Tsunami Sources in the South China Sea Region

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1 Tectonic Setting and Seismicity Characteristics

2 Historical Strong Earthquakes in the SCS Region

3 Non-seismic Sources of Tsunamis in the SCS Region

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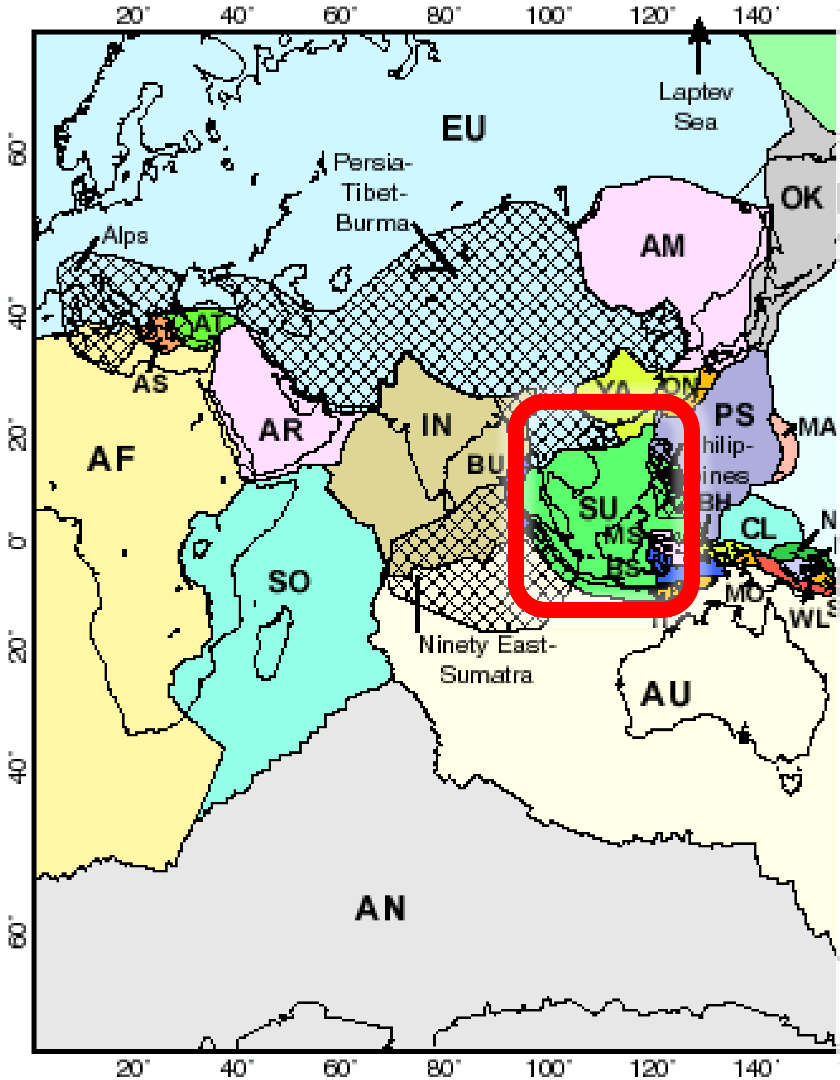
Tectonic Setting and Seismicity Characteristics

Tectonic Setting: A Broader View



- The Sunda Plate is a minor tectonic plate in Southeast Asia
- Bounded to the north by the **Eurasian Plate**, the Sunda Plate is surrounded by active subducting plates, including:
  1. The **Indian-Burma Plate** from the west ;
  2. The **Australian Plate** from the south ; and
  3. The **Philippine Sea Plate** beneath the Philippine islands from the east

Indo-Australian Plate

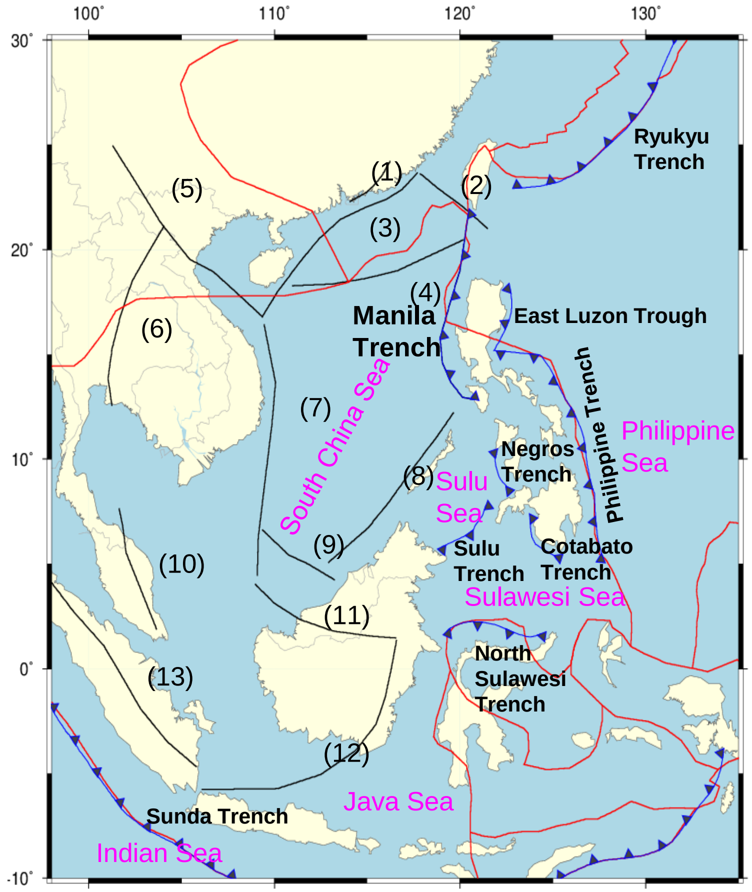
Figure from Peter Bird 2003

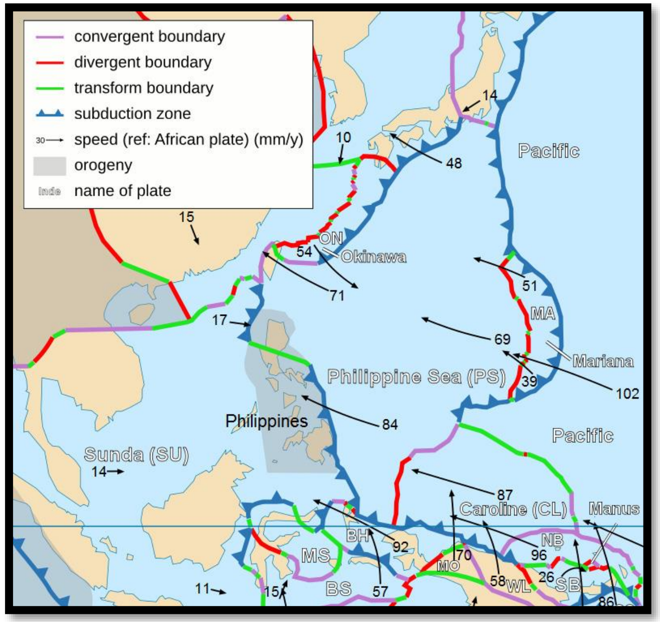
Tectonic Setting: A Closer View

Seismotectonic features of Southeast Asia region

- Major fault lines include Manila Trench, Sulu Trench, Cotabato Trench, Negros Trench and North Sulawesi Trench

- A number of intraplate faults was also identified in the region





(Modified from Wikipedia)

(1) Lishui-Haifen fault; (2) Western Penhui fault;

(3) Literal fault; (4) Northern edge fault of the Xisha trough;

(5) Jinshajiang–Red River fault; (6) Luang prabang fault;

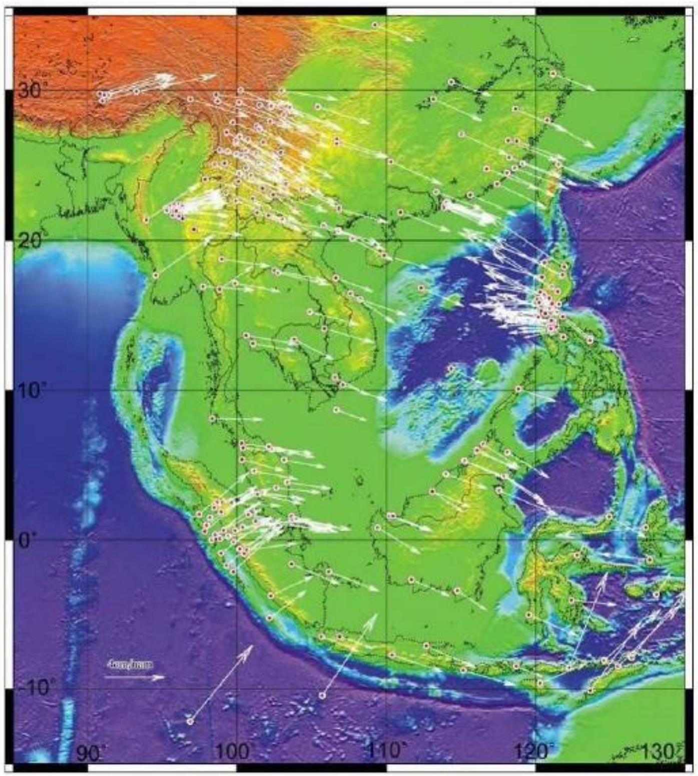
(7) Eastern Vietnam fault; (8) Nansha trough fault;

(9) Tinjia fault; (10) Raub-Bentung fault; (11) Lupoer fault;

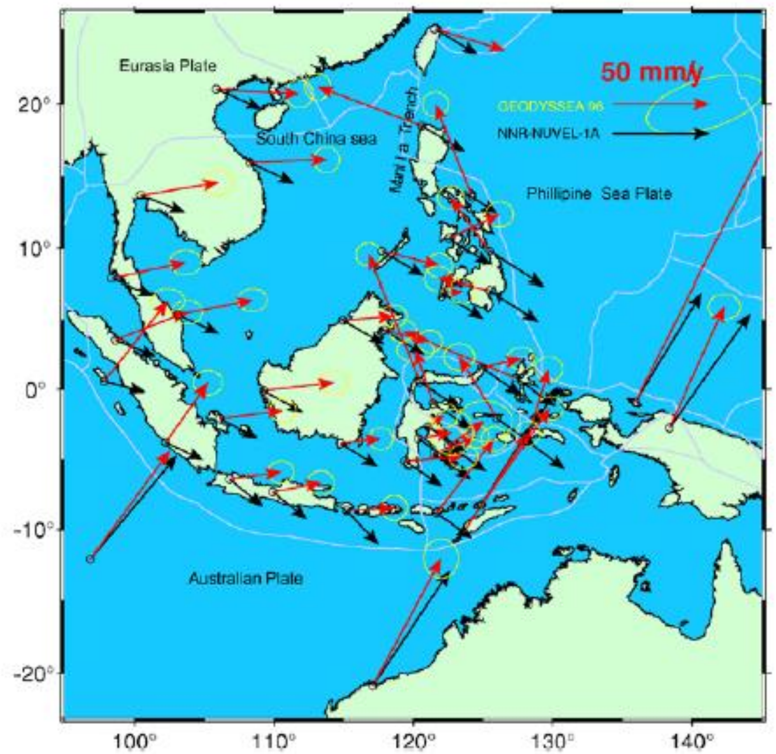
(12) Molatusi fault; (13) Balisan fault

Geodynamics and Tectonic Movement

- Study of tectonic movement using GNSS network
- Convergence of three plates makes the SCS region under significant and complicated tectonic stress



Crustal motion on the Projects GEODYSSEA,PCGIAP,SEAMERGES



Site motion in ITRF96 reference frame derived using GPS observation campagins in 1996 (GEODYSSEA) together with those extracted with NNR-NU-VEL-1A model

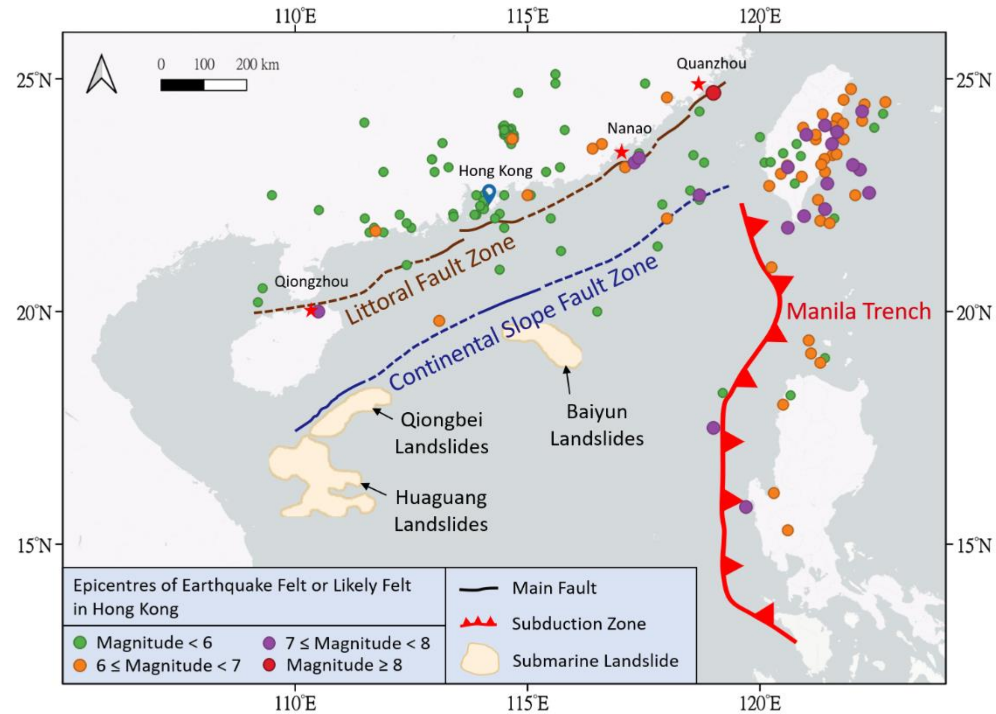
Littoral Fault Zone and Continental Slope Fault Zone

Littoral Fault Zone (LFZ)

- Location & Nature: Stretches ~1,200 km in coastal northern South China Sea
- Normal strike-slip fault within the Eurasian Plate (not a plate boundary)
- Low crustal activity, slow strain rates
- Historical Seismicity in 400 years of records:
  4 earthquakes ≥ M7.0;
  ~30 events ≥ M6.0
- Theoretical upper limit ~ M7.5

Continental Slope Fault Zone (CSFZ)

- Location: Northeast-oriented normal strike-slip fault near continental shelf edge
- Seismic Potential: Limited studies suggest potential for ~ M7.0 earthquakes
- Further research required to assess hazard with confidence



Manila Trench

1. Long-term megathrust deficit

The strongest recorded earthquake along the Manila Trench was the M7.6 event in 1934. Tsunami was observed south of Luzon Island.

No earthquakes ≥ Mw 7.6 recorded since reliable Spanish colonial records began in 1560, indicating either aseismic slip or strain accumulation for future great/giant quake.

2. High coupling ratio

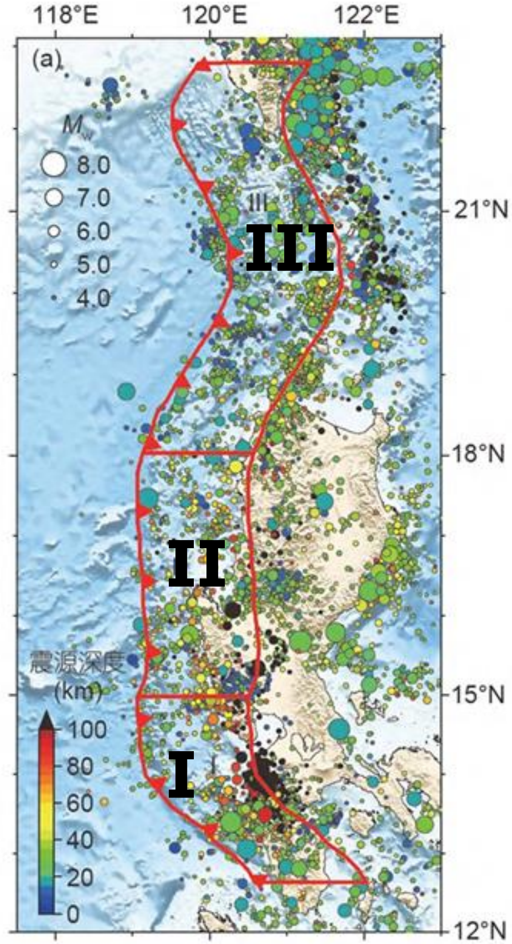
Block modelling using GNSS data (1998–2015) suggests a coupling ratio of ~0.48 or higher in the subduction interface.

3. Exceptionally high convergence rate

65–100 mm/yr—higher than many active subduction zones (e.g., Japan Trench 62–81 mm/yr, Sumatra 50–60 mm/yr, South America 58–72 mm/yr).

Manila Subduction Zone: Earthquake Recurrence Interval

M_w	Historical earthquake-based Zone I a=5.97 b=1.20	Zone II a=4.96 b=0.94	Zone III a=6.20 b=1.12	Geodetic data-based Zone I a=5.45 b=1.0	Zone II a=5.74 b=1.0	Zone III a=5.96 b=1.0
7	467	93	80	75	39	23
7.2	810	143	133	120	61	37
7.4	1406	220	223	190	97	58
7.6	2441	338	372	300	154	93
7.8	4238	521	623	476	244	147
8.0	7357	802	1042	755	387	232
8.2	12772	1235	1743	1196	614	368
8.4	22172	1901	2915	1895	973	584
8.6	–	–	4876	–	–	925
8.8	–	–	8157	–	–	1466
9.0	–	–	13644	–	–	2324



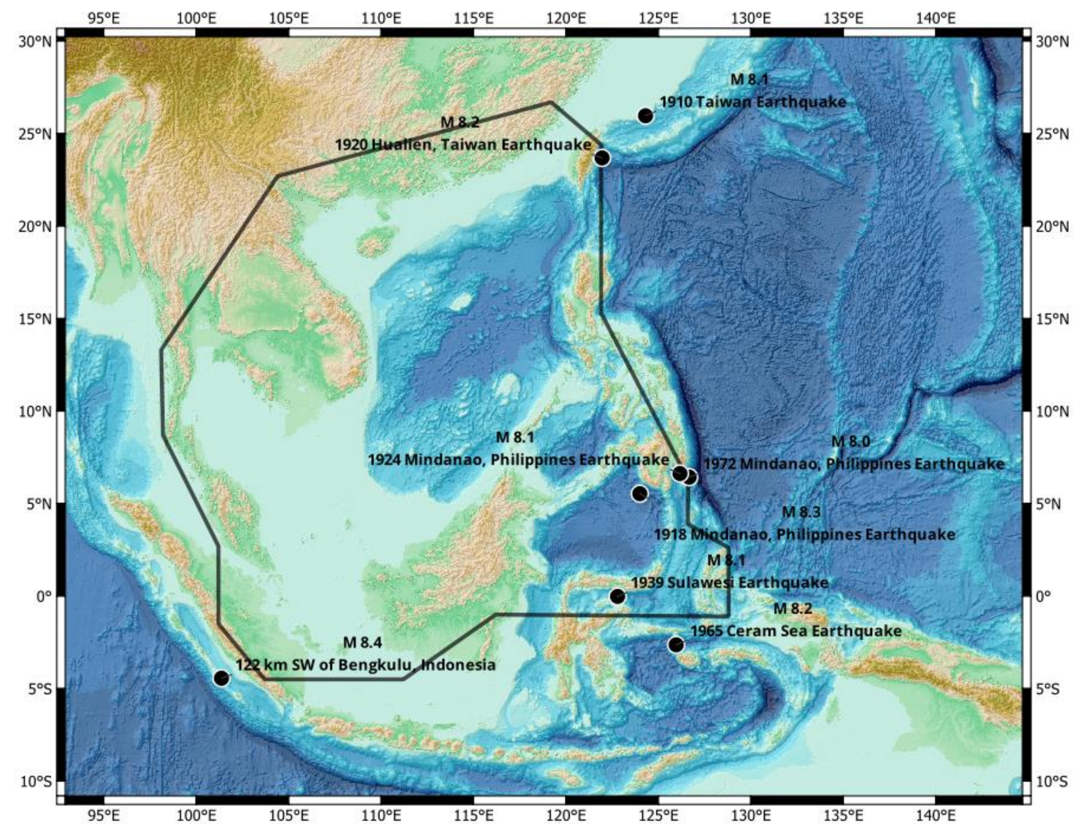
Li L., Qiu Q., Li Z., Zhang P., 2022, Tsunami hazard assessment in the South China Sea: A review of recent progress and research gaps. Science China Earth Sciences, 65(5): 783–809, https://doi.org/10.1007/s11430-021-9893-8

Historical Strong Earthquakes in the SCS Region

Historical events

Earthquakes within the Area of Service of SCSTAC with magnitude M>=8.0 (based on USGS data from 1 Jan 1900 to 21 Dec 2025)

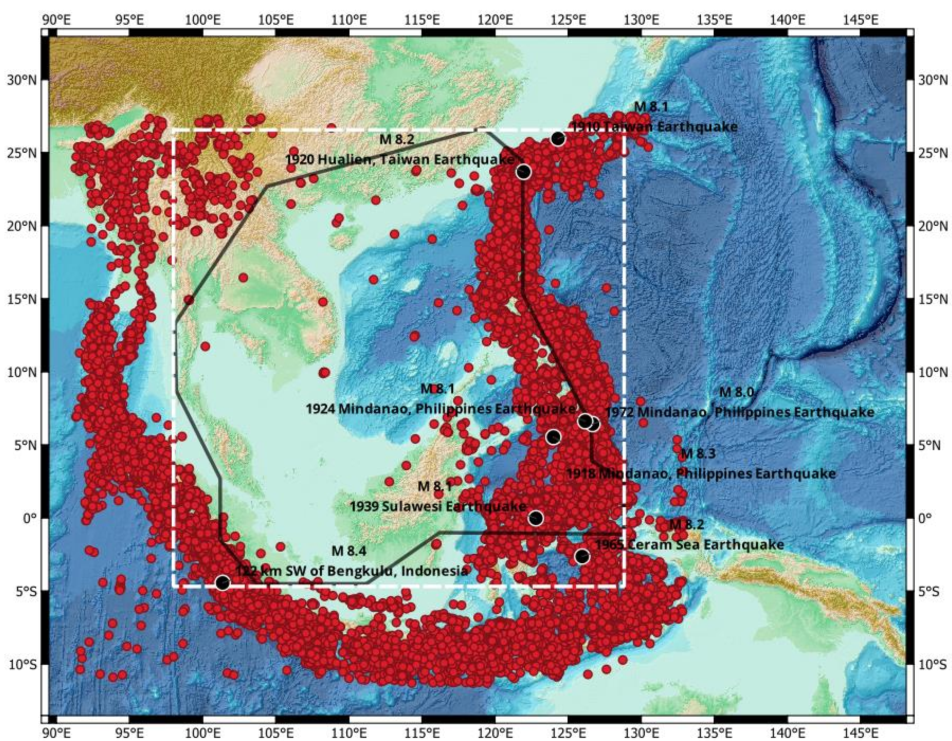
Date	Lat	Lon	Depth (km)	M	Region name
1918/08/15	5.96	124.37	20	8.3	Mindanao, Philippines
1920/06/05	23.68	121.98	20	8.2	Taiwan
1924/04/14	6.72	126.03	15	8.0	Mindanao, Philippines
1939/12/21	-0.07	122.51	35	8.1	Sulawesi, Indonesia
1972/12/02	6.72	126.03	15	8.0	Mindanao, Philippines



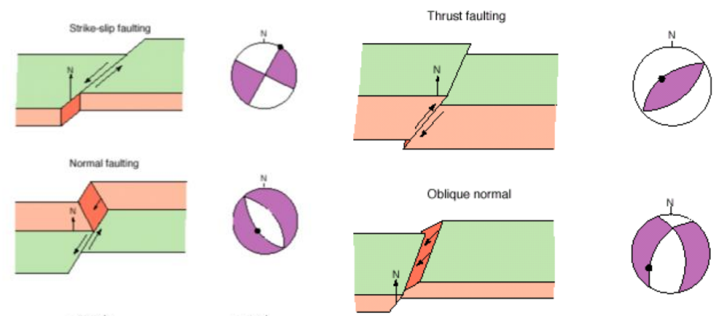
Historical Seismic Distribution

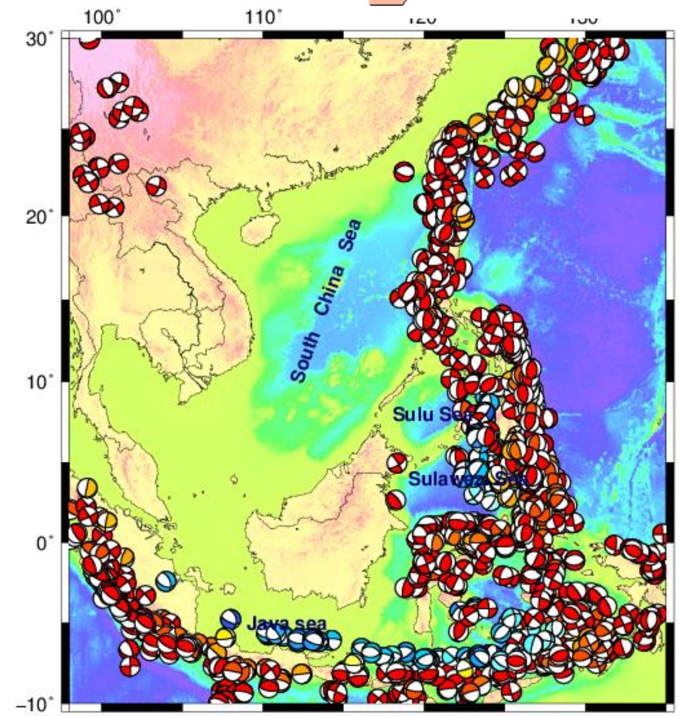
- Catalog of earthquakes with magnitude M ≥ 5.0 based on USGS data from 1 Jan 1900 to 21 Dec 2025 (~126 years)
- Total 12,007 earthquakes inside white dashed line box with magnitude:

M : 5.0 – 5.9	10,445	(~82.9 times/yr)
M : 6.0 – 6.9	1,369	(~10.9 times/yr)
M : 7.0 – 7.9	184	(~1.5 times/yr)
M ≥ 8.0	8	(~0.06 times/yr)



Schematic Diagram of Fault Plane Mechanisms





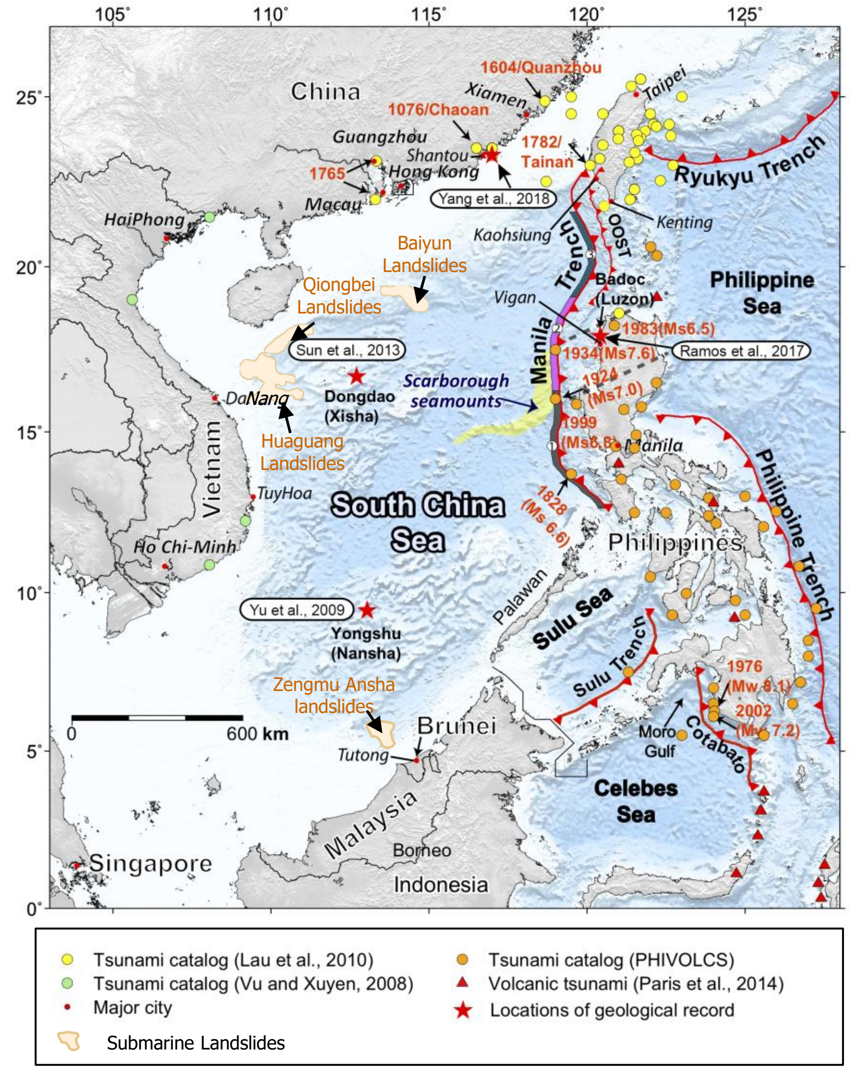
Non-seismic Source of Tsunamis in the SCS Region

Non-seismic and Complex Tsunamis

- Apart from thrust faults, potential tsunami sources include submarine landslides, and volcanic activities in the South China Sea region.

- Some identified sources of submarine landslides:
- Baiyun landslides
- Qiongbei landsides
- Huaguang landslides
- Zengmu Ansha landslides

- Risk assessment of tsunamis caused by submarine landslides in the SCS remains at an early stage, and specific mechanisms, preconditions and probabilities still require substantial further research.



Adapted from Li et al. (2022)

Submarine Landslides

Baiyun Landslides   Zengmu Reef Landslide

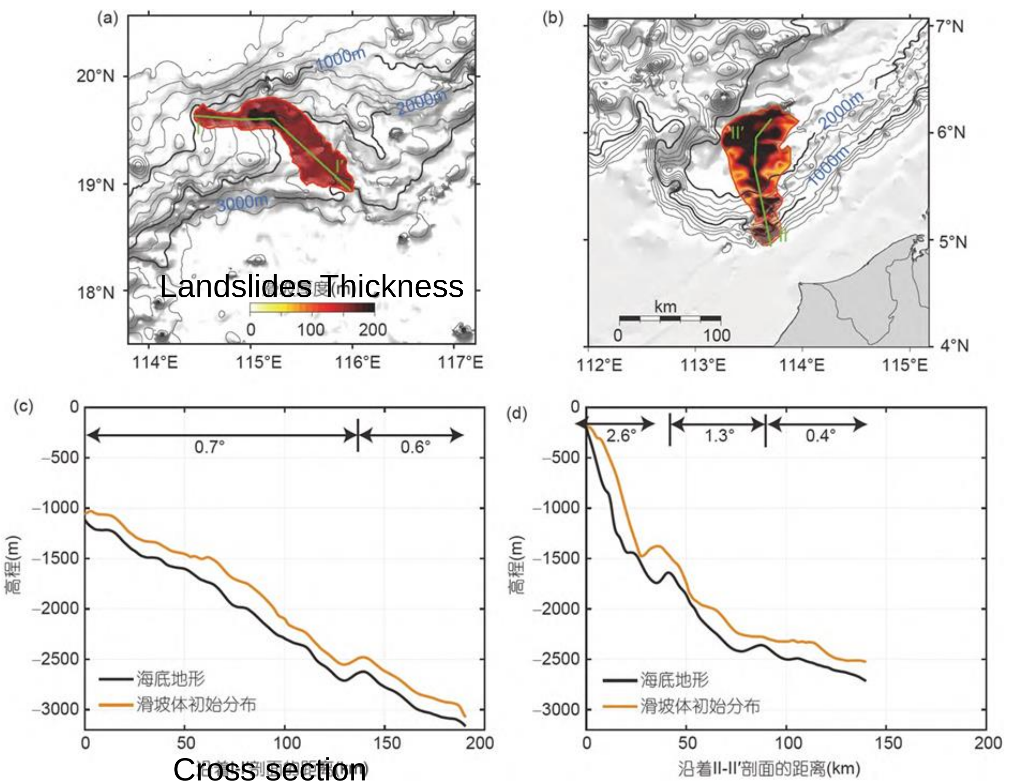
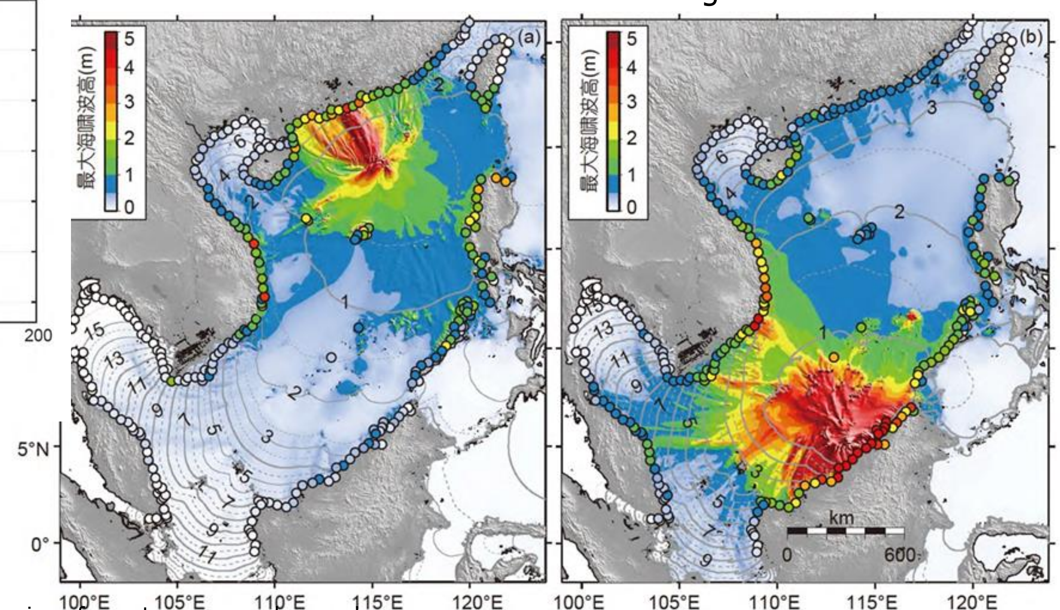


图 11　白云滑坡和曾母暗沙滑坡的初始厚度分布和其剖面坡度图

Undersea Terrain
Initial distribution of landslide body

Baiyun Landslides   Zengmu Reef Landslides



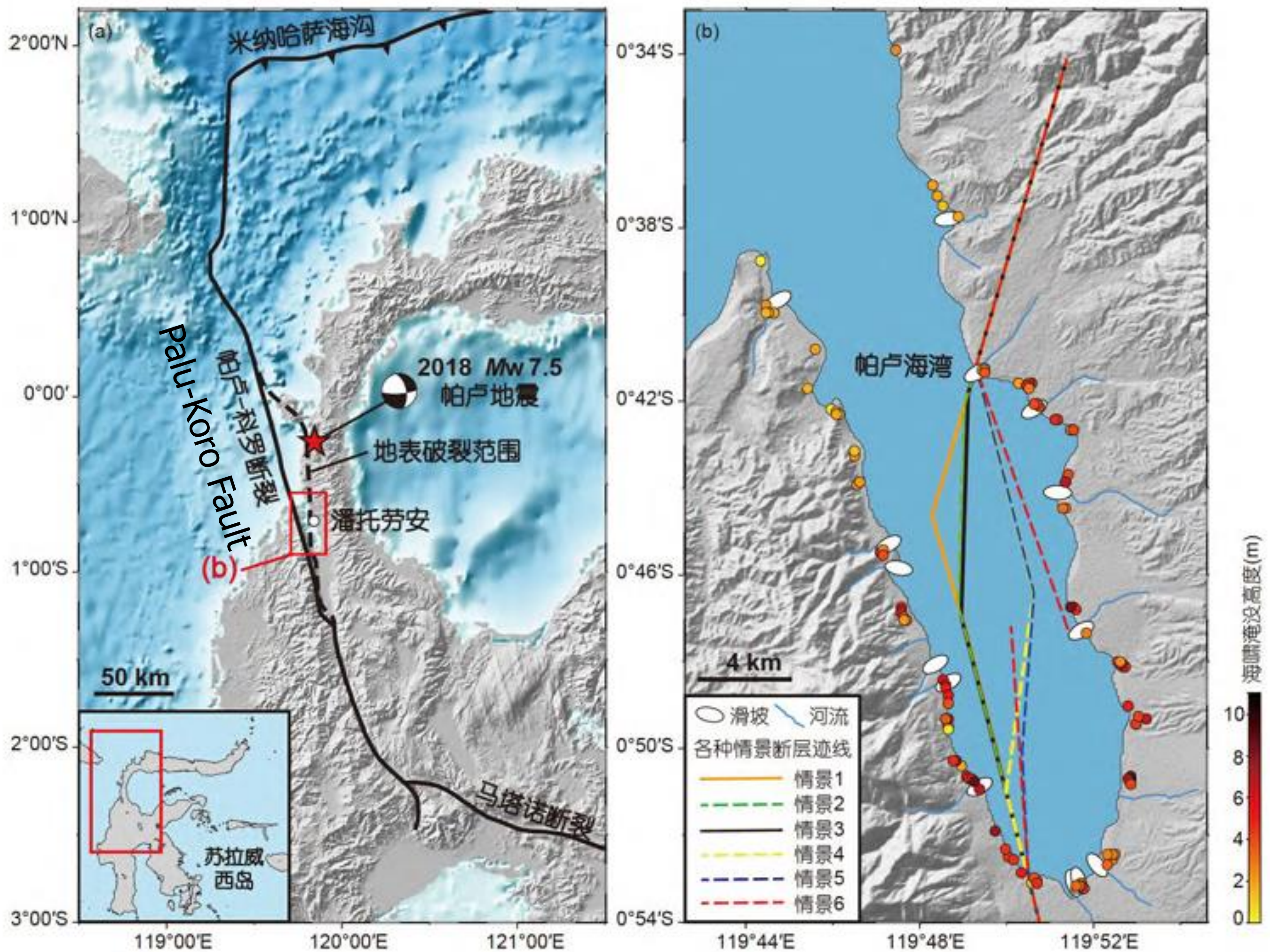
Li L.,Qiu Q., Li Z., Zhang P., 2022, Tsunami hazard assessment in the South China Sea: A review of recent progress and research gaps. Science China Earth Sciences, 65(5): 783–809, https://doi.org/10.1007/s11430-021-9893-8

Non-seismic and Complex Tsunamis

Tectonic background and surveyed tsunami wave heights of the Palu Earthquake on 28 September 2018

(a) Tectonic background of the Palu Mw 7.5 strike-slip earthquake. The black dashed line is the co-seismic surface rupture (Socquet et al.). The red star denotes the epicenter.

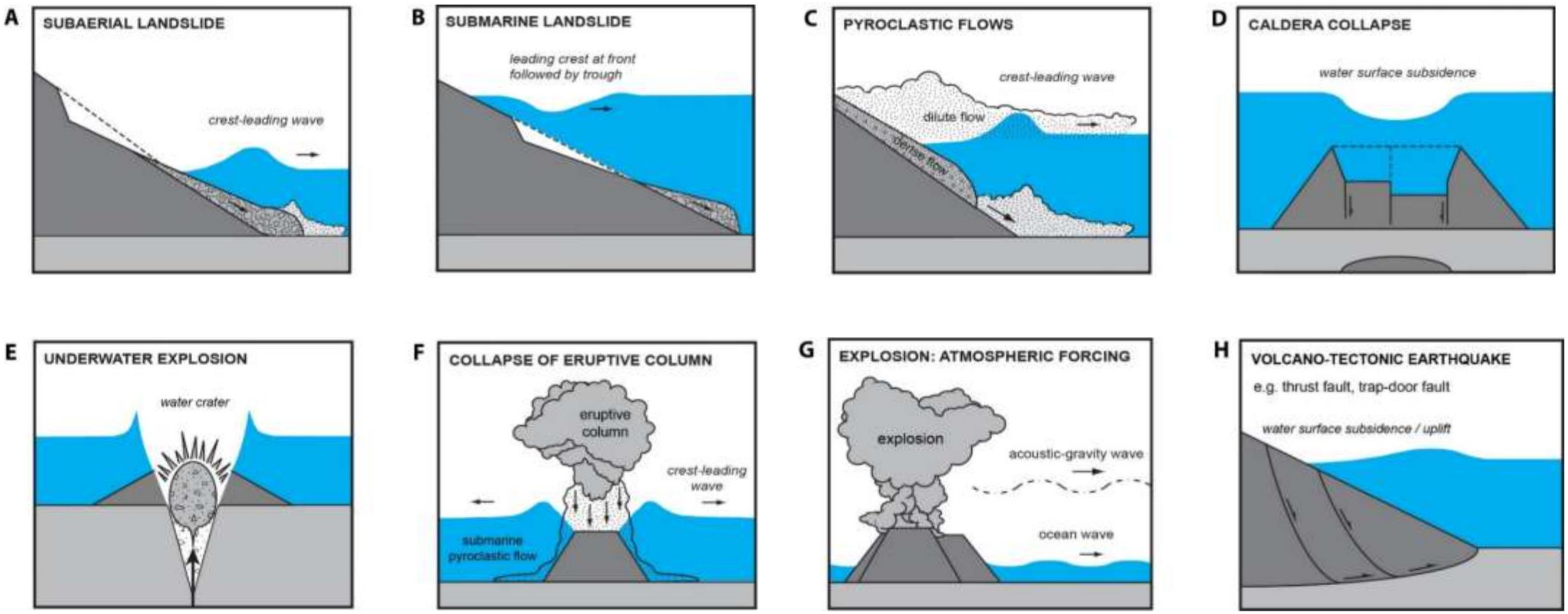
(b) Fault traces under various scenarios within Palu Bay. Traces are adapted from Simons et al., tsunami measurements (dots) are from Omira et al., Mikami et al., and Widiyanto et al. River and landslide locations are referenced from Liu et al.



Tectonic Background and Measured Tsunami Wave Heights of the 2018 Palu Earthquake on September 28（Li et al.,2024）

Tsunami generated by volcanic eruption

DIFFERENT TYPES OF VOLCANIC TSUNAMIS

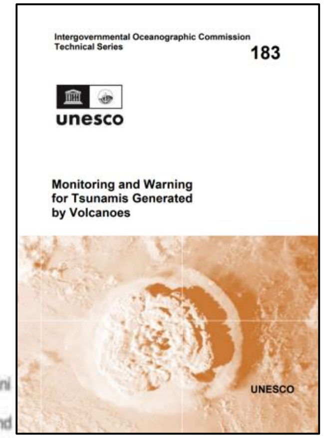


Source: Intergovernmental Oceanographic Commission (IOC). "Monitoring and warning for tsunamis generated by volcanoes." (2024).
https://unesdoc.unesco.org/ark:/48223/pf0000388765

Tsunami generated by volcanic eruption

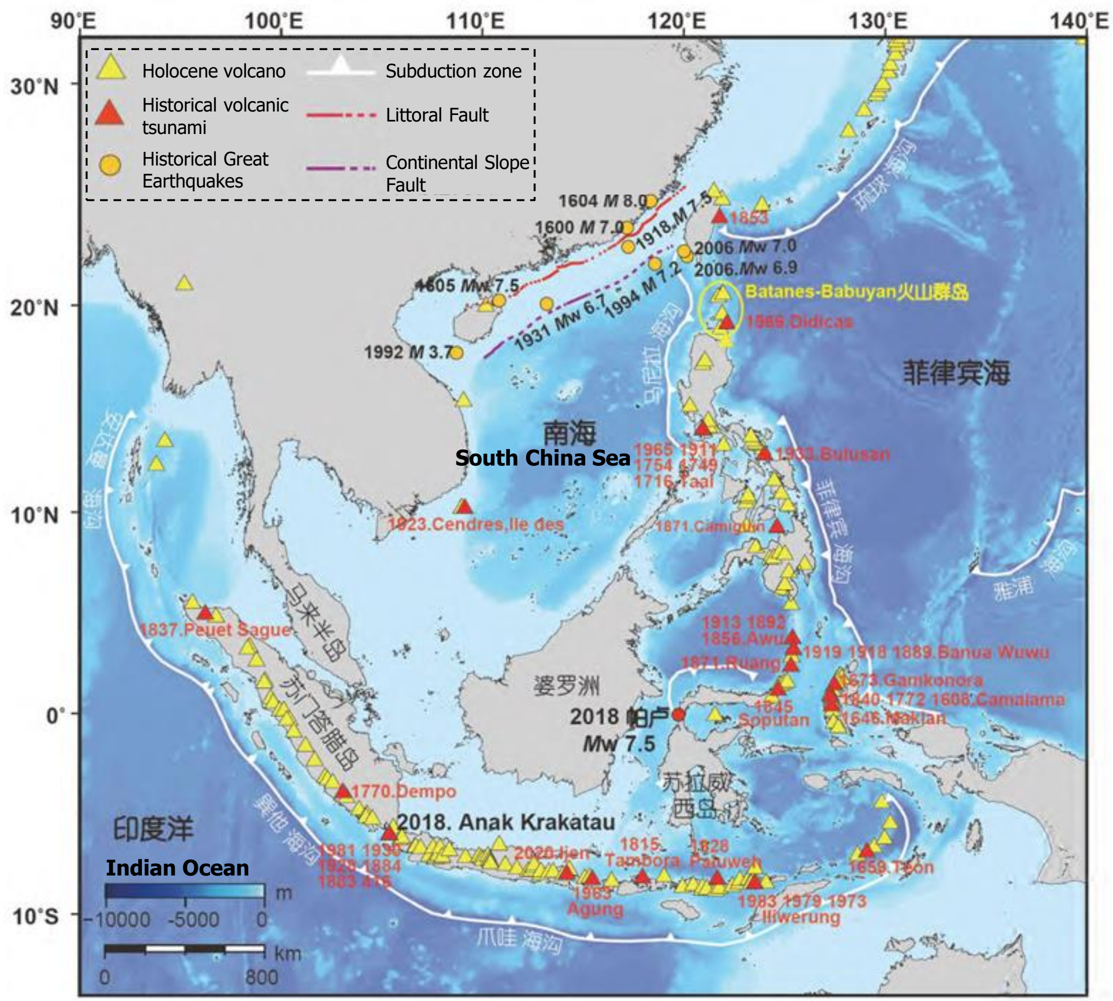
MAP OF TSUNAMIGENIC VOLCANOES

NAME	COUNTRY	REGION	VOLCANO TYPE	DISTANCE / COAST (km)	LAST ERUPTION
Anak Krakatau	INDONESIA	JAVA-SUMATRA	B	0,5	2022
Banda Api	INDONESIA	BANDA SEA	A	1,5	1988
Teon	INDONESIA	BANDA SEA	A	1,5	1904
Batu Tara	INDONESIA	FLORES SEA	A	1	2022
Rokatenda	INDONESIA	FLORES SEA	A	2,3	2013
Sangeang Api	INDONESIA	FLORES SEA	A	5,2	2022
Gamalama	INDONESIA	MALUKU	A	4,3	2018
Gamkonora	INDONESIA	MALUKU	A	4,8	2007
Iliwerung	INDONESIA	NUSA TENGGARA EAST	A	1,5	2021
Lewotolo	INDONESIA	NUSA TENGGARA EAST	A	4	2012
Awu	INDONESIA	SULAWESI	A	5,5	2004
Karangetang	INDONESIA	SULAWESI	A	4	2020
Ruang	INDONESIA	SULAWESI	A	1,6	2002
Didicas	PHILIPPINES	BABUYAN ISLANDS	B	0,2	1978
Camiguin	PHILIPPINES	BOHOL SEA	B	4	1953
Taal	PHILIPPINES	LUZON	B	2,2	2021



Source: Intergovernmental Oceanographic Commission (IOC). "Monitoring and warning for tsunamis generated by volcanoes." (2024). https://unesdoc.unesco.org/ark:/48223/pf0000388765

Volcanic Distribution

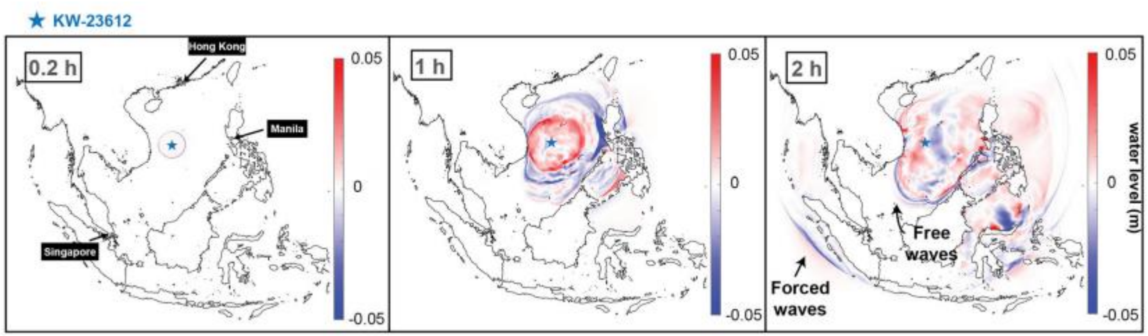


Tectonic background of the South China Sea and its surrounding areas（Li et al., 2024）

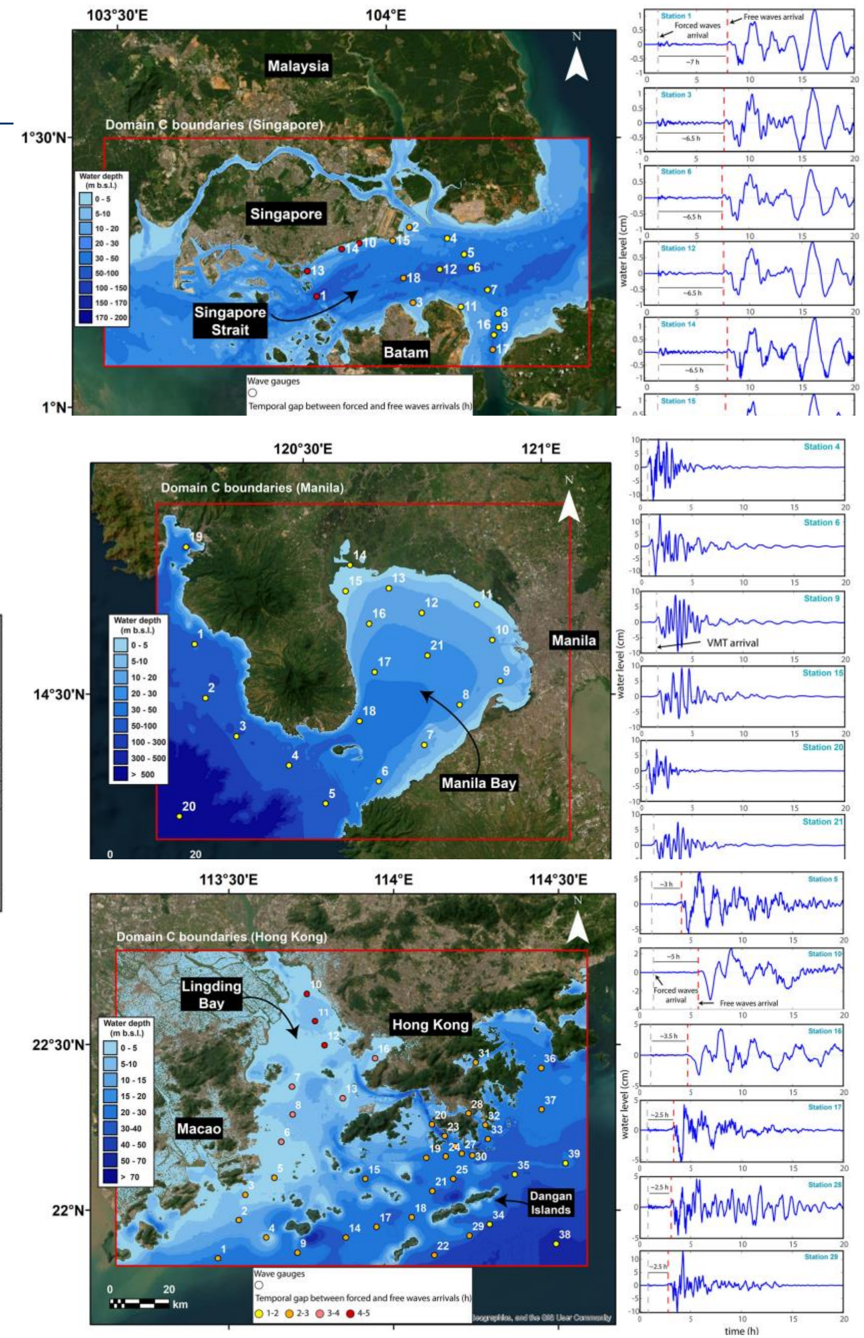
Some Model Simulation Results

Volcanic Eruption

- Same intensity of the HTHH eruption at KW-23612



Verolino, Andrea, et al. "Forced and free waves of simulated volcanic meteo-tsunamis in the South China Sea." *npj Natural Hazards* 2.1 (2025): 25.



ʼure Appl. Geophys. 168 (2011), 1153–1173

DOI 10.1007/s00024-010-0230-x

Pure and Applied Geophysics

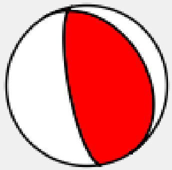
Tsunami Simulations for Regional Sources in the South China and Adjoining Seas

EMILE A. OKAL,[1] COSTAS E. SYNOLAKIS,[2,3,4] and NIKOS KALLIGERIS[3,4]

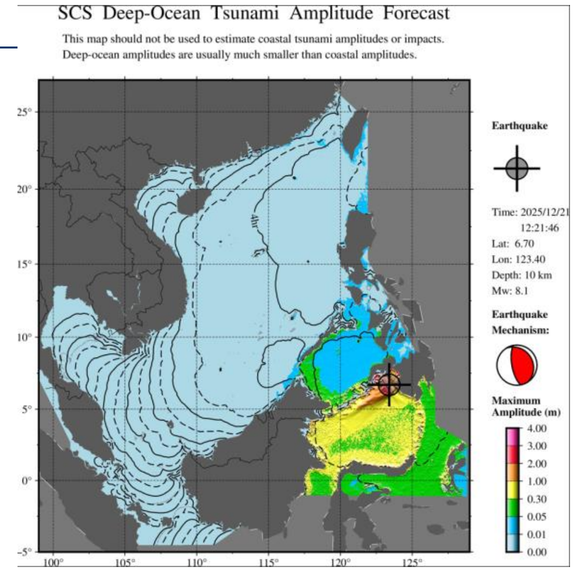
In this paper, 14 scenarios of potential tsunamis in the SCS and its adjoining basins, the Sulu and Sulawezi Seas. The sources consist of earthquake dislocations inspired by the study of historical events, either recorded (since 1900) or described in historical documents going back to 1604. Worst-case scenarios are considered, where the size of the earthquake is not limited by the largest known event, but merely by the dimension of the basin over which a coherent fault may propagate.

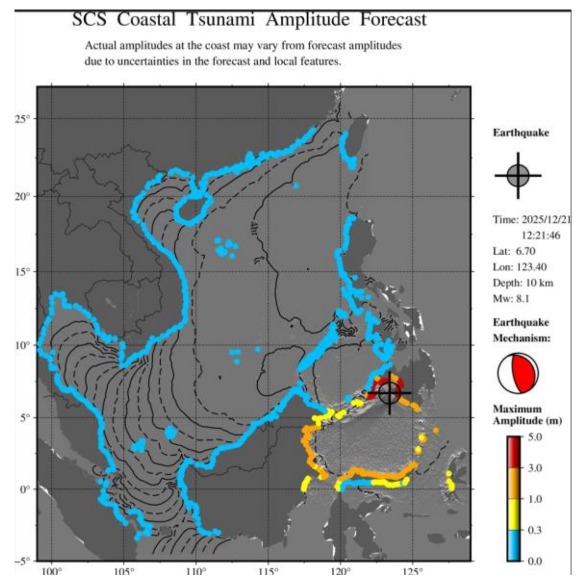
Based on the scenarios and seismic parameters used in this paper, COMCOT model was run by HKO for 12 scenarios and the simulation results are presented in the following.

Mindanao 1976

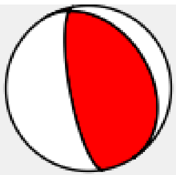
M		位置	深度
8.1		123.4E 6.7N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
PHILIPPINES	COTABUTO_CITY	2025-12-21 12:38:53	1.78	4.32	
PHILIPPINES	ZAMBOANGA	2025-12-21 13:01:13	1.84	3.06	
INDONESIA	MELONGUANE	2025-12-21 13:06:15	1.58	2.5	
INDONESIA	TARAKAN	2025-12-21 15:01:48	0.94	1.46	
PHILIPPINES	GENERAL_SANTOS	2025-12-21 12:55:30	0.53	1.46	
INDONESIA	MANADO	2025-12-21 13:22:23	0.46	1.32	
INDONESIA	TOLI-TOLI	2025-12-21 13:29:24	0.75	1.26	
INDONESIA	JAILOLO	2025-12-21 13:48:31	0.55	0.85	
INDONESIA	TABUKAN_TENGAH	2025-12-21 13:08:47	0.49	0.85	
MALAYSIA	LAHAD_DATU	2025-12-21 15:46:28	0.31	0.55	
INDONESIA	GORONTALO	2025-12-21 13:55:19	0.11	0.32	



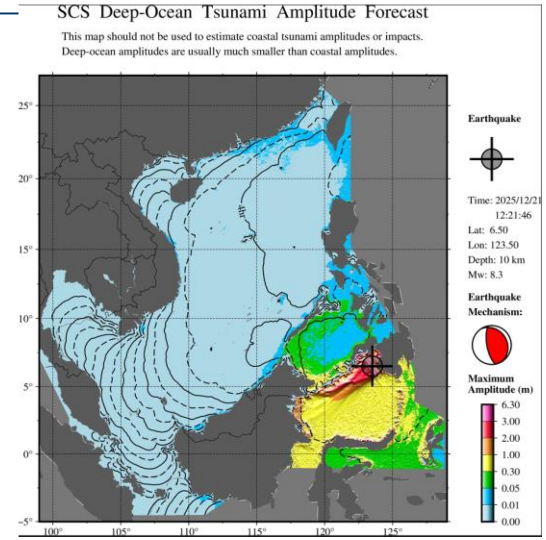


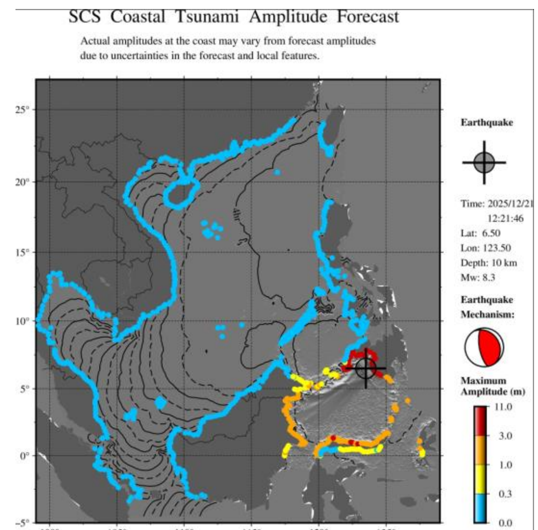
Mindanao 1918



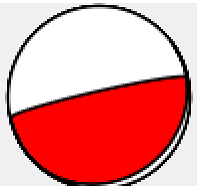
M	位置	深度
8.3	123.5E 6.5N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
PHILIPPINES	COTABUTO_CITY	2025-12-21 12:39:54	2.39	5.79	
PHILIPPINES	ZAMBOANGA	2025-12-21 13:02:23	2.54	4.23	
INDONESIA	MELONGUANE	2025-12-21 13:04:22	1.66	2.63	
PHILIPPINES	GENERAL_SANTOS	2025-12-21 12:53:38	0.84	2.3	
INDONESIA	MANADO	2025-12-21 13:20:32	0.75	2.16	
INDONESIA	TOLI-TOLI	2025-12-21 13:28:08	1.19	2.0	
INDONESIA	TARAKAN	2025-12-21 15:00:53	1.17	1.81	
INDONESIA	TABUKAN_TENGAH	2025-12-21 13:06:50	0.83	1.43	
INDONESIA	JAILOLO	2025-12-21 13:46:34	0.81	1.25	
MALAYSIA	LAHAD_DATU	2025-12-21 15:46:00	0.47	0.82	
INDONESIA	GORONTALO	2025-12-21 13:53:26	0.24	0.68	
MALAYSIA	SANDAKAN	2025-12-21 16:12:05	0.22	0.36	
PHILIPPINES	MAIMBUNG	2025-12-21 14:03:27	0.15	0.35	

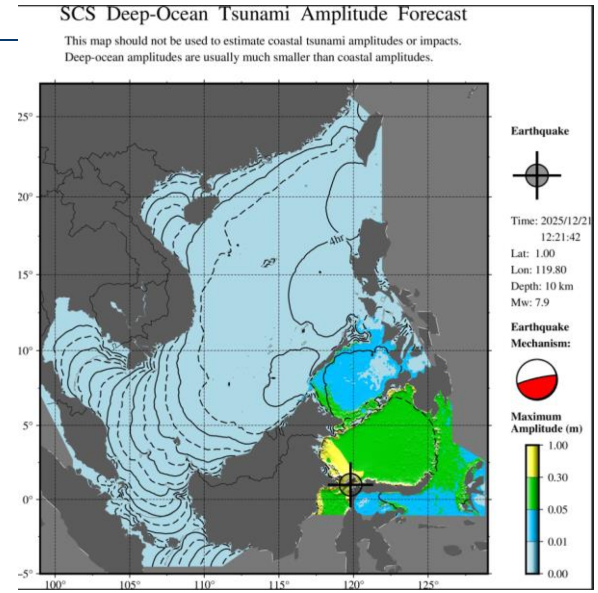


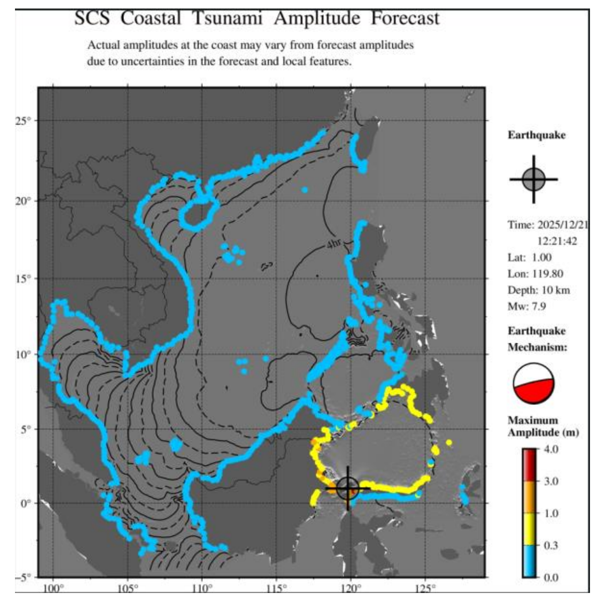


Sulawezi 1996

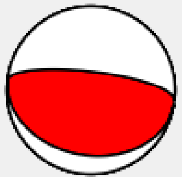
M		位置	深度
7.9		119.8E 1.0N	10.0km

INDONESIA	TOLI-TOLI	2025-12-21 12:44:38	0.44	0.74	
INDONESIA	TARAKAN	2025-12-21 14:27:28	0.47	0.72	
PHILIPPINES	ZAMBOANGA	2025-12-21 13:52:15	0.33	0.56	
PHILIPPINES	COTABUTO_CITY	2025-12-21 13:38:37	0.23	0.55	
INDONESIA	MELONGUANE	2025-12-21 13:39:39	0.31	0.48	
PHILIPPINES	GENERAL_SANTOS	2025-12-21 13:39:23	0.16	0.43	
INDONESIA	MANADO	2025-12-21 13:25:54	0.14	0.39	
INDONESIA	TABUKAN_TENGAH	2025-12-21 13:35:30	0.2	0.35	
MALAYSIA	LAHAD_DATU	2025-12-21 15:38:53	0.18	0.31	

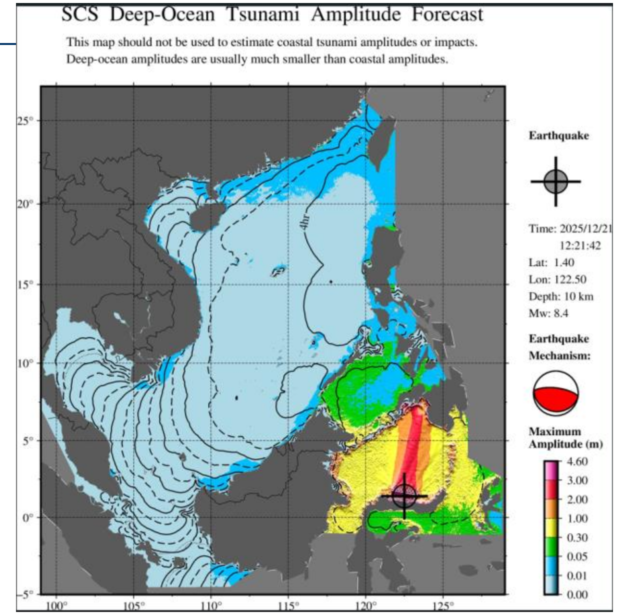


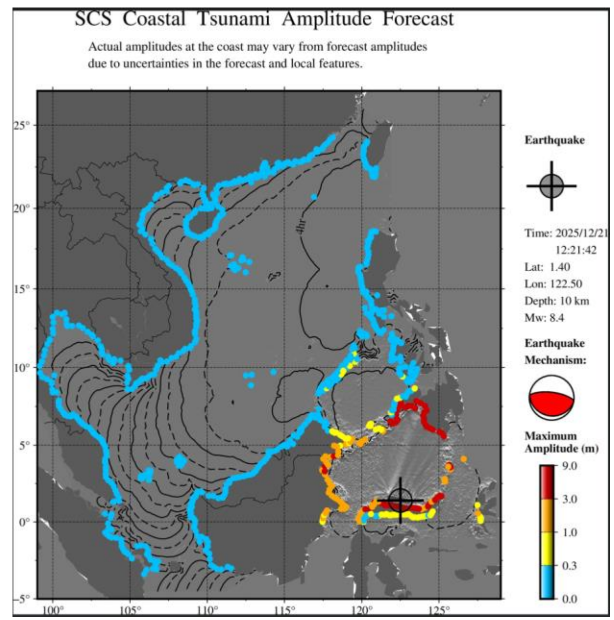


(Hypothetical) North Sulawezi

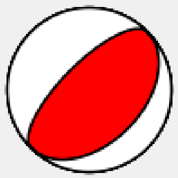
M		位置	深度
8.4		122.5E 1.4N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
PHILIPPINES	GENERAL_SANTOS	2025-12-21 13:20:04	2.09	5.75	
PHILIPPINES	COTABUTO_CITY	2025-12-21 13:24:25	1.81	4.39	
PHILIPPINES	ZAMBOANGA	2025-12-21 13:40:49	2.21	3.69	
INDONESIA	TARAKAN	2025-12-21 14:45:23	2.05	3.18	
INDONESIA	MANADO	2025-12-21 12:57:57	1.11	3.18	
INDONESIA	TOLI-TOLI	2025-12-21 13:01:07	1.54	2.59	
INDONESIA	MELONGUANE	2025-12-21 13:15:46	1.15	1.83	
INDONESIA	TABUKAN_TENGAH	2025-12-21 13:11:55	1.01	1.75	
MALAYSIA	LAHAD_DATU	2025-12-21 15:44:51	0.69	1.23	
INDONESIA	JAILOLO	2025-12-21 13:32:09	0.62	0.96	
INDONESIA	GORONTALO	2025-12-21 13:37:10	0.2	0.57	
MALAYSIA	SANDAKAN	2025-12-21 16:11:04	0.28	0.46	
PHILIPPINES	MAIMBUNG	2025-12-21 14:20:07	0.15	0.35	
PHILIPPINES	PUERTO_PRINCESA	2025-12-21 14:34:30	0.15	0.33	

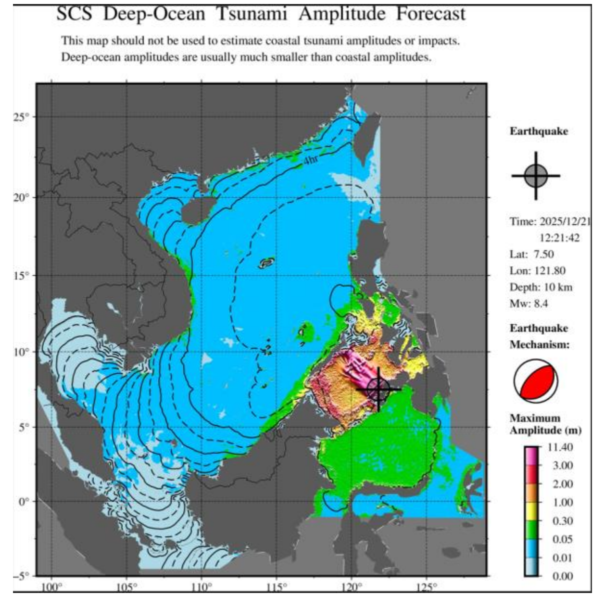


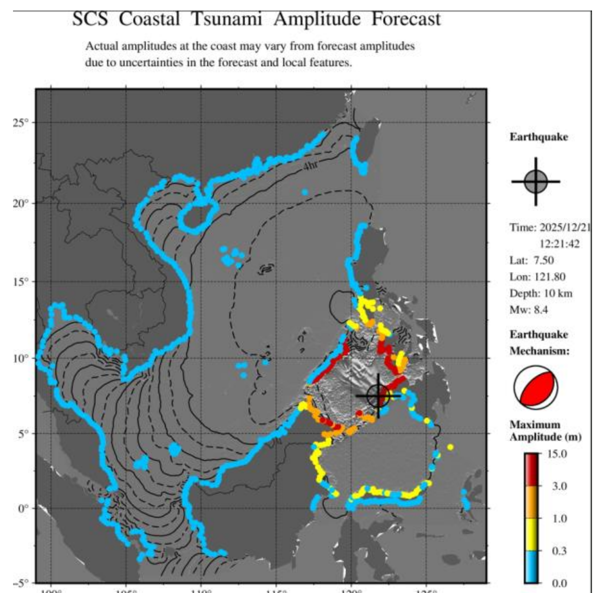


Sulu Islands 1897

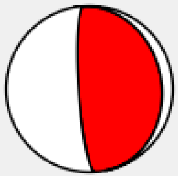
M		位置	深度
8.4		121.8E 7.5N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)
PHILIPPINES	PUERTO_PRINCESA	2025-12-21 13:15:26	2.42	5.32
PHILIPPINES	ILOILO	2025-12-21 13:09:14	1.73	4.12
MALAYSIA	SANDAKAN	2025-12-21 15:16:02	1.88	3.1
PHILIPPINES	MAIMBUNG	2025-12-21 13:34:27	0.69	1.6
MALAYSIA	LAHAD_DATU	2025-12-21 15:45:05	0.81	1.43
INDONESIA	TOLI-TOLI	2025-12-21 14:10:22	0.41	0.69
INDONESIA	TARAKAN	2025-12-21 15:28:35	0.35	0.55
INDONESIA	MELONGUANE	2025-12-21 14:31:51	0.24	0.38
MALAYSIA	KUDAT	2025-12-21 15:51:08	0.23	0.35
PHILIPPINES	ZAMBOANGA	2025-12-21 14:24:02	0.2	0.33

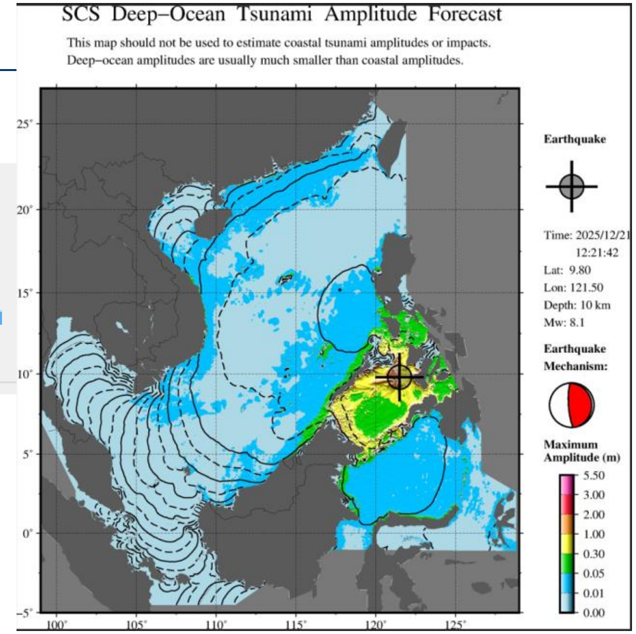


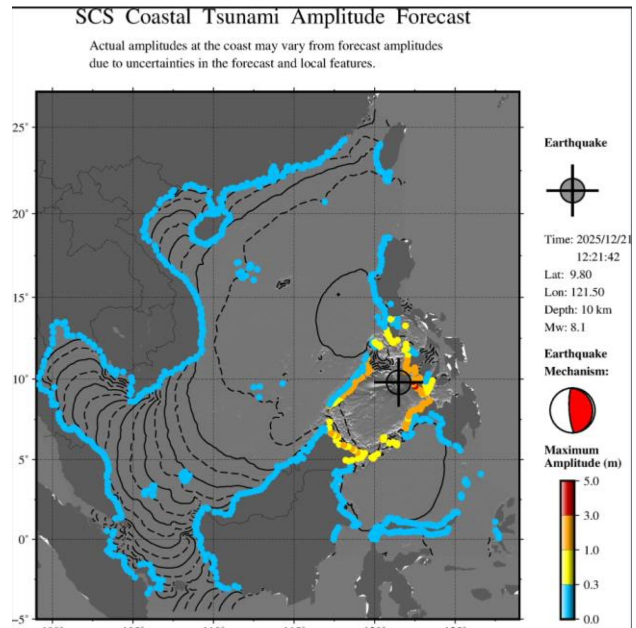


☐ (Hypothetical) West of Panay

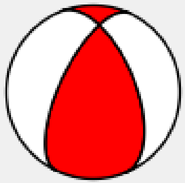
M		位置	深度
8.1		121.5E 9.8N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
PHILIPPINES	ILOILO	2025-12-21 12:51:52	0.75	1.79	
PHILIPPINES	PUERTO_PRINCESA	2025-12-21 13:14:01	0.66	1.44	
MALAYSIA	SANDAKAN	2025-12-21 15:28:31	0.61	1.01	
PHILIPPINES	MAIMBUNG	2025-12-21 13:50:07	0.19	0.44	
MALAYSIA	LAHAD_DATU	2025-12-21 16:00:16	0.19	0.33	

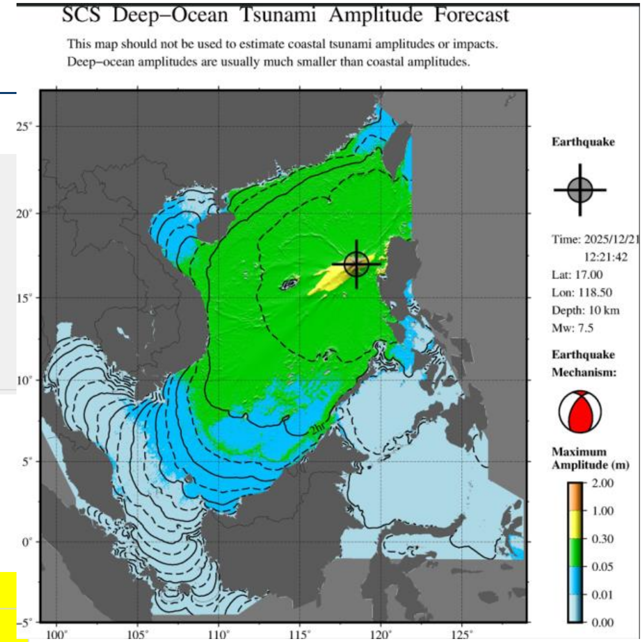


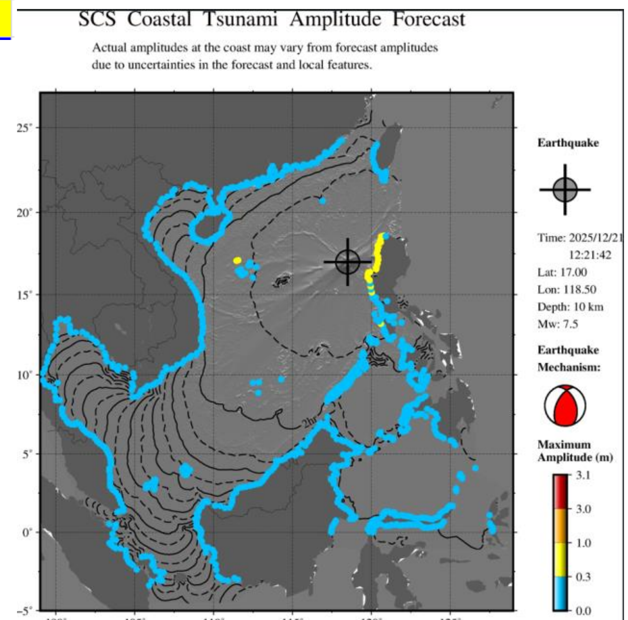


West of Luzon 1934

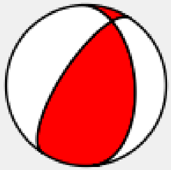
M		位置	深度
7.5		118.5E 17.0N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
PHILIPPINES	CURRIMAO	2025-12-21 12:47:27	0.32	0.65	
PHILIPPINES	SAN_FERNANDO	2025-12-21 12:51:21	0.42	0.63	
PHILIPPINES	LAOAG	2025-12-21 12:54:34	0.38	0.55	

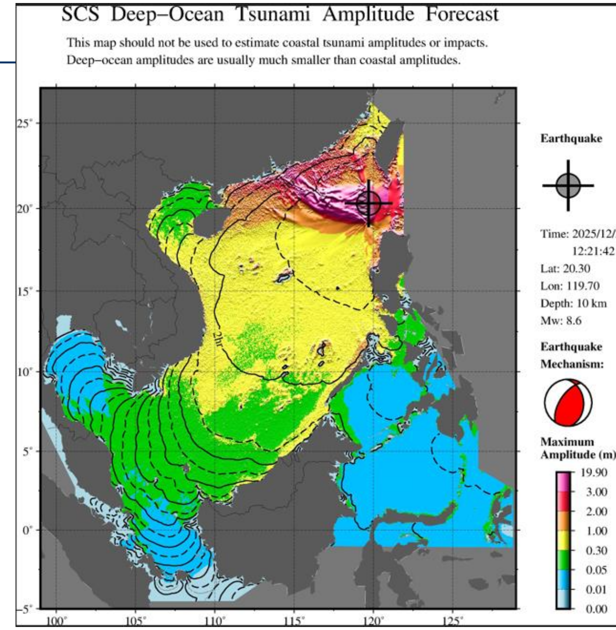


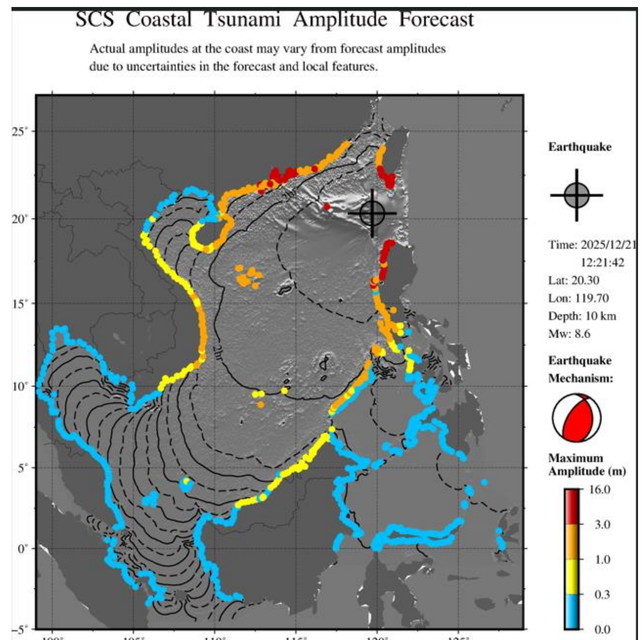


□ (Hypothetical) Luzon Strait

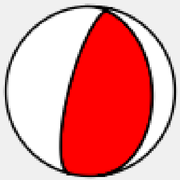
M		位置	深度
8.6		119.7E 20.3N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
CHINA	MACAO	2025-12-21 17:08:44	5.53	6.45	
CHINA	KAOHSIUNG	2025-12-21 12:56:38	2.28	4.25	
CHINA	SHENZHEN	2025-12-21 17:48:04	3.16	3.76	
PHILIPPINES	CURRIMAO	2025-12-21 12:51:53	1.79	3.69	
PHILIPPINES	SAN_FERNANDO	2025-12-21 13:11:27	2.15	3.25	
PHILIPPINES	LAOAG	2025-12-21 12:51:40	2.13	3.11	
CHINA	HONG_KONG	2025-12-21 16:43:45	2.25	2.45	
CHINA	SHANWEI	2025-12-21 15:02:46	2.14	2.44	
CHINA	ZHAPO	2025-12-21 16:38:28	2.13	2.4	
PHILIPPINES	SUBIC_BAY	2025-12-21 14:18:55	0.8	2.17	
PHILIPPINES	MANILA	2025-12-21 15:35:49	1.11	1.77	
CHINA	QINGLAN	2025-12-21 15:03:31	1.23	1.77	
PHILIPPINES	LUBANG	2025-12-21 13:43:15	0.61	1.64	
VIETNAM	QUI_NHON	2025-12-21 15:22:39	0.66	1.17	
VIETNAM	NHA_TRANG	2025-12-21 15:56:43	0.69	1.11	
VIETNAM	QUANG_NGAI	2025-12-21 15:29:15	0.64	0.98	
VIETNAM	DA_NANG	2025-12-21 15:54:39	0.64	0.92	
CHINA	SANYA	2025-12-21 15:14:13	0.64	0.84	
MALAYSIA	KUDAT	2025-12-21 16:14:59	0.42	0.65	
MALAYSIA	KOTA_KINABALU	2025-12-21 16:12:19	0.35	0.42	
BRUNEI	MUARA	2025-12-21 17:15:50	0.32	0.41	
VIETNAM	VINH	2025-12-21 19:55:50	0.28	0.39	
VIETNAM	VUNG_TAU	2025-12-21 18:32:50	0.28	0.32	
MALAYSIA	BINTULU	2025-12-21 18:25:32	0.27	0.31	

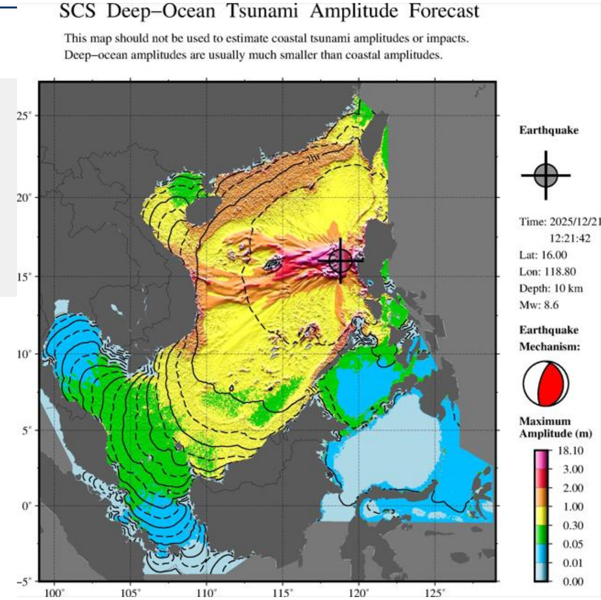


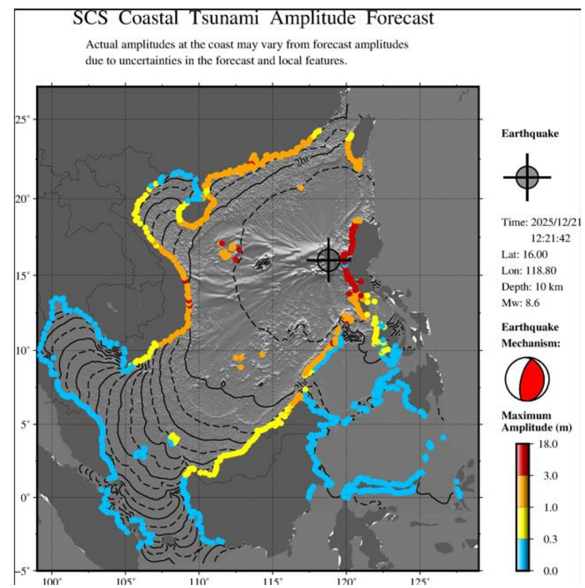


□ (Hypothetical) Luzon Trench

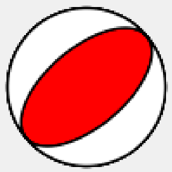
M		位置	深度
8.6		118.8E 16.0N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
PHILIPPINES	SAN_FERNANDO	2025-12-21 12:52:09	7.58	11.47	
PHILIPPINES	SUBIC_BAY	2025-12-21 13:39:51	1.87	5.07	
PHILIPPINES	MANILA	2025-12-21 14:56:45	2.83	4.5	
PHILIPPINES	LUBANG	2025-12-21 13:04:06	1.64	4.41	
PHILIPPINES	CURRIMAO	2025-12-21 12:51:59	1.89	3.91	
PHILIPPINES	LAOAG	2025-12-21 13:00:33	2.44	3.56	
CHINA	KAOHSIUNG	2025-12-21 13:38:03	1.71	3.19	
CHINA	MACAO	2025-12-21 17:13:42	2.57	3.0	
VIETNAM	QUI_NHON	2025-12-21 14:52:55	1.55	2.74	
VIETNAM	NHA_TRANG	2025-12-21 15:24:03	1.3	2.08	
CHINA	SHENZHEN	2025-12-21 17:53:02	1.74	2.07	
VIETNAM	QUANG_NGAI	2025-12-21 15:00:06	1.35	2.07	
CHINA	SHANWEI	2025-12-21 15:20:25	1.81	2.06	
CHINA	QINGLAN	2025-12-21 14:54:03	1.28	1.85	
CHINA	ZHAPO	2025-12-21 16:32:06	1.52	1.71	
VIETNAM	DA_NANG	2025-12-21 15:40:50	1.11	1.6	
CHINA	SANYA	2025-12-21 15:04:45	1.17	1.52	
CHINA	HONG_KONG	2025-12-21 16:49:39	1.33	1.45	
MALAYSIA	KUDAT	2025-12-21 15:35:38	0.81	1.25	
BRUNEI	MUARA	2025-12-21 16:36:29	0.64	0.82	
MALAYSIA	KOTA_KINABALU	2025-12-21 15:32:58	0.67	0.78	
VIETNAM	VUNG_TAU	2025-12-21 17:58:23	0.64	0.72	
VIETNAM	VINH	2025-12-21 19:46:23	0.4	0.55	
MALAYSIA	BINTULU	2025-12-21 17:46:14	0.42	0.48	
INDONESIA	KEPULAUAN_RIAU	2025-12-21 17:09:18	0.34	0.43	
VIETNAM	BAC_LIEU	2025-12-21 21:49:12	0.37	0.42	

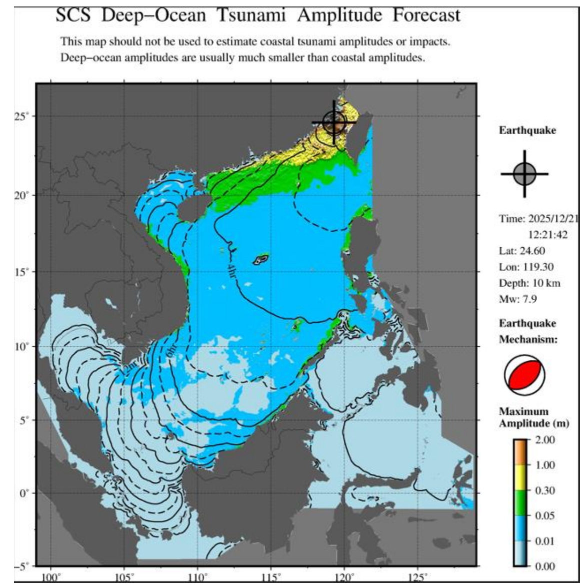


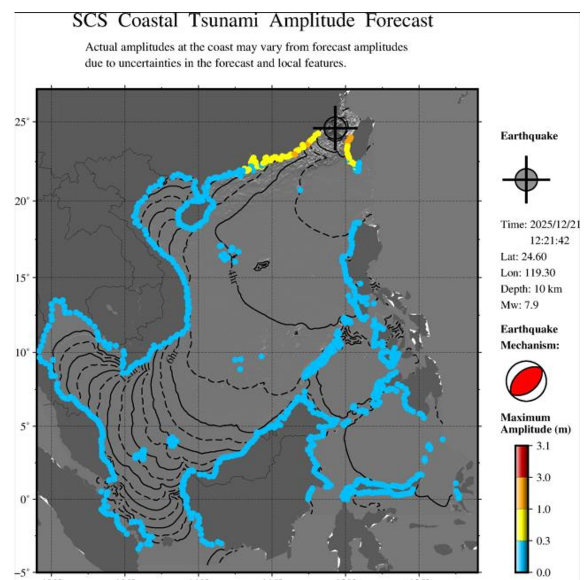


Taiwan Strait inspired by 1604

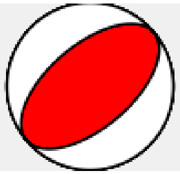
M		位置	深度
7.9		119.3E 24.6N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
CHINA	SHENZHEN	2025-12-21 20:14:30	0.51	0.61	
CHINA	SHANWEI	2025-12-21 17:15:22	0.46	0.53	
CHINA	HONG_KONG	2025-12-21 19:07:34	0.45	0.49	
CHINA	KAOHSIUNG	2025-12-21 14:42:33	0.2	0.37	

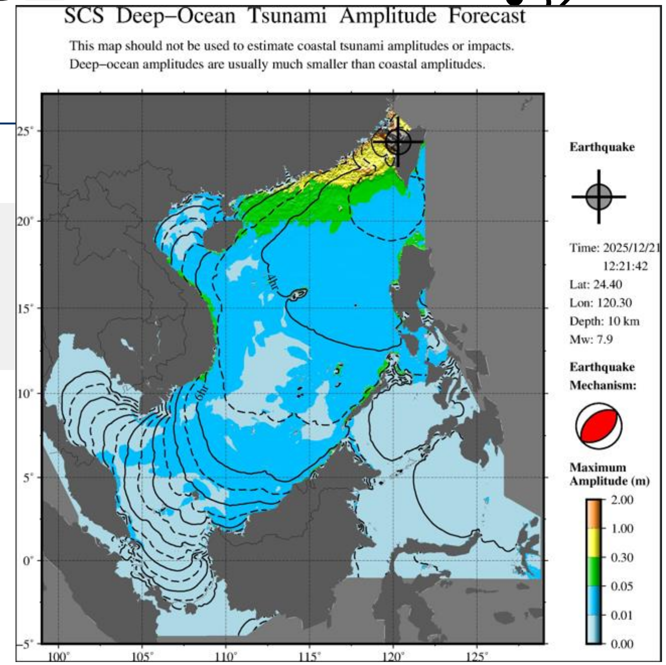


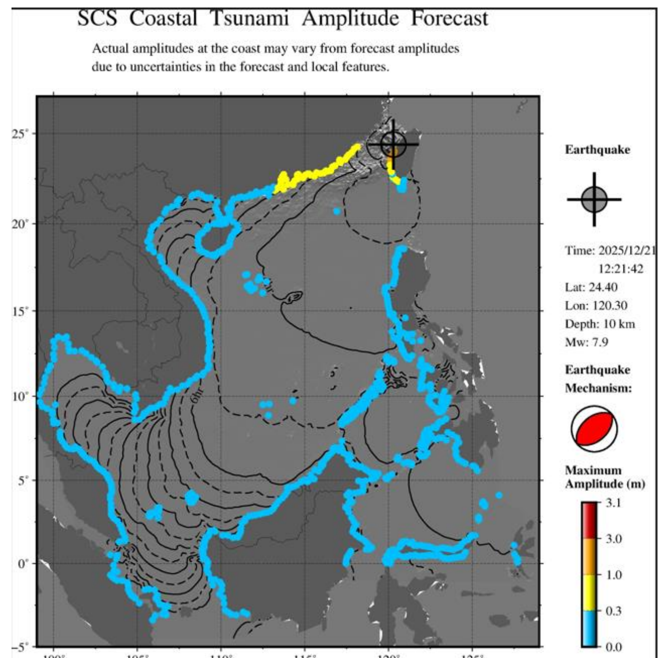


Taiwan Strait inspired by 1782

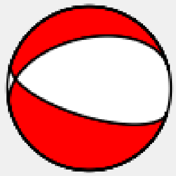
M		位置	深度
7.9		120.3E 24.4N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
CHINA	SHANWEI	2025-12-21 17:24:03	0.55	0.62	
CHINA	MACAO	2025-12-21 19:43:52	0.41	0.48	
CHINA	SHENZHEN	2025-12-21 20:23:11	0.39	0.47	
CHINA	HONG_KONG	2025-12-21 19:16:16	0.31	0.33	

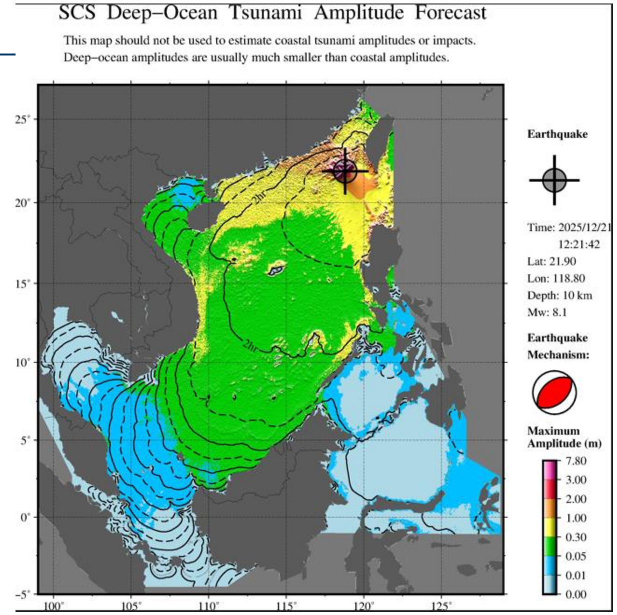


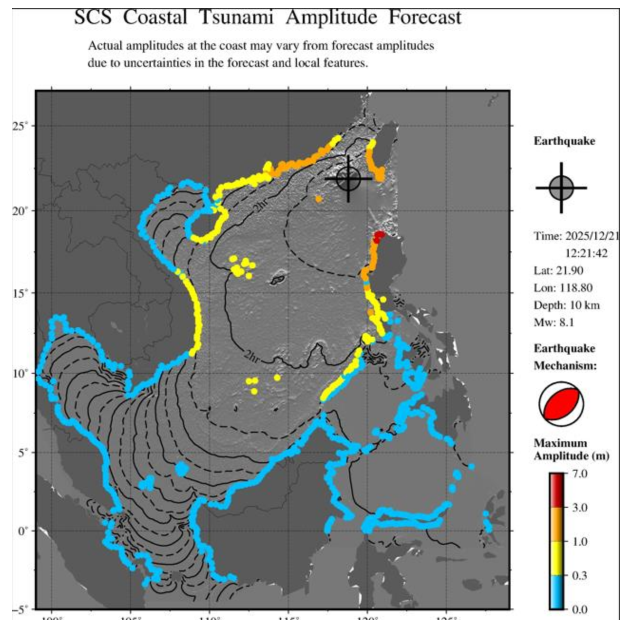


Taiwan Strait inspired by 1661

M		位置	深度
8.1		118.8E 21.9N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
PHILIPPINES	LAOAG	2025-12-21 13:11:56	2.33	3.4	
CHINA	KAOHSIUNG	2025-12-21 12:50:17	1.53	2.85	
PHILIPPINES	CURRIMAO	2025-12-21 13:12:03	1.14	2.35	
PHILIPPINES	SAN_FERNANDO	2025-12-21 13:30:59	1.11	1.68	
CHINA	SHENZHEN	2025-12-21 17:54:16	1.03	1.23	
CHINA	SHANWEI	2025-12-21 14:53:00	1.04	1.19	
CHINA	MACAO	2025-12-21 17:14:57	0.99	1.16	
CHINA	HONG_KONG	2025-12-21 16:45:21	0.94	1.02	
PHILIPPINES	LUBANG	2025-12-21 14:02:01	0.37	1.01	
PHILIPPINES	SUBIC_BAY	2025-12-21 14:37:41	0.33	0.89	
PHILIPPINES	MANILA	2025-12-21 15:54:35	0.48	0.76	
CHINA	ZHAPO	2025-12-21 16:46:55	0.54	0.6	
VIETNAM	QUI_NHON	2025-12-21 15:34:52	0.31	0.55	
VIETNAM	QUANG_NGAI	2025-12-21 15:40:56	0.33	0.51	
CHINA	QINGLAN	2025-12-21 15:12:30	0.32	0.47	
VIETNAM	NHA_TRANG	2025-12-21 16:09:03	0.28	0.44	
CHINA	SANYA	2025-12-21 15:23:12	0.26	0.33	
VIETNAM	DA_NANG	2025-12-21 16:03:38	0.22	0.32	





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https://doi.org/10.5194/nhess-19-1565-2019

Natural Hazards
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Revised earthquake sources along Manila trench for tsunami hazard assessment in the South China Sea

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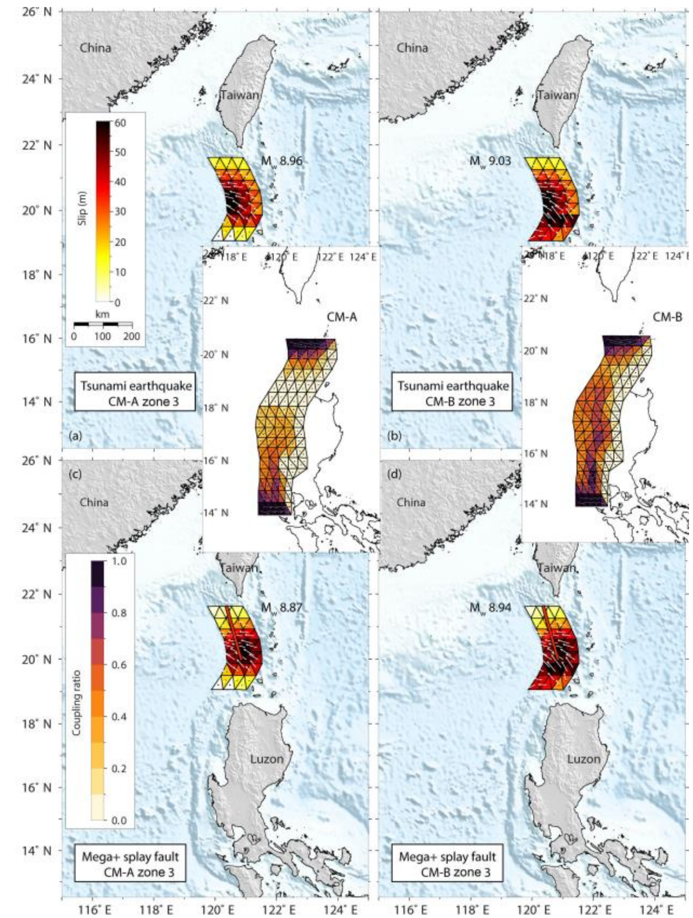
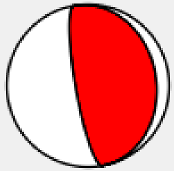
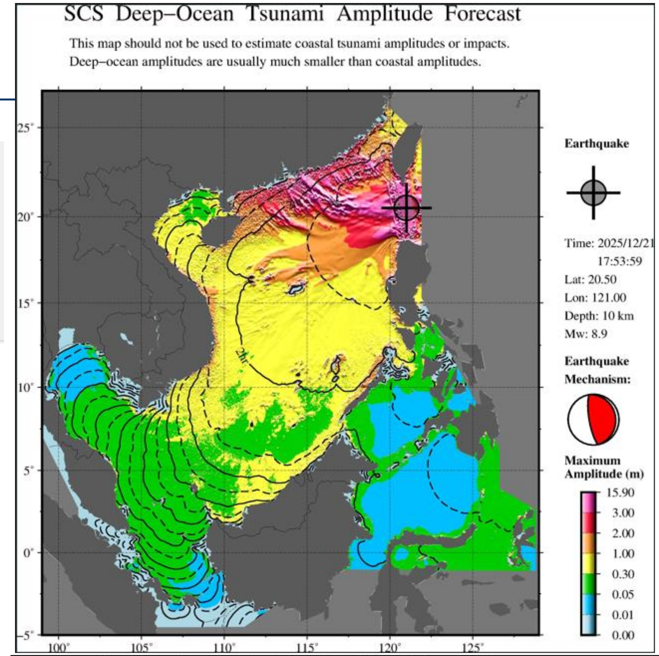
[5]Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan
[6]Department of Geosciences, National Taiwan University, Taipei, Taiwan
[7]Earth Observatory of Singapore, Nanyang Technological University, Singapore

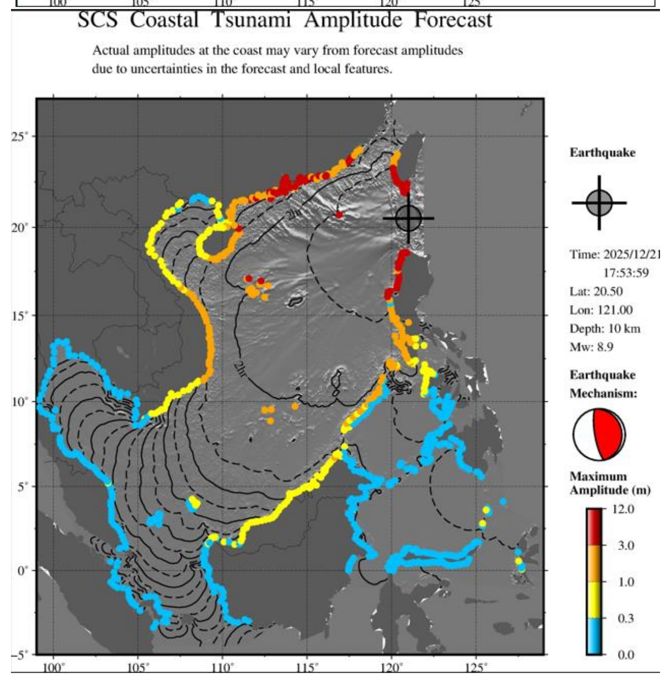


Based on the seismic parameters used in this paper, COMCOT model was run by HKO and the simulation results are presented in the following.

M		位置	深度
8.9		121.0E 20.5N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)
CHINA	MACAO	2025-12-21 22:53:33	5.63	6.57
CHINA	SHENZHEN	2025-12-21 23:32:53	4.25	5.05
CHINA	KAOHSIUNG	2025-12-21 18:31:35	2.55	4.75
PHILIPPINES	CURRIMAO	2025-12-21 18:29:41	1.8	3.72
PHILIPPINES	LAOAG	2025-12-21 18:28:02	2.55	3.72
PHILIPPINES	SAN_FERNANDO	2025-12-21 18:50:18	2.34	3.54
CHINA	HONG_KONG	2025-12-21 22:28:34	2.7	2.95
CHINA	SHANWEI	2025-12-21 20:46:55	2.49	2.85
CHINA	ZHAPO	2025-12-21 22:22:27	2.38	2.68
PHILIPPINES	MANILA	2025-12-21 21:15:13	1.45	2.31
CHINA	QINGLAN	2025-12-21 20:47:30	1.42	2.05
PHILIPPINES	LUBANG	2025-12-21 19:22:39	0.74	1.99
PHILIPPINES	SUBIC_BAY	2025-12-21 19:58:19	0.65	1.77
VIETNAM	QUI_NHON	2025-12-21 21:04:25	0.87	1.54
VIETNAM	QUANG_NGAI	2025-12-21 21:11:01	0.98	1.51
VIETNAM	NHA_TRANG	2025-12-21 21:38:02	0.92	1.47
CHINA	SANYA	2025-12-21 20:58:12	0.95	1.24
VIETNAM	DA_NANG	2025-12-21 21:38:38	0.75	1.08
MALAYSIA	KUDAT	2025-12-21 21:54:43	0.62	0.96
BRUNEI	MUARA	2025-12-21 22:55:34	0.6	0.77
MALAYSIA	KOTA_KINABALU	2025-12-21 21:52:03	0.55	0.65
VIETNAM	VINH	2025-12-22 01:39:49	0.42	0.59
VIETNAM	VUNG_TAU	2025-12-22 00:13:59	0.48	0.54
MALAYSIA	BINTULU	2025-12-22 00:05:15	0.35	0.41
VIETNAM	BAC_LIEU	2025-12-22 04:04:48	0.34	0.38
INDONESIA	KEPULAUAN_RIAU	2025-12-21 23:26:05	0.31	0.38
INDONESIA	TABUKAN_TENGAH	2025-12-21 20:43:40	0.18	0.3





Littoral Fault Zone

- Research suggested a maximum of around M7.5

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High-resolution tsunami hazard assessment for the Guangdong-Hong Kong-Macao Greater Bay Area based on a non-hydrostatic tsunami model

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Based on the seismic parameters used in this paper, COMCOT model was run by HKO and the simulation results are presented in the following.

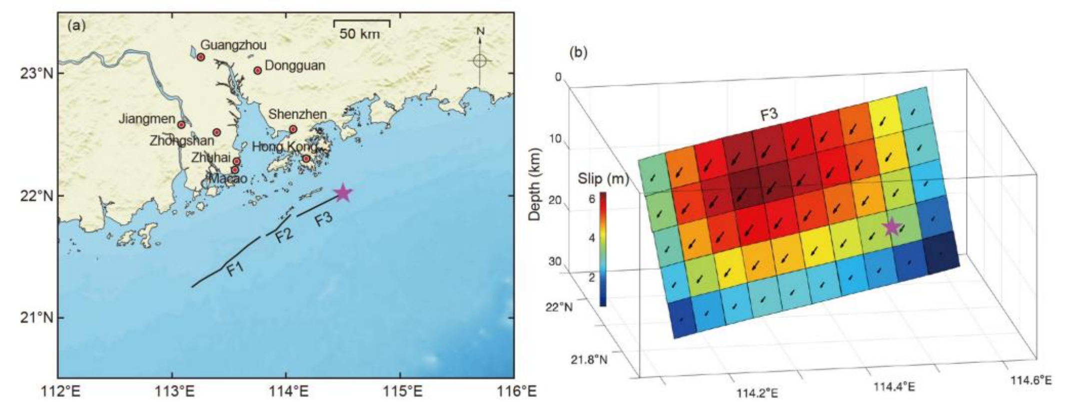
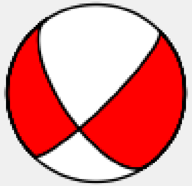
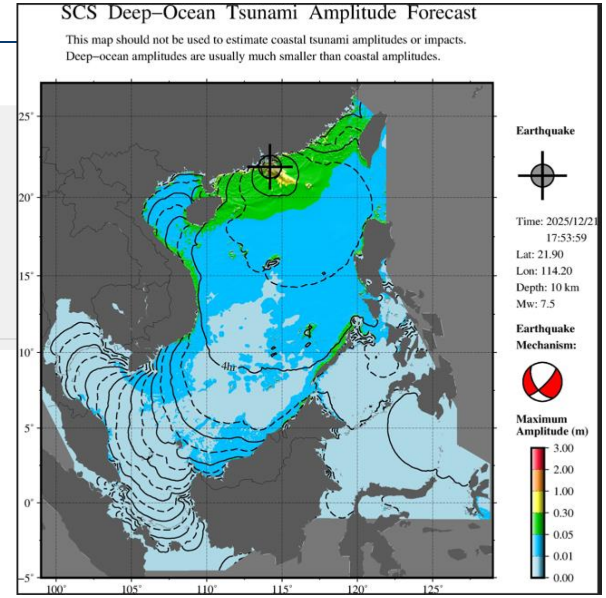
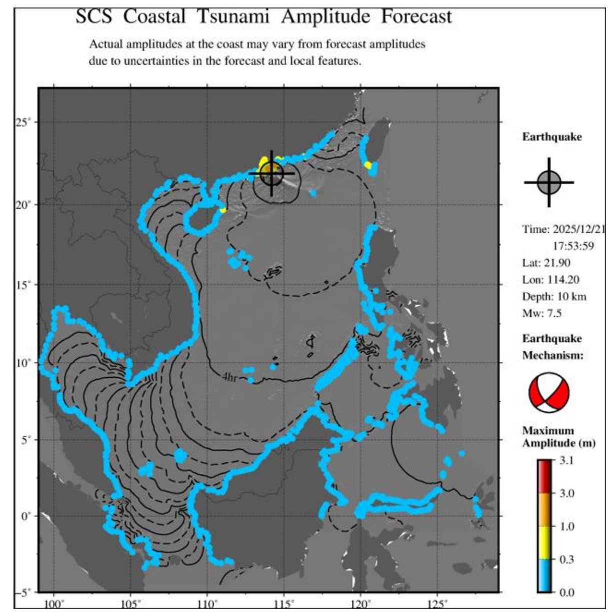


Figure 7 Representative earthquake source model for the LFZ off the PRE. (a) Fault lines of the LFZ off the PRE. (b) M_w7.5 finite-fault model obtained through dynamic rupture simulation. Arrows represent the vectors of coseismic slip, and magenta star indicates the location of nucleation. As rupture is limited to the easternmost F3 segment, only the slip distribution in this segment is displayed here.

M		位置	深度
7.5		114.2E 21.9N	10.0km

		Expected arrival time	Max amplitude (m)	Max amplitude after Green's transformation (m)	
CHINA	HONG_KONG	2025-12-21 19:33:06	0.66	0.73	
CHINA	MACAO	2025-12-21 20:00:34	0.54	0.64	
CHINA	SHENZHEN	2025-12-21 20:36:55	0.28	0.33	





Concluding Remarks

- South China Sea region is a zone with complicated geological structure and active seismotectonics as places of meeting and crossing by seismic active fault systems.

- Depending on geological structure, the seismicity of the SCS region is characterised by having moderate to strong earthquakes, with active seismicity in Taiwan, central Manila Trench, Cotabato Trench and North Sulawesi Trench.

- According to the focal mechanisms of historical seismic events, north and south-central of Manila, central of Cotabato Trench and North Sulawesi Trench are of thrust fault type, which are potential sources of significant tsunamigenic earthquakes.

- Risk assessment of tsunamis caused by non-seismic sources such as submarine landslides and volcanic eruptions in the SCS region still requires further substantial research.

- A comprehensive review of the latest advancements in the prediction of tsunamis from different sources, as well as information sharing and knowledge exchanges among Member States can contribute to the sustainable development of Tsunami Ready in the SCS region.

Thank You