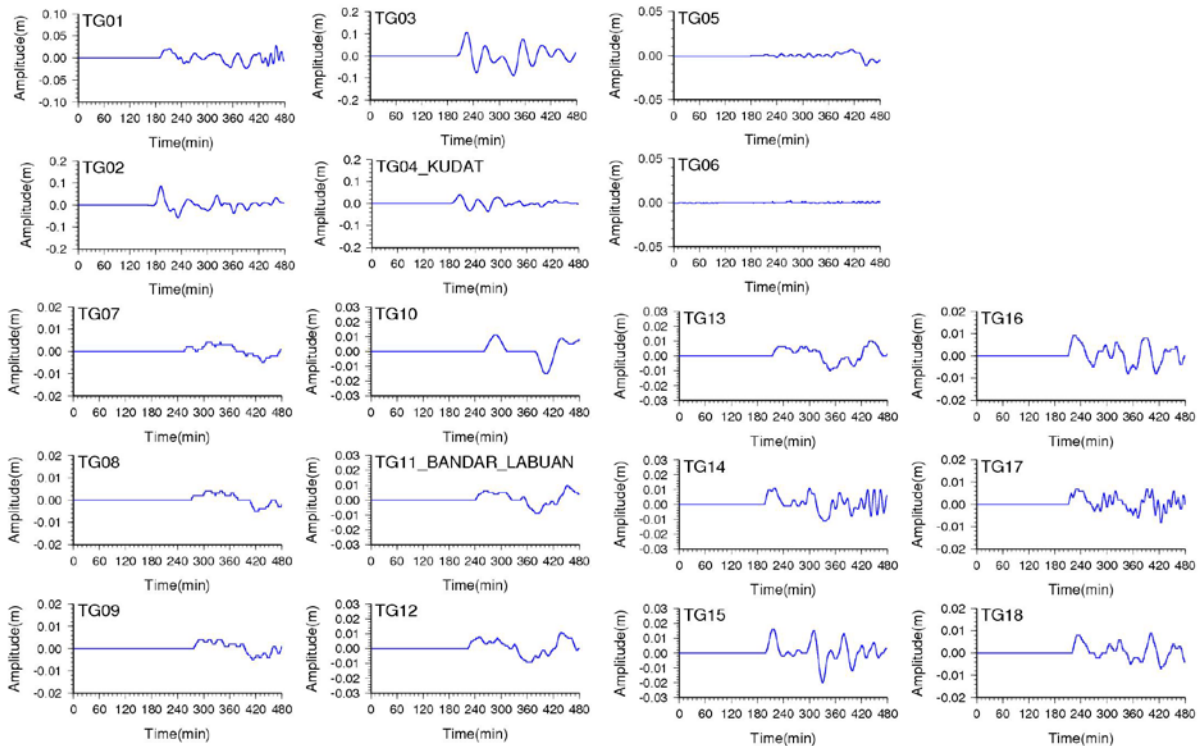


Figure 6. Tsunami waveforms at tide gauge stations for Case 2a.



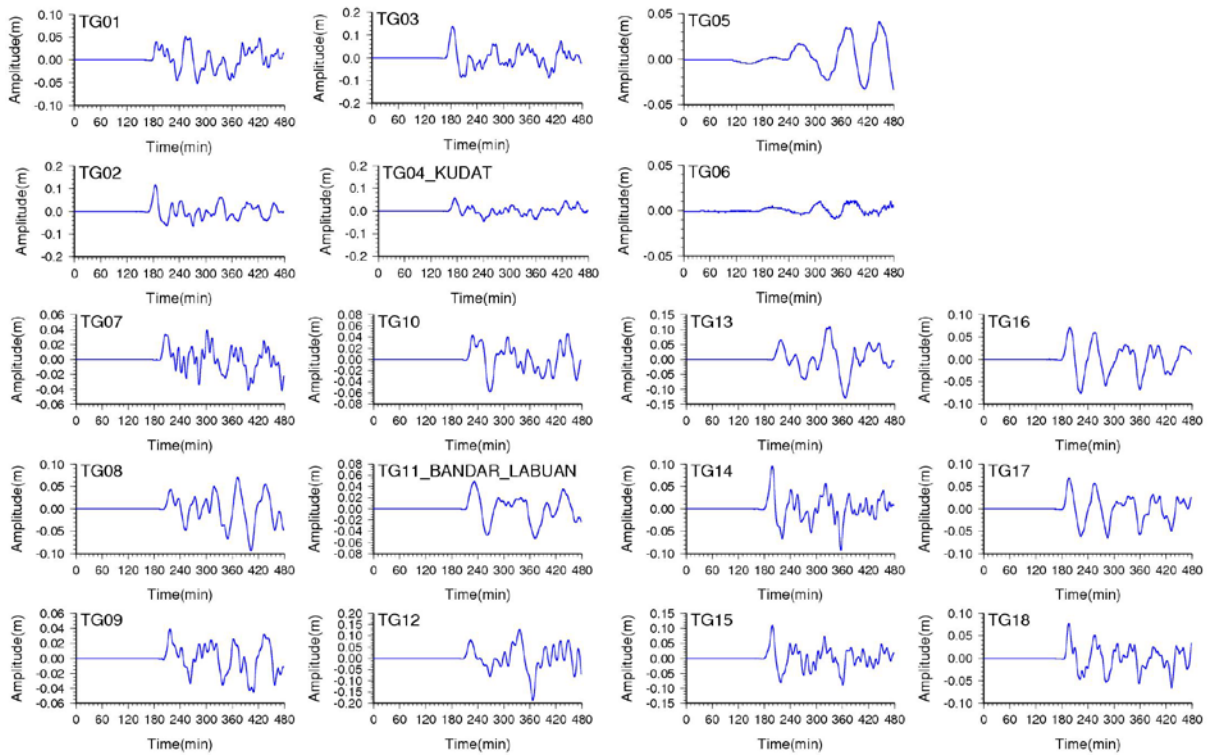


Figure 7. Tsunami waveforms at tide gauge stations for Case 2b.

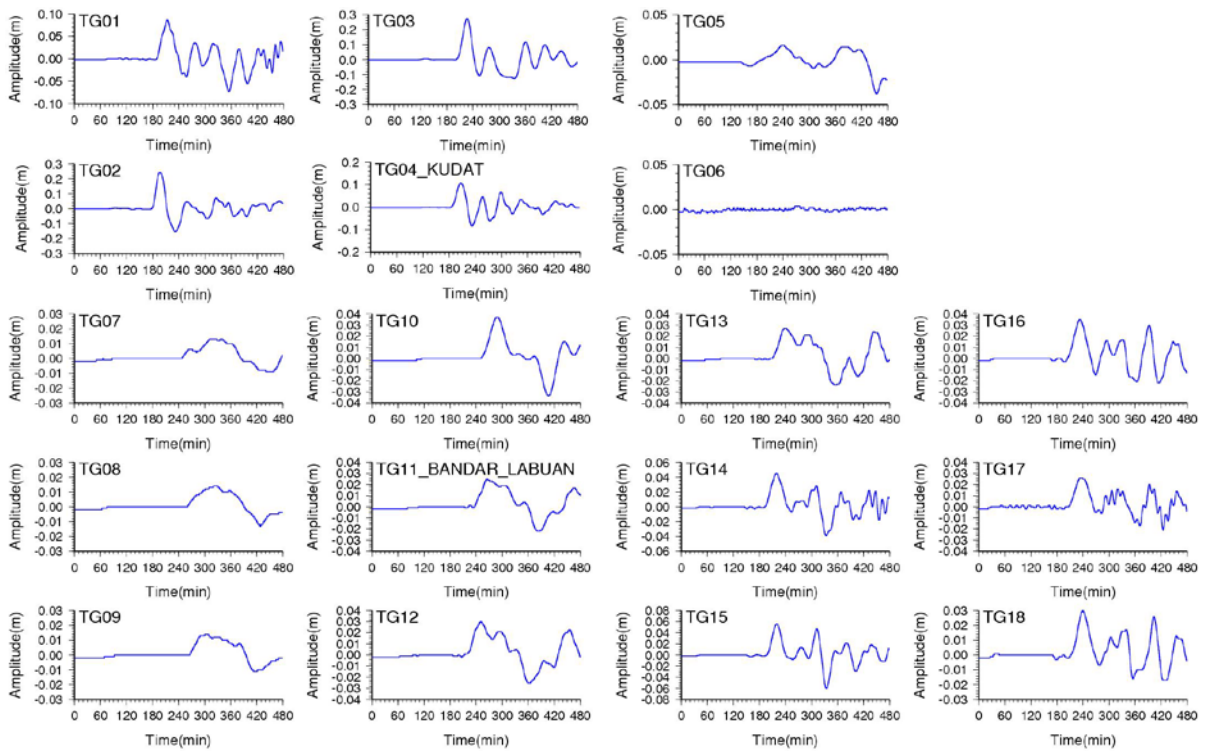


Figure 8. Tsunami waveforms at tide gauge stations for Case 3a.

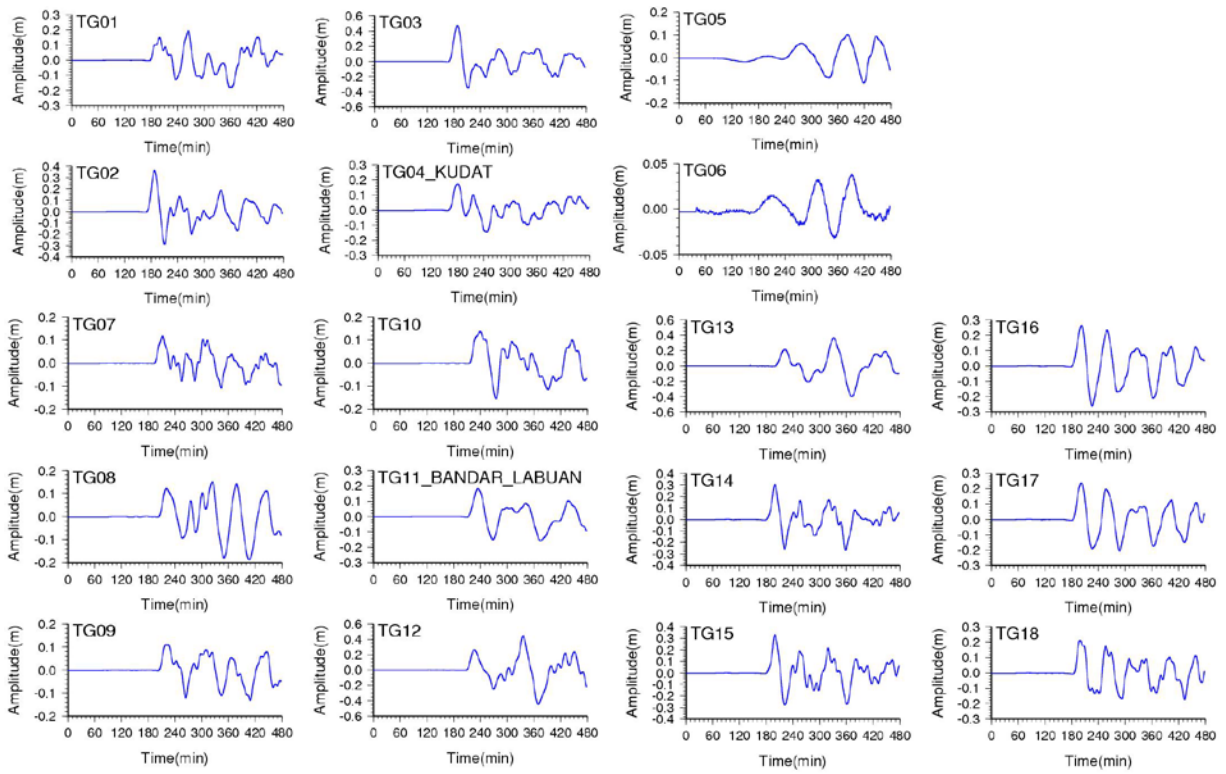


Figure 9. Tsunami waveforms at tide gauge stations for Case 3b.

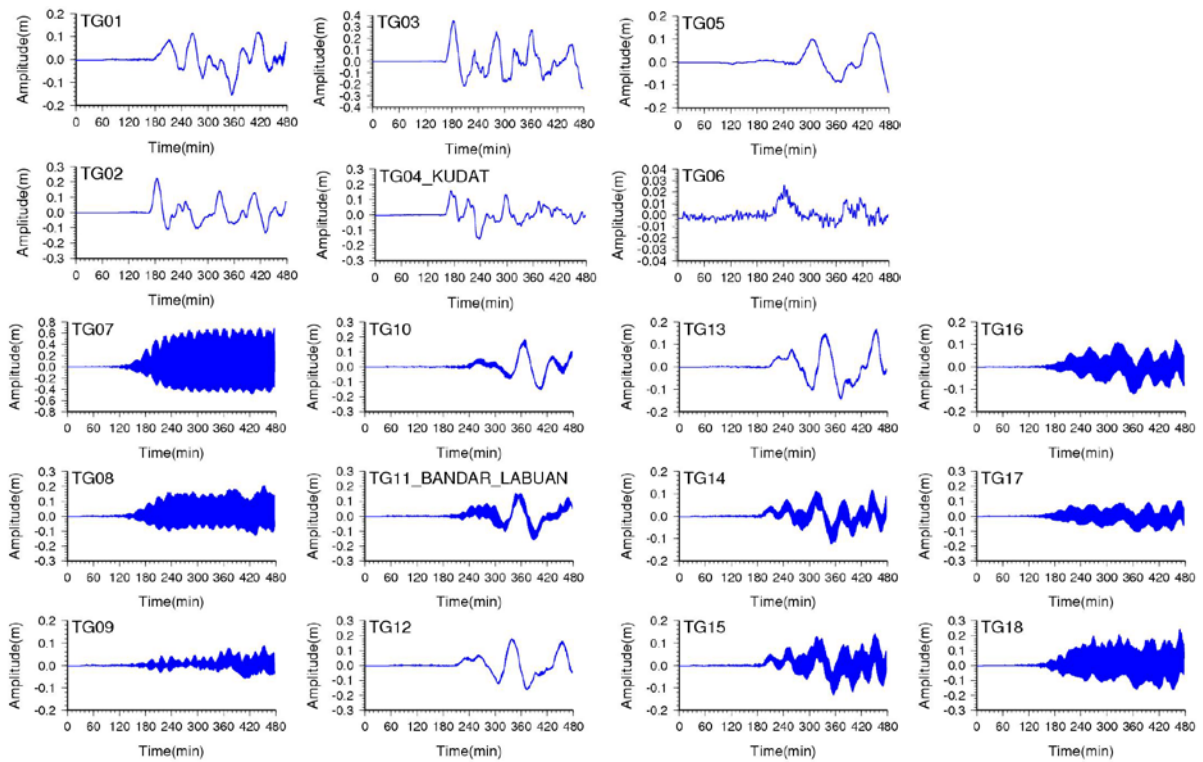


Figure 10. Tsunami waveforms at tide gauge stations for Case 3c.

#### 4. Conditions for Computation

Table 3. Computation regions and data used for simulation using nested grids.

Region	Region 1	Region 2	Region 3	Region 4
Latitude	5°-20°N	5.15°-6.65°N	5.235° - 5.735°N	5.240°-5.400°N
Longitude	115°-121°E	115.05°-117.05°E	115.100°-115.850°E	115.146°-115.290°E
Bathymetry data	GEBCO 30 arc-seconds	GEBCO 30 arc-seconds	Nautical chart	Nautical chart
Topography data	GEBCO 30 arc-seconds	GEBCO 30 arc-seconds	SRTM (90 m)	ASTER (30 m)
Resolution	27 arc-seconds	9 arc-seconds	3 arc-seconds	1 arc-second
Grid dimension	800 x 1999	800 x 600	900 x 600	520 x 577