TSUNAMI MODELING OF THE 2012 El SALVADOR EARTHQUAKE ALONG THE PACIFIC COAST OF EL SALVADOR AND NICARAGUA

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1. Fault Parameters of Tsunami Sources

Table 1. Source parameters of case 1, using the model of the 2012 El Salvador earthquake (Mw 7.3).

Mo (Nm)	Rigidity (GPa)	Mw	Long. (°W)	Lat. (°N)	Length (km)	Width (km)	Slip (m)	Depth (km)	Dip (deg)	Rake (deg)	Strike (deg)
1.19 x $10^{2°}$	30	7.3	-88.70	12.3	60	30	2.2	12	15	81	287

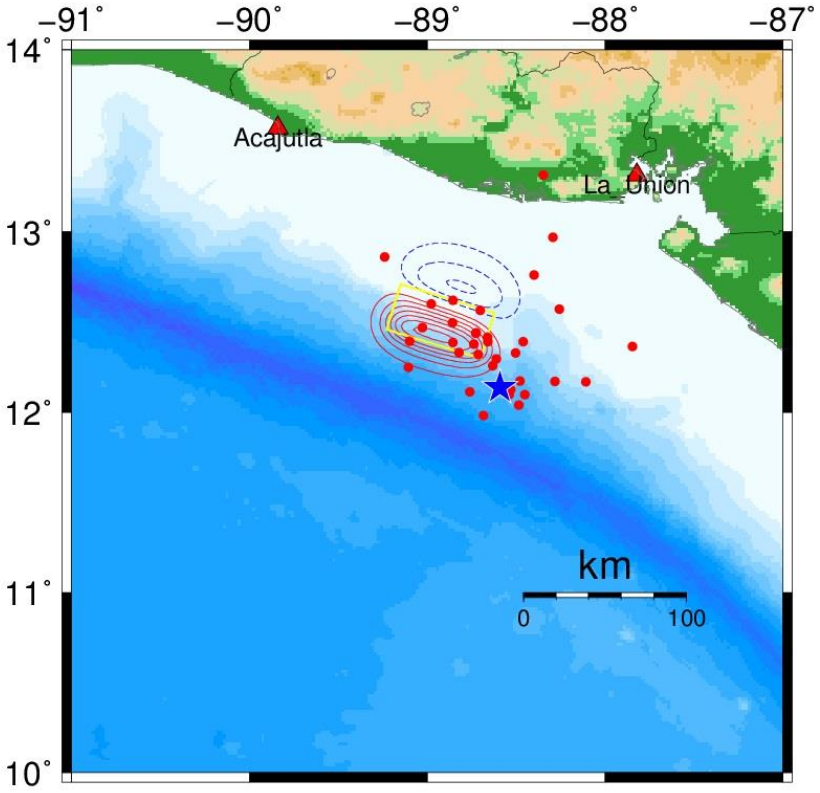

Figure 1. Sea floor deformation obtained from the source model by Heidarzadeh et al. (2014). The yellow rectangle is the fault. The red lines show the uplift area. with a contour interval of 0.1m and the blue dash lines show the subsidence with a contour interval of 0.1m. The red dots indicate epicenters of the aftershock.

Table 2. Source parameters of case 2, using the model of the 2012 El Salvador earthquake (Mw 7.3).

Mo (Nm)	Rigidity (GPa)	Mw	Long. (°W)	Lat. (°N)	Length (km)	Width (km)	Slip (m)	Depth (km)	Dip (deg)	Rake (deg)	Strike (deg)
1.19 x $10^{2°}$	15	7.3	-88.55	11.95	60	30	4.4	3.0	15	81	287

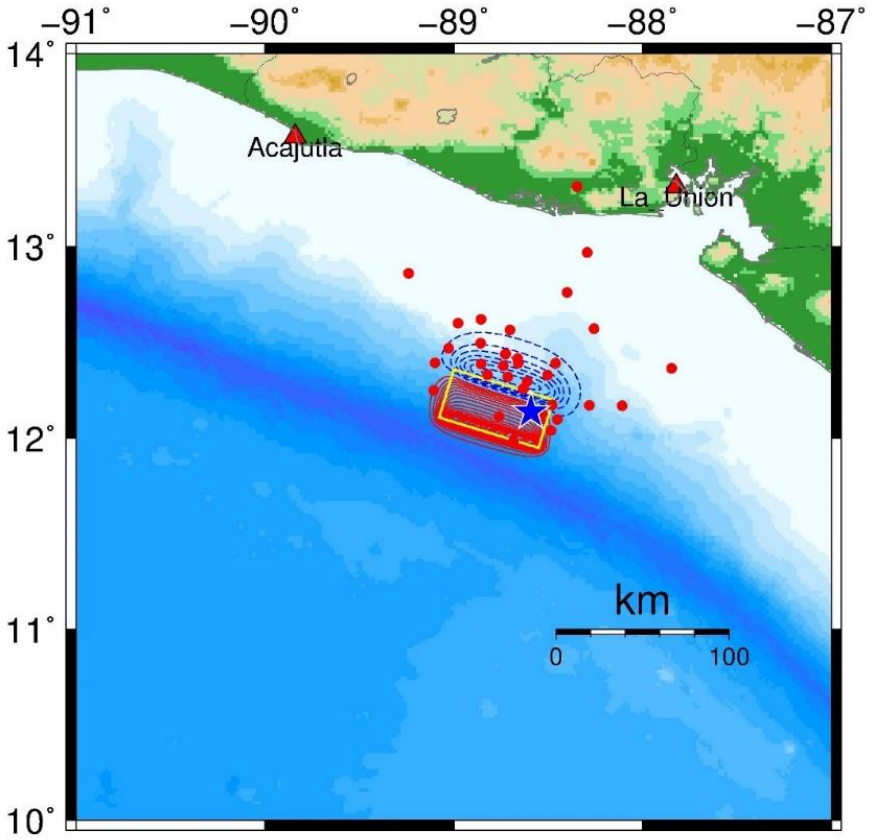

Figure 2. Sea floor deformation obtained from source model case 2. The yellow rectangle is the fault. The red lines show the uplift area with a contour interval of 0.1m and the blue dash lines show the subsidence with a contour interval of 0.1m. The red dots indicate epicenters of the aftershock.

2. Coastal Points

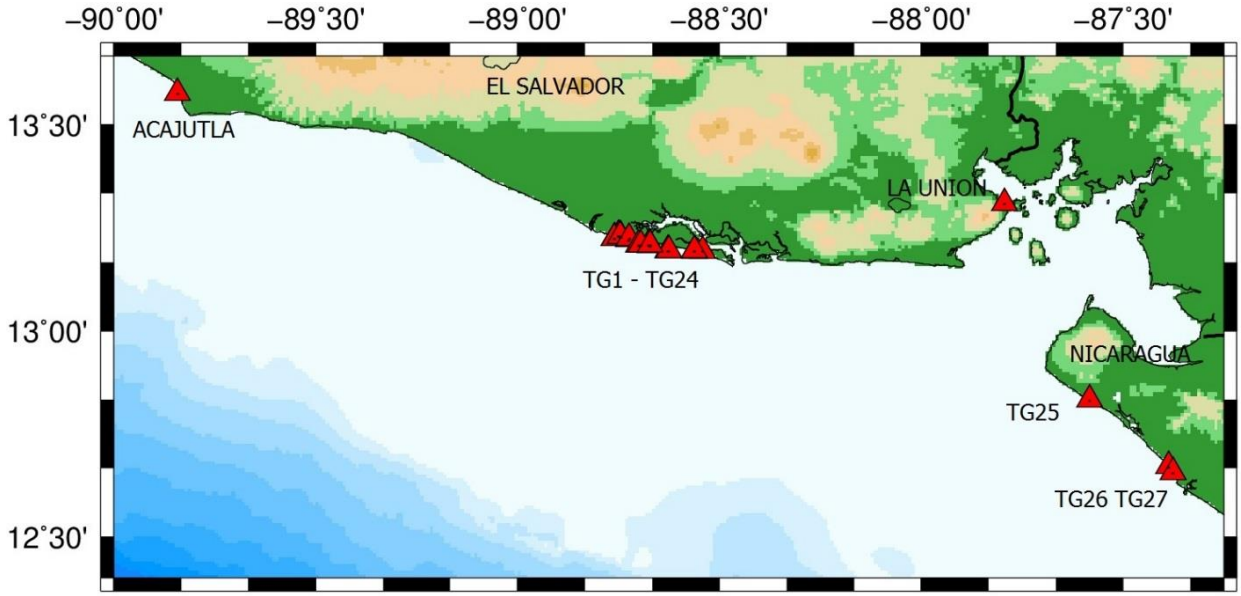

Figure 3. Coastal points based on the field survey of 2012 El Salvador tsunami (Borrero et al., 2014) and tide gauges: 24 coastal points located in San Juan del Gozo Peninsula, El Salvador and 3 coastal points in northern Nicaragua, and also 2 tide gauges.

Table 3. Coastal points used in the numerical simulation and field survey data from 2012 El Salvador tsunami according to Borrero et al. (2014).

Survey Points	Longitude W (Deg)	Latitude N (Deg)	Terrain z (m)	Flow Depth h (m)	Tsunami height (m)	Run-Up (m)	Coastal Points	Longitude W (Deg)	Latitude N (Deg)
1	-88.6716	13.2183	4.2	2.1	6.3		TG1	-88.673	13.2176
1	-88.6716	13.2186	3.5	2.3	5.8		TG2	-88.673	13.2176
1	-88.6713	13.2206	2.2			2.2	TG3	-88.673	13.2176
2	-88.5433	13.1907	5.3			5.3	TG4	-88.543	13.1885
3	-88.5623	13.195	5.1	0.5	5.6		TG5	-88.562	13.1939
3	-88.5622	13.1953	3.7			3.7	TG6	-88.562	13.1939
4	-88.627	13.2101	4.0	0.5	4.5		TG7	88.627	13.2084
4	-88.6268	13.2107	1.7			1.7	TG8	-88.627	13.2084
5	-88.7495	13.2315	3.2	1.6	4.8		TG9	-88.749	13.2286
5	-88.7495	13.2315	3.3	1.6	4.9		TG10	-88.749	13.2286
5	-88.7494	13.2319	2.2	0.5	2.7		TG11	-88.749	13.2286
5	-88.7494	13.2325	2.3			2.3	TG12	-88.749	13.2286
5	-88.7493	13.2325	2.1			2.1	TG13	-88.749	13.2286
6	-88.7593	13.2339	2.5	0.6	4.1		TG14	-88.76	13.2326

7	-88.76	13.2348	2.1			2.1	TG15	-88.76	13.2326
7	-88.76	13.2349	1.9			1.9	TG16	-88.76	13.2326
8	-88.7458	13.2305	3.2	1.6	4.8		TG17	-88.747	13.2292
8	-88.7447	13.231	3.5			3.5	TG18	-88.747	13.2292
8	-88.7453	13.231	3.0			3.5	TG19	-88.747	13.2292
9	-88.7252	13.2274	2.7			3	TG20	-88.725	13.2256
9	-88.7253	13.2274	3.2			2.7	TG21	-88.725	13.2256
10	-88.6997	13.2234	2.1			3.2	TG22	-88.701	13.2214
11	-88.6941	13.2226	3.2			2.1	TG23	88.694	13.2194
12	-88.672	13.2198	3.2	0.5		3.2	TG24	-88.673	13.2176
Nicaragua									
1	-87.583	12.833		0.5			TG25	-87.582	12.830
2	-87.387	12.672		n/a			TG26	-87.391	12.672
3	-87.376	12.657		0.5			TG27	-87.384	12.662

3. Results (Tsunami Height)

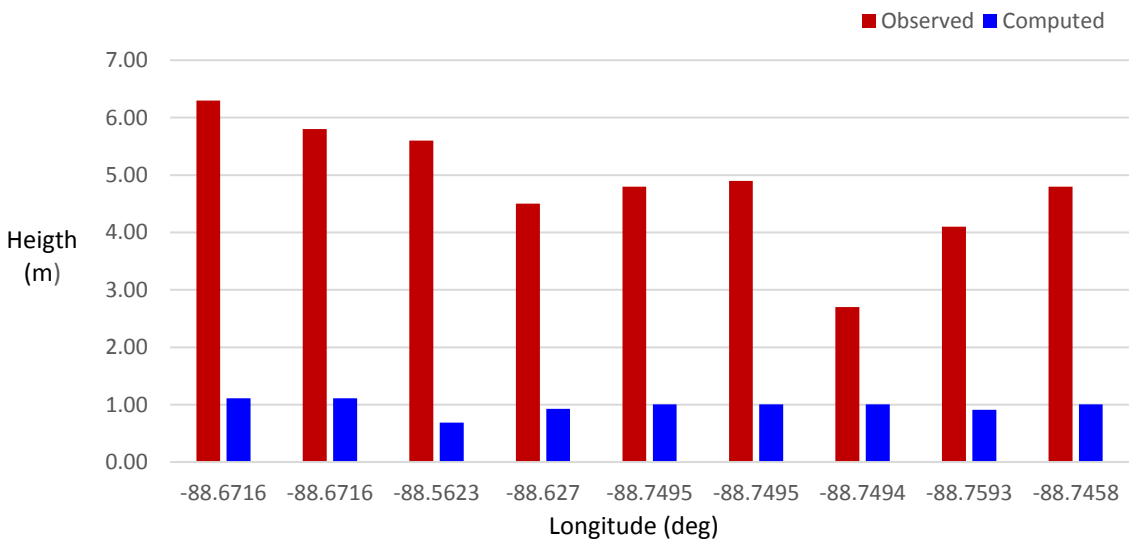

Figure 4. Maximum tsunami height at coastal points using a single grid.

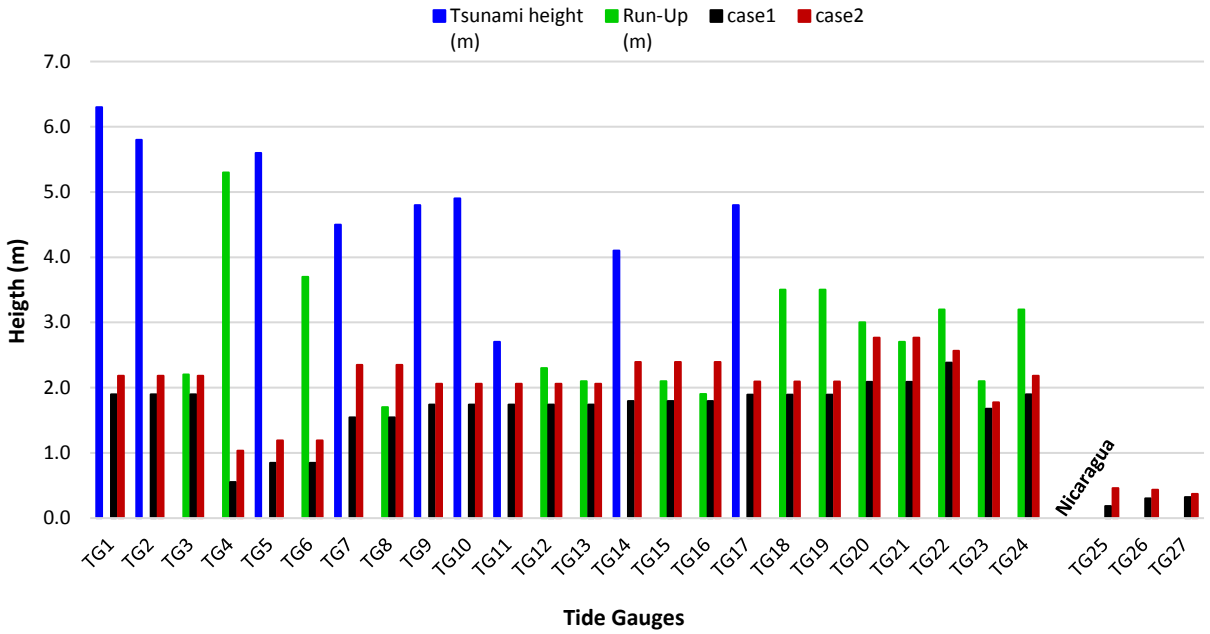

Figure 5. Maximum tsunami height at coastal points using nesting grid for case 1 and case 2

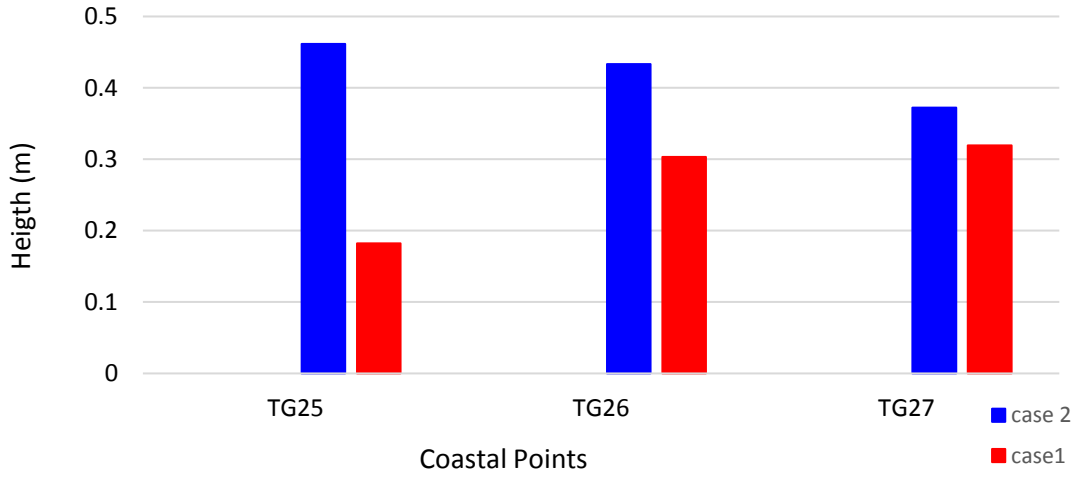

Figure 6. Maximum tsunami height at coastal points for region 3b using nesting grid for case 1 and case 2.

4. Conditions for Computation

Table 4. Region and data resolution used in each computational domain for near field. The calculation time for the computation is 14,400 s (4 hours) and computation time step Δt of 1.0 sis used. By assuming 1 degree of latitude is 111.2 km and spatial grid size at 1 arc-minute.

Region	Longitude (W) deg:min		Latitude (N) deg:min		Spatial grid size (arc-min)	Number of grid size nx/ny	Bathymetry / Topography Data
1	-91:00	-87:00	10:00	14:00	1	240/240	GEBCO 30"/GEBCO 30"
2	-89:54	-87:09	12:03	13:42	0.33333	495/297	GEBCO 30"/GEBCO 30"
3a	-88:50	-88:24	13:03	13:20	0.11111	234/153	GEBCO 30"/ASTER 1"
3b	-87:42	-87:22	12:39	12:51	0.11111	180/108	GEBCO 30"/ASTER 1"

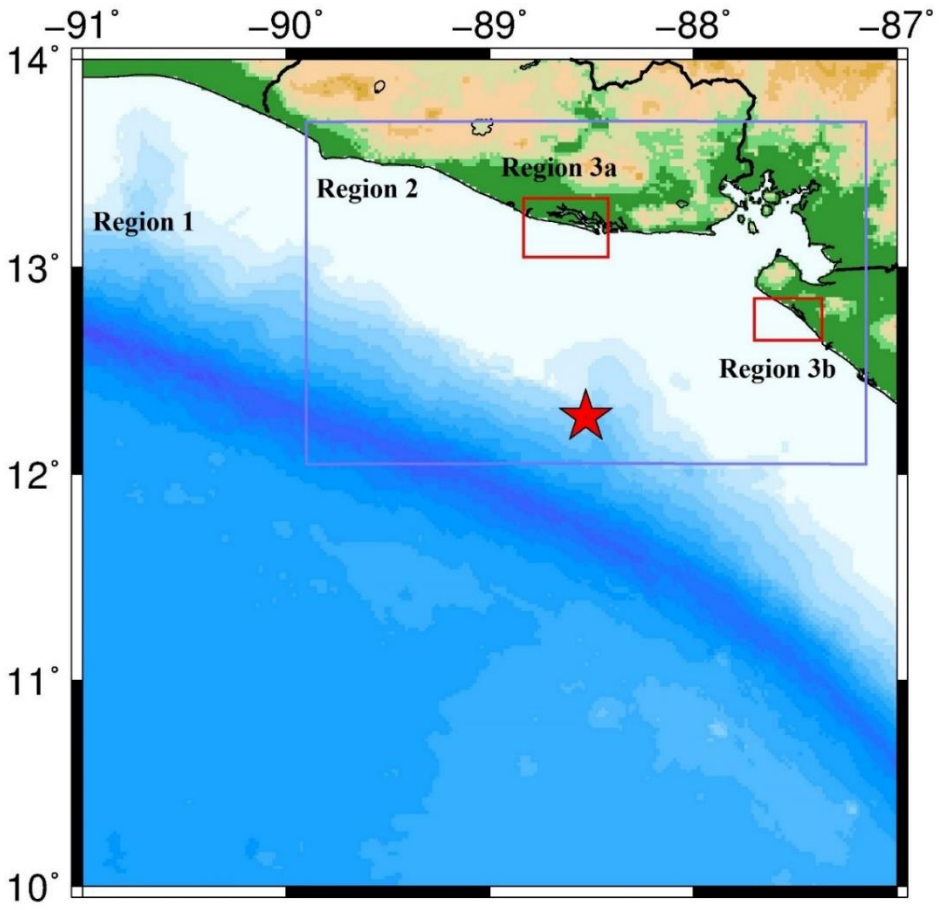

Figure 7. Computation domain for near field using nesting grid.

Table 5. Regions and data resolution used in each computational domain for far field. Calculation time of 21,600 s (6 hours) is chosen for this computation because the study region is located far from the tsunami source.

Region	Longitude (w) deg:min		Latitude deg:min		Spatial grid size (arc-min)	Number of grid size nx/ny	Bathymetry / Topography Data
R1	-105:00	-77:00	-8:00	15:00	2	840/690	GEBCO 30"
R2	-94:30	-78:30	-5:30	-3:30	0.66667	1440/810	GEBCO 30"
R3a	-91:12	-89:42	-1:06	00:00	0.22222	405/297	GEBCO 30"
R3b	-81:48	-79:42	-3:06	-1:30	0.22222	567/432	GEBCO 30"

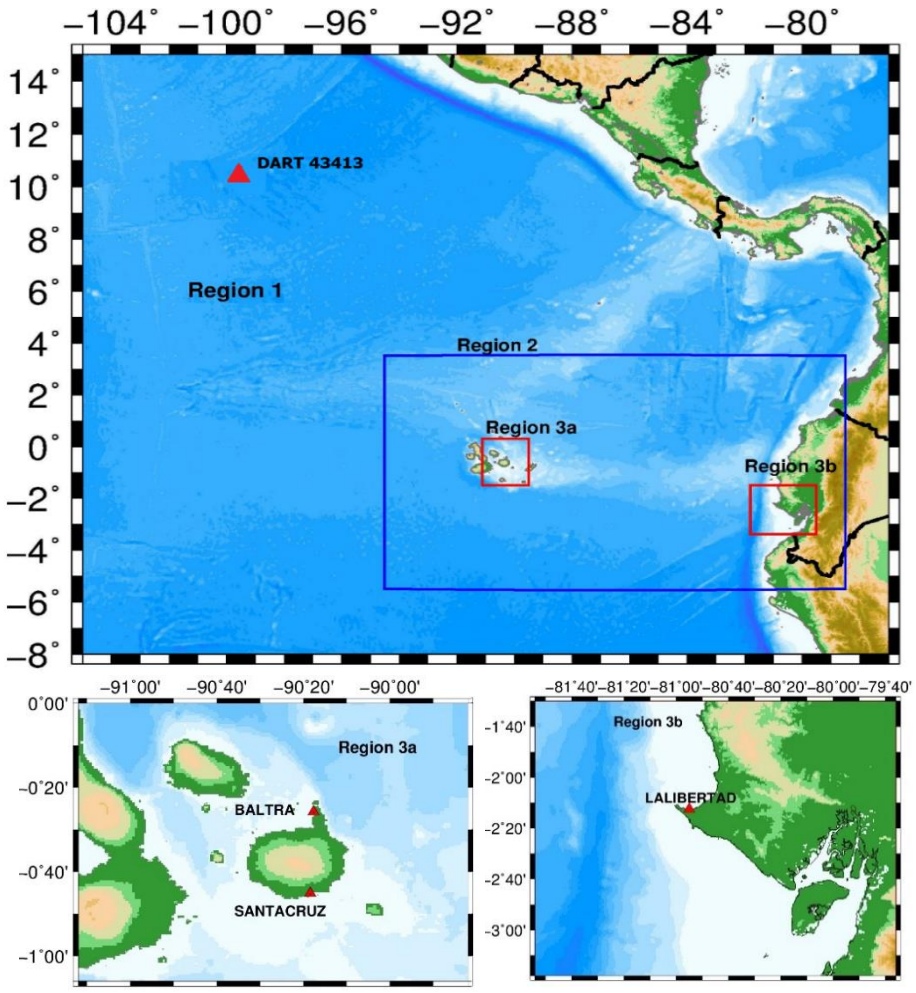

Figure 8. Computation domain for far field using nesting grid.