Thirty-first Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXXI), Beijing, China, 07-11 April 2025

Report on the South China Sea Tsunami Advisory Center (SCSTAC)

Presenter: WANG, Zongchen

National Marine Environmental Forecasting Center, MNR of CHINA

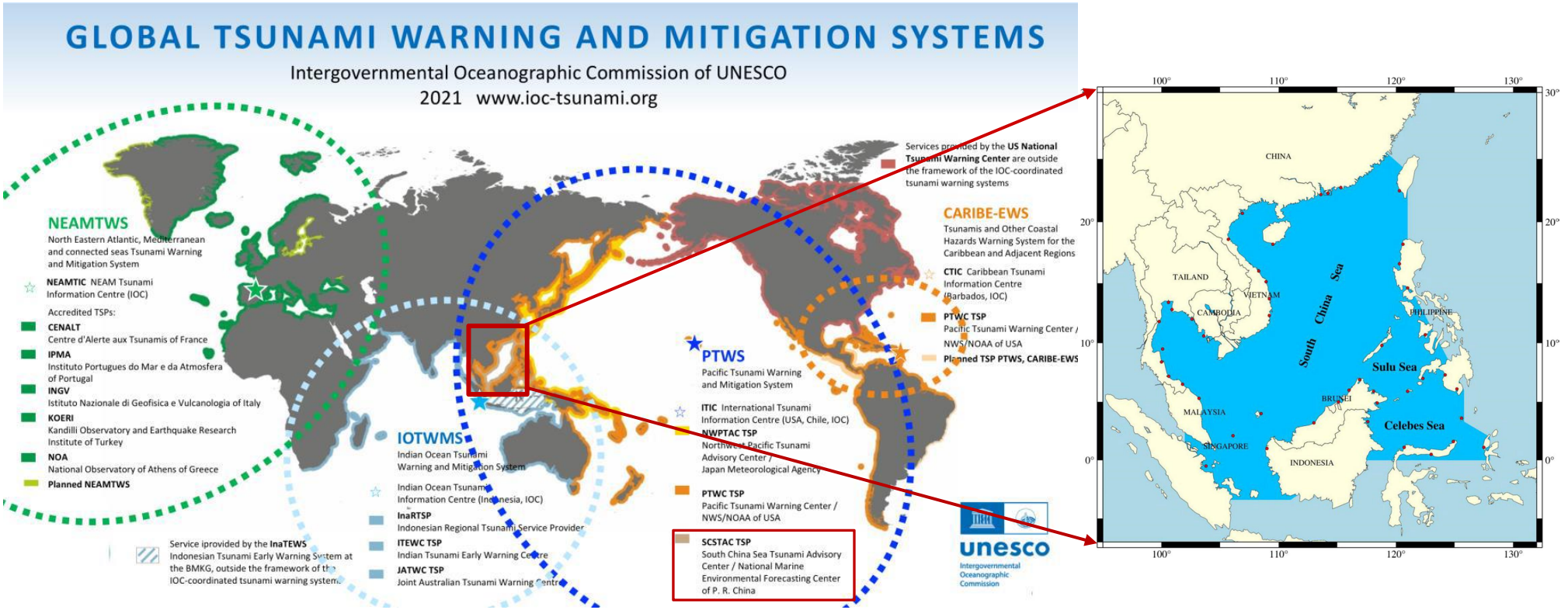
South China Sea Tsunami Advisory Center, UNESCO/IOC

Outline

1. Operation of SCSTAC
2. Key Performance Indicators
3. Activities on Capacity Building
4. Further Plans

Full Operation of SCSTAC

The South China Sea Tsunami Advisory Center has been in full operation since 5 November 2019.



The Area of Service (AoS) for the SCSTAC specified by ICG/PTWS embraces all coasts of the South China Sea, and the adjacent Sulu Sea and Celebes Sea, separated by Palawan and Sulu Archipelago from north to south respectively. Nine Member States of the SCS region include **Brunei, Cambodia, China, Indonesia, Malaysia, The Philippines, Singapore, Thailand, and Vietnam** (in alphabetic order).

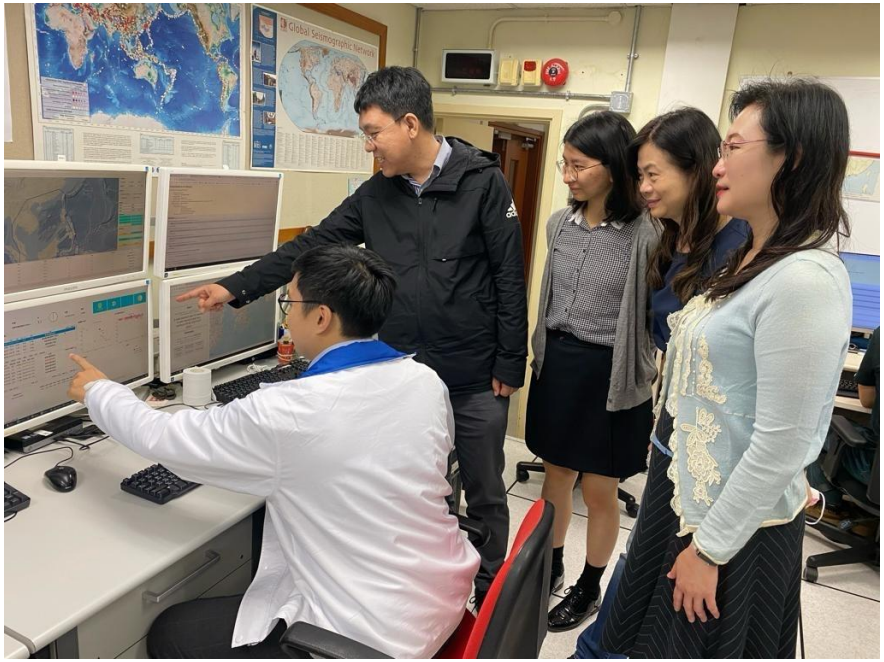
http://scstac.oceanguide.org.cn

Entity of SCSTAC

The South China Sea Tsunami Advisory Center is supported by the National Marine Environmental Forecasting Center/National Tsunami Warning Center of China, located at 8 Dahuisi Road, Haidian District, Beijing. A new operation platform was launched in February 2025. 13 staffs are mandated to do tsunami watch according to the schedule with a 12-hour shift.

Entity of BSCSTAC (Hong Kong)

The Backup South China Sea Tsunami Advisory Center (Hong Kong) (BSCSTAC), operated by the Hong Kong Observatory, was officially put into operation on 29 March 2023, after a year of trial operation. BSCSTAC is on hot standby mode and ready to support SCSTAC in providing tsunami advisory products for the South China Sea region as and when necessary. It undergoes scheduled operation every year for a period as agreed with SCSTAC at least three months before the operation.



Scheduled Operation of BSCSTAC (Hong Kong)

- On 11-22 December 2023 and 9-20 December 2024, BSCSTAC (Hong Kong) took over from the main centre in Beijing for scheduled activation.
- Communication test was performed before scheduled activation. Switchover messages were issued respectively by BSCSTAC upon commencement and by SCSTAC at the end of scheduled activation.
- During scheduled operation, five watchstanders from the Hong Kong Observatory are deployed to perform round-the-clock 12-hour shifts, ensuring seamless and continuous operation.
- No event triggered BSCSTAC to issue tsunami bulletins during scheduled activation in 2023 and 2024.

WESS31 VHHH 090200

ISSUED BY BACKUP SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (HONG KONG) (BSCSTAC) AT 0200 UTC DEC 09 2024.

THIS IS FOR INFORMATION ONLY THAT THE BACKUP SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (HONG KONG) (BSCSTAC) WILL OPERATE STARTING FROM 0200 UTC DEC 09 2024 TO 0200 UTC DEC 20 2024 INCLUSIVE IN PLACE OF THE SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC).

IN CASE OF QUESTIONS, PLEASE CONTACT SCSTAC (EMAIL: TSU@NMEFC.CN) OR BSCSTAC (EMAIL: INFO-BSCSTAC@HKO.GOV.HK).

SOPs for Tsunami Warning at SCSTAC

Magnitude(*M*w)	Tsunami Potential Description
6.0 ≤ M_w ≤ 7.0	There is no tsunami threat from this earthquake
7.1 ≤ M_w ≤ 7.5	Possibility of a destructive local tsunami confined to 100-300 km of the epicenter
M_w ≥ 7.6	Possibility of a destructive basin-wide tsunami

Bulletin type		Criteria	Content	Timeline
Tsunami Information	Only one bulletin	Mag. of 6.0-6.4; or on land; or depth ≥ 100km	EQ parameters and statement of 'No tsunami threat'	8-10 min
	Only one bulletin unless minor waves observed and should be reported	Mag. of 6.5-7.0	EQ parameters and statement of 'No tsunami threat'	8-10 min
Tsunami Threat Message	Bulletin with quantitative forecast	7.1 and above	EQ parameters and quantitative forecasts on threat level and Estimated Time of Arrival (ETA)	8-15 min
	Supplementary with observations		EQ parameters, quantitative forecast and tidal gauge observations	If revision on EQ & tsunami forecasts, or observation available
	Final bulletin		Statement of 'No tsunami confirmed or threat passed'	hazardous waves have passed or no significant tsunami observations

Tsunami Messages（January 2023 - March 2025）

SCSTAC responded and distributed messages for a total of 16 events.

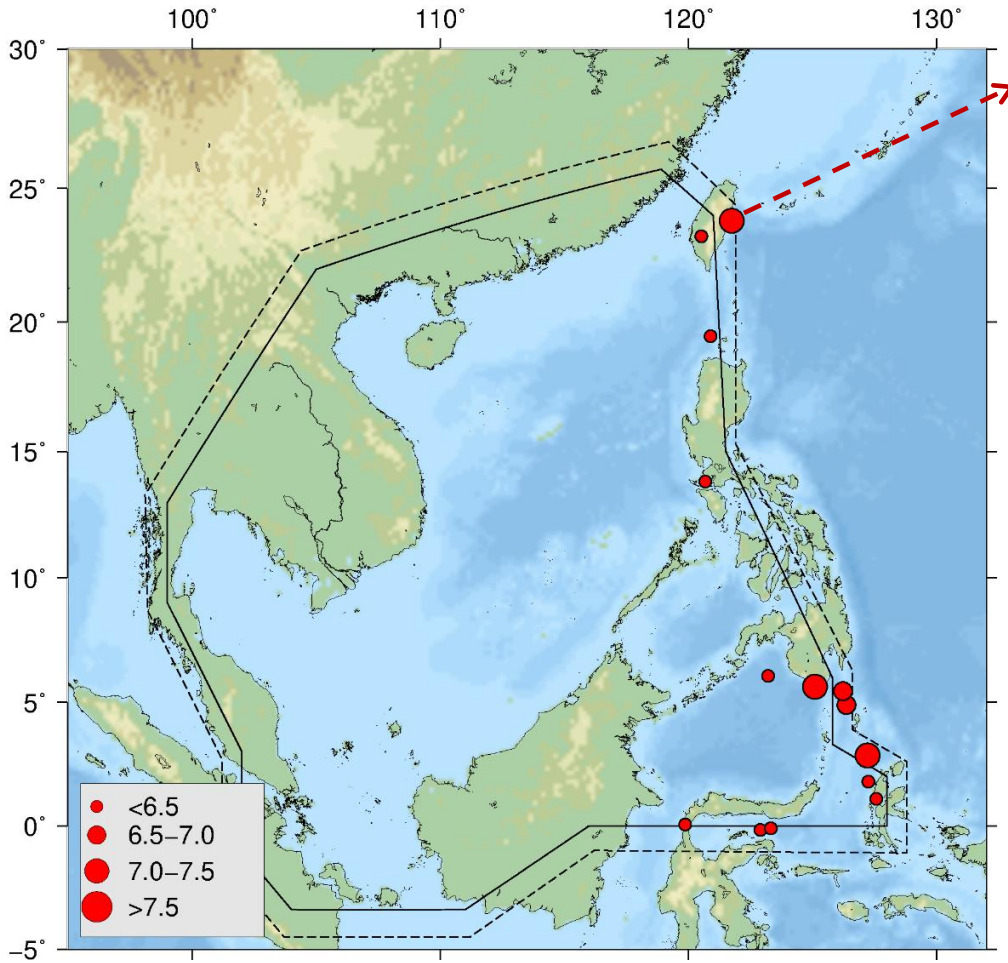
Two threat messages issued for

- **Magnitude 7.3, TAIWAN, CHINA , 2 April 2024**
- **Magnitude 7.0, MINDANAO, THE PHILIPPINES, 17 November 2023**

No	Mag	Origin Time (UTC)	Depth (km)	Lon (°)	Lat (°)	Location	Message
1	6.1	2025/1/20 16:17	15	120.52°E	23.23°N	TAIWAN, CHINA	Detail..
2	6.1	2024/9/23 19:51	140	122.9°E	0.17°S	MINAHASSA PENINSULA, SULAWESI	Detail..
3	6.3	2024/7/11 2:13	613	123.21°E	6.06°N	MINDANAO, PHILIPPINES	Detail..
4	6.1	2024/4/22 18:26	15	121.63°E	23.72°N	TAIWAN, CHINA	Detail..
5	6.6	2024/4/9 9:48	15	127.2°E	2.82°N	NORTHERN MOLUCCA SEA	Detail..
6	7.3	2024/4/2 23:58	12	121.74°E	23.81°N	TAIWAN, CHINA	Detail..
7	6.7	2024/1/8 20:48	102	126.37°E	4.89°N	TALAUD ISLANDS, INDONESIA	Detail..
8	6	2023/11/22 2:48	112	127.25°E	1.79°N	HALMAHERA, INDONESIA	Detail..
9	7	2023/11/17 8:14	80	125.1°E	5.63°N	MINDANAO, PHILIPPINES	Detail..
10	6.5	2023/10/4 11:21	131	126.23°E	5.45°N	MINDANAO, PHILIPPINES	Detail..
11	6.4	2023/9/12 11:03	10	120.89°E	19.46°N	PHILIPPINE ISLANDS REGION	Detail..
12	6.1	2023/9/11 12:51	157	127.57°E	1.09°N	HALMAHERA, INDONESIA	Detail..
13	6.1	2023/9/9 14:43	15	119.87°E	0.05°N	MINAHASSA PENINSULA, SULAWESI	Detail..
14	6.3	2023/6/15 2:19	119	120.68°E	13.82°N	MINDORO, PHILIPPINES	Detail..
15	7	2023/1/18 6:06	60	127.22°E	2.85°N	NORTHERN MOLUCCA SEA	Detail..
16	6.2	2023/1/18 0:34	140	123.32°E	0.10°S	MINAHASSA PENINSULA, SULAWESI	Detail..

http://scstac.oceanguide.org.cn/index.htm?opType=indexMore

Magnitude 7.3, TAIWAN, CHINA , 2 April 2024



Tsunami messages issued by SCSTAC from Jan. 2023 to March 2025

Timeline for tsunami warning operation:

2024-04-02
23:58 EQ occured in Hualien City;

2024-04-03
00:00 EQ detection system **trigerred**;

00:03 Watchstander **determined** the preliminary eq. parameters with ***M*w 7.5 (transformed from *M*wp)**;

00:05 **Tsunami forecast** was implemented;

00:08 Tsunami threat message was made based on the forecast results;

00:10 SCSTAC **Issued 1st** threat message

03:32 SCSTAC **Issued 2st(Final)** information message(*M*w revised to 7.3)

Magnitude 7.3, TAIWAN, CHINA , 2 April 2024

WESS21 BABJ 030011

TSUNAMI BULLETIN NUMBER 1
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED 0010 UTC Apr 03 2024

1st threat message

...POTENTIAL TSUNAMI THREAT EXISTS FOR PHILIPPINES...

**** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE ****
THIS STATEMENT IS ISSUED FOR INFORMATION ONLY IN SUPPORT OF THE UNESCO/IOC SOUTH CHINA SEA SUB-REGIONAL TSUNAMI WARNING AND MITIGATION SYSTEM. NATIONAL AUTHORITIES WILL BE RESPONSIBLE FOR DETERMINATION OF THE APPROPRIATE LEVEL OF ALERT FOR EACH COUNTRY. THE PUBLIC SHOULD FOLLOW THE GUIDANCE OF NATIONAL AUTHORITIES.
**** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE ****

[PRELIMINARY EARTHQUAKE PARAMETERS]
*MAGNITUDE 7.5
*ORIGIN TIME 2358 UTC Apr 02 2024
*COORDINATES 23.85 N,121.6 E
*DEPTH 9 KM
*LOCATION TAIWAN CHINA

[EVALUATION]
THERE IS A POSSIBILITY OF A DESTRUCTIVE LOCAL TSUNAMI CONFINED TO 100-300 KM OF THE EPICENTER BASED ON AVAILABLE INFORMATION.

[TSUNAMI AMPLITUDE AND ETA FORECASTS]

FORECAST POINT	COORDINATES	ETA(UTC)	MAX. AMPL
PHILIPPINES			
SAN_FERNANDO	120.3, 16.6	0131	0-0.3M

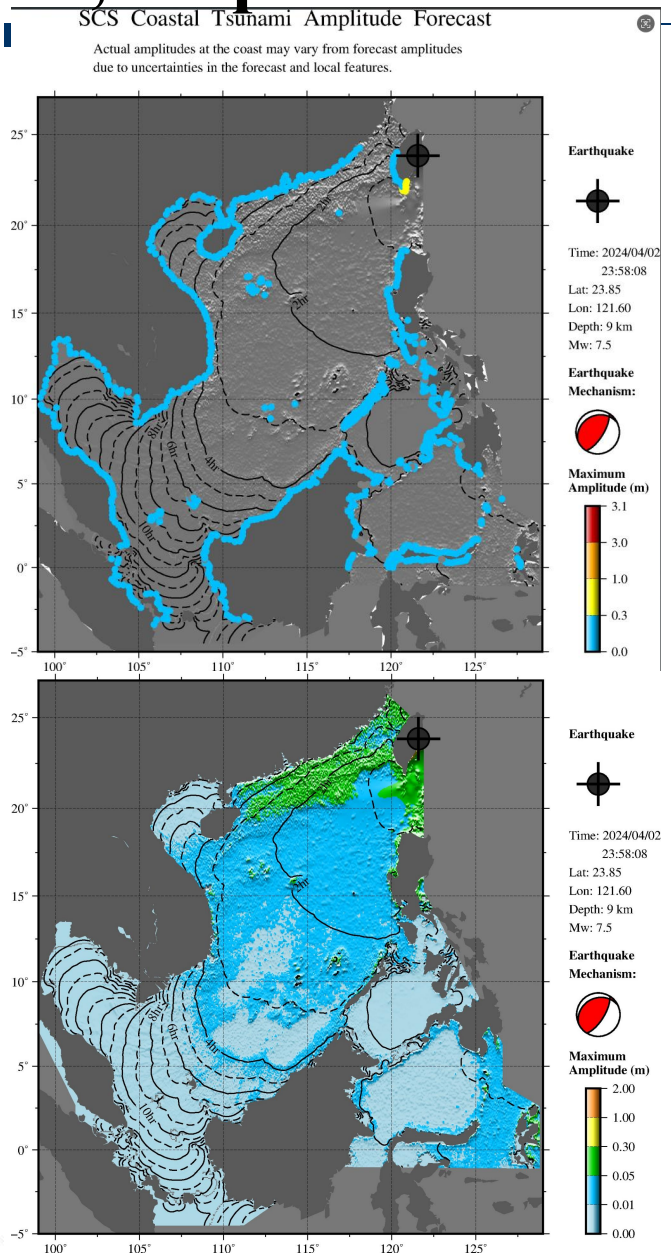
* THIS LIST IS GROUPED BY COUNTRIES, AND COUNTRY NAMES ARE ORDERED ACCORDING TO THREAT LEVELS.
* ETA - ESTIMATED TIME OF ARRIVAL OF THE INITIAL TSUNAMI WAVE. NOTING THAT IN SOME COASTAL AREAS TSUNAMI WAVES MAY ARRIVE EARLIER THAN OUR ESTIMATE DUE TO COARSE BATHYMETRY USED BY MODEL.
* MAX. AMPL - MAXIMUM WAVE HEIGHT RELATIVE TO NORMAL SEA LEVEL EXTRACTED FROM MODEL RESULTS AND GROUPED INTO FOUR BINS OF <0.3 M, 0.3 TO 1 M, 1 TO 3 M and ABOVE 3 M. NOTING THAT THE INITIAL WAVE MAY NOT NECESSARILY BE THE LARGEST, AND WAVE ACTIVITIES MAY VARY SIGNIFICANTLY ALONG COASTS DUE TO LOCAL FEATURES.

[RECOMMENDED ACTIONS]
* LOCAL AUTHORITIES SHOULD PAY CLOSE ATTENTION TO THE EVALUATION OF THEIR NATIONAL TSUNAMI WARNING CENTERS ON TSUNAMI HAZARD, AND TAKE APPROPRIATE ACTIONS IN RESPONSE TO THIS POTENTIAL HAZARD.
* PERSONS LOCATED IN THREATENED COASTAL AREAS SHOULD KEEP ALERT FOR WARNING INFORMATION AND FOLLOW INSTRUCTIONS FROM LOCAL AUTHORITIES.

[UPDATES]
THE NEXT BULLETIN WILL BE ISSUED AS MORE INFORMATION BECOMES AVAILABLE.

[ADDITIONAL INFORMATION]
* MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE SCSTAC.OCEANGUIDE.ORG.CN OR BSCSTAC.HKO.GOV.HK
* TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.
* TEL: +86-10-62104561
* EMAIL: TSU@NMEFC.CN

END OF BULLETIN



Outline

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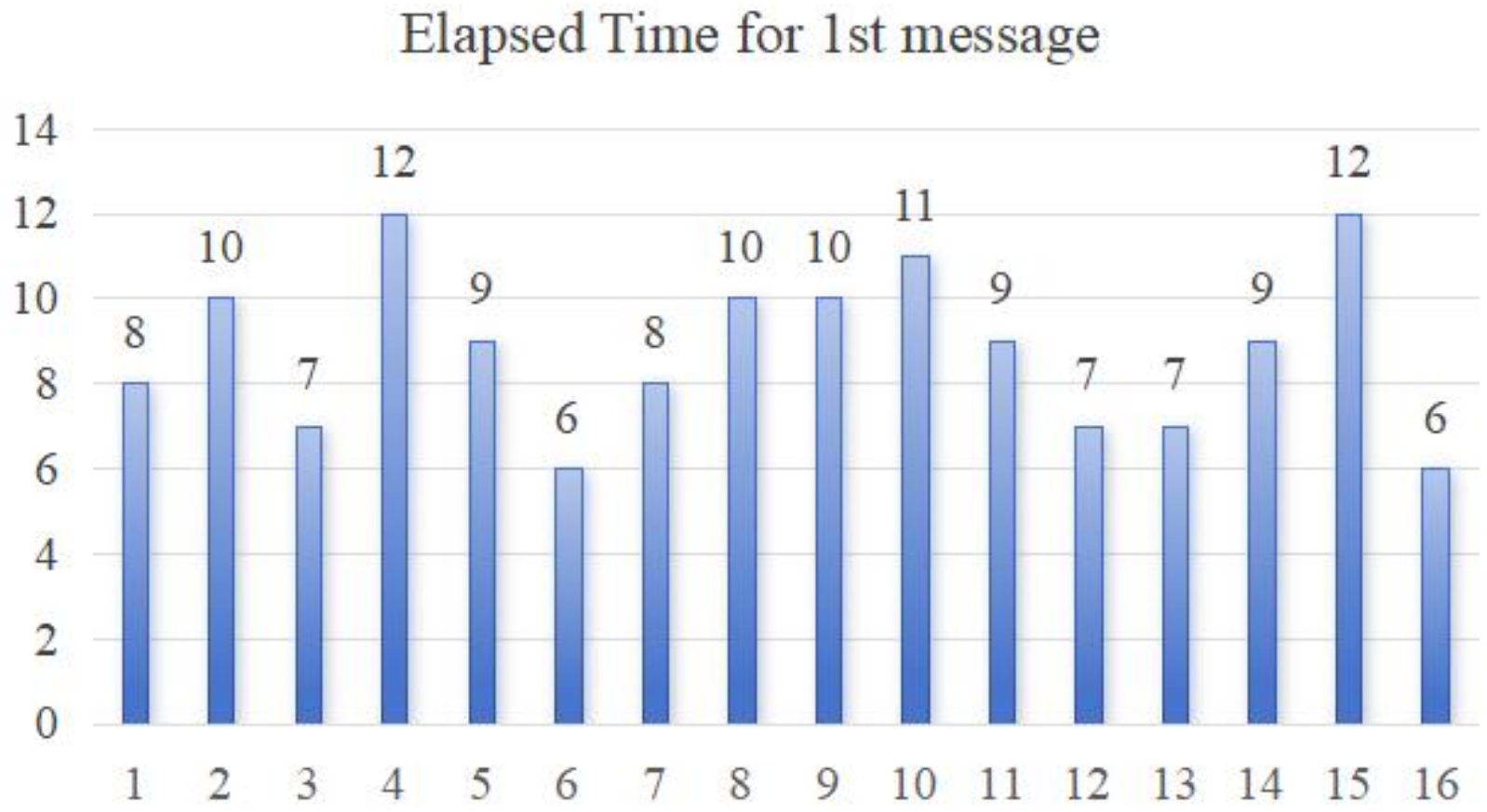
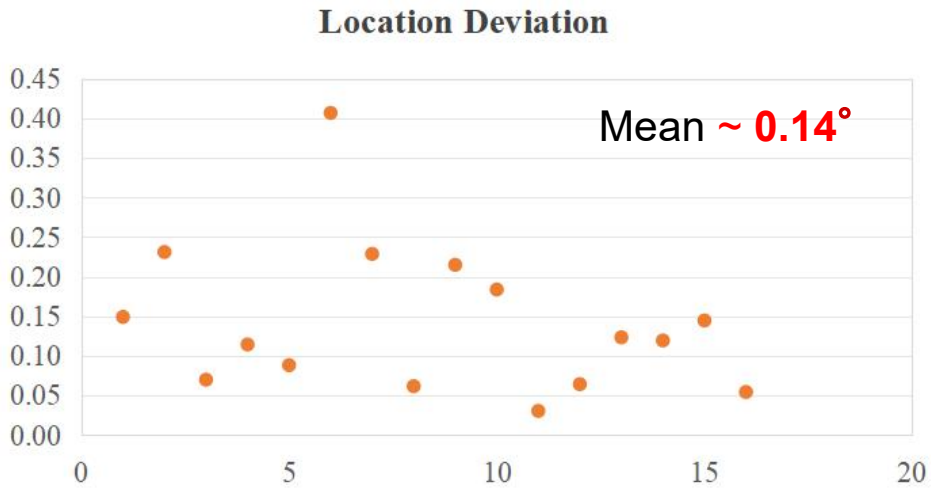
2. Key Performance Indicators
3. Activities on Capacity Building
4. Further Plans

Key Performance Indicator - Elasped Time

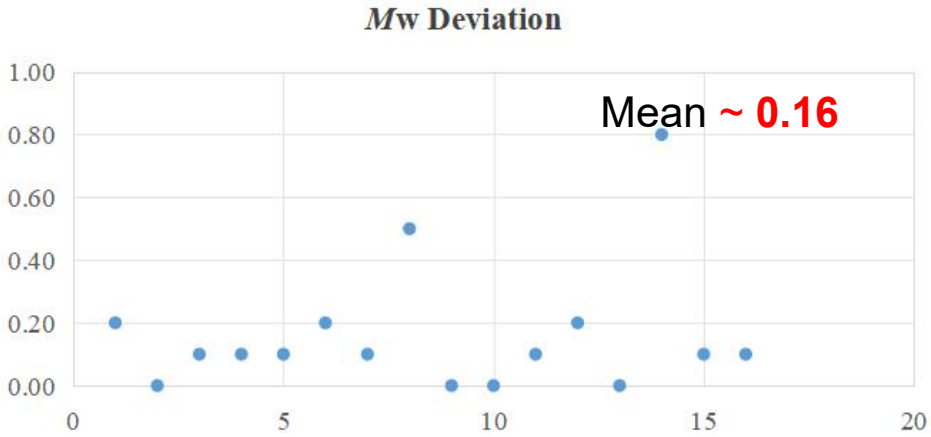
Mean time ~ 8.8 min

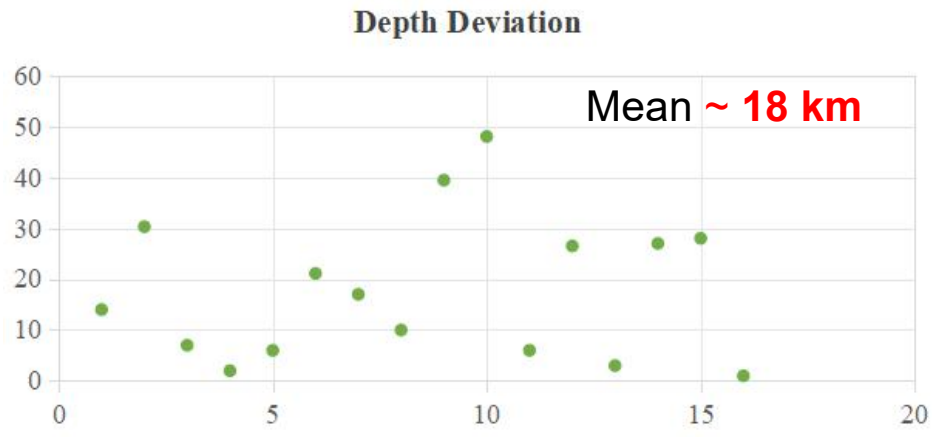


Key Performance Indicator - EQ Location/Magnitude/Depth



Compared with USGS final PDE





Achievement of Key Performance Indicators

Key Performance Indicators	Target values	Evaluation Result	Yes/No
Elapsed time from earthquake to issuance of initial tsunami products with preliminary earthquake parameters	Within 8-15 min	Average elapsed time ~8.8 min	**Yes**
Probability of detection of earthquakes with Mw>=6.0	100%	16 events with Mw>=6.0, **100%**	**Yes**
Accuracy of preliminary earthquake parameters on hypocenter location/magnitude/depth	0.3° /0.2/30km	Difference in location/ magnitude/ depth when compared with USGS final PDE **0.14° /0.16/18 km**	**Yes**
Accuracy of the Estimated Time of Arrival (ETA) and amplitudes of the tsunamis actually is triggered	Within 10% of travel time	Satisfied	**Yes**
Percentage of Member States that receive products issued by SCSTAC	100%	GTS/Fax/email/website	**questionable**
Percentage of time the SCSTAC is operating and able to respond to a tsunami event	100%	24 hours × 365 days; two watchstanders,**100%**	**Yes**
Regular communication tests	4 times per year	**Each quarter**	**Yes**

All the KPIs are satisfied with targeted values exept for the accessible rate of products.

Communication Tests

- SCSTAC conducted 4 rounds of communication tests with NTWC and TWFPs within the Area of Service (AoS) in January, May and September of 2024, as well as in Feb. 2025;
- BSCSTAC (Hong Kong) conducted one communication test with NTWC and TWFPs within the Area of Service (AoS) on 22 November 2024.

NTWC/TWFP	Country	SCSTAC 202502			BSCSTAC 202411		
		GTS	EMAIL	FAX	GTS	EMAIL	FAX
Malaysian Meteorological Department	Malaysia	YES	YES	No	YES	YES	No
National Disaster Warning Center	Thailand	No	YES	No	No	YES	YES
Earthquake Information and Tsunami Warning	Vietnam	\	YES	No	\	YES	No
Brunei Darussalam Meteorological Department	Brunei	YES	YES	No	YES	YES	No
Meteorological Service Singapore	Singapore	YES	YES	YES	YES	YES	YES
???	Cambodia	NS	NS	NS	NS	NS	NS
Philippine Institute of Volcanology and Seismology	Philipines	NS	YES	NS	YES	YES	YES
Agency For Meteorology, Climatology and Geophysics	Indonesia	No	YES	No	No	YES	No
NWPTAC	Japan	YES	YES	YES	YES	YES	YES
PTWC	USA	No	YES	No	NS	YES	NS
		40%	90%	20%	50%	90%	40%

YES: Well Received
No: Not Received
NS: Not Sure(No Response)

Communication Tests

Proposal:
1. NTWCs or TWFPs design a watch-stander or frontline manager particularly responsible for the communication test feedback, and updating their email address if necessary.
2. SCSTAC .&. BSCSTAC double-check the receipt feedback from the Member States, and updates the email list upon the request of MS

Note:
Dissemination of SCSTAC .&. BSCSTAC bulletins via fax has been terminated **at 00:00 UTC on 1 April 2025** in accordance with the notification issued by the *UNESCO-IOC Circular Letter No 3006*

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Attending PacWave24

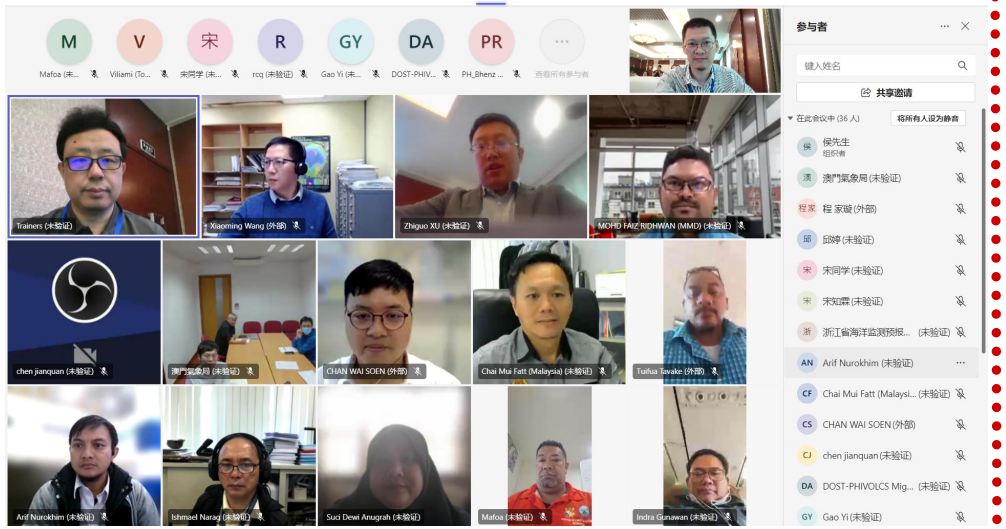
The aim of the PacWave24 is to test PTWS Tsunami Service Provider (TSP) arrangements, and country preparedness arrangements and operational procedures to respond and recover from a destructive tsunami.

Communication Exercise was conducted at SCSTAC on 5 Nov. 2024.

WESS31 BABJ 050000
TEST PACWAVE24 TSUNAMI EXERCISE **TEST**
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED AT 0000Z 05 NOV 2024
THIS IS A COMMUNICATION TEST BULLETIN FOR PACWAVE24 TSUNAMI EXERCISE.
THIS IS A TEST TO VERIFY COMMUNICATION LINKS AND DETERMINE
TRANSMISSION TIMES INVOLVED IN THE DISSEMINATION OF OPERATIONAL
TSUNAMI ADVICE PRODUCTS FROM THE SOUTH CHINA SEA TSUNAMI ADVISORY
CENTER TO DESIGNATED 24-HOUR TSUNAMI WARNING FOCAL POINTS OF THE SOUTH
CHINA SEA TSUNAMI WARNING SYSTEM.
THIS TEST MESSAGE IS SENT BY GTS, FAX AND EMAIL.
RECIPIENTS ARE REQUESTED TO PLEASE RESPOND BACK TO ICG PTWS TASK TEAM
ON PACWAVE24. GUIDANCE FOR THE EXERCISE CAN BE FOUND IN
THE PACWAVE24 EXERCISE MANUAL LOCATED AT
WWW.PACWAVE.INFO
PLEASE RESPOND BEFORE THE DUE DATE SPECIFIED IN THE EXERCISE MANUAL.
THANK YOU FOR YOUR PARTICIPATION IN THIS COMMUNICATION TEST
PLEASE TAKE NOTE OF THE TIME YOU RECEIVE THIS MESSAGE AND THE METHOD(S)
BY WHICH YOU RECEIVE THIS MESSAGE AND REPORT BACK THROUGH THE EXERCISE
PACWAVE POST-EXERCISE ONLINE EVALUATION SURVEY BY 15 DECEMBER 2024

Regional Training and Workshop

Training on tsunami modeling in the South China Sea Region, Zhenjiang city, Jiangsu Province, 22 May 2024



Joint Workshop on Tsunami, Storm Surge, and Other Ocean Hazards Forecasting with STMKG in 2024

Short-Term Visit of International Staff in 2024

NMEFC continues implementation of annual International Secondment Programme, funding three experts from MS in the SCS region to SCSTAC for tsunami operation and knowledge exchange for two months.

Mr. Mohammad Obie Restianto (Indonesia)

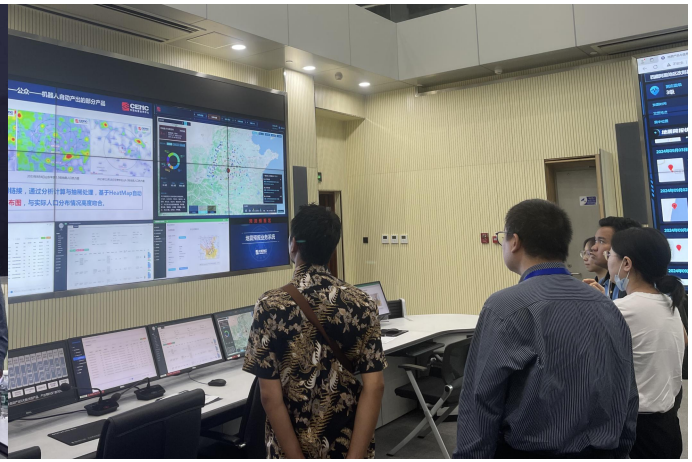
Mr. Bhenz Rodriguez (The Philippines)

Mr. Yip Weng Sang (Malaysia)

Major activities include:

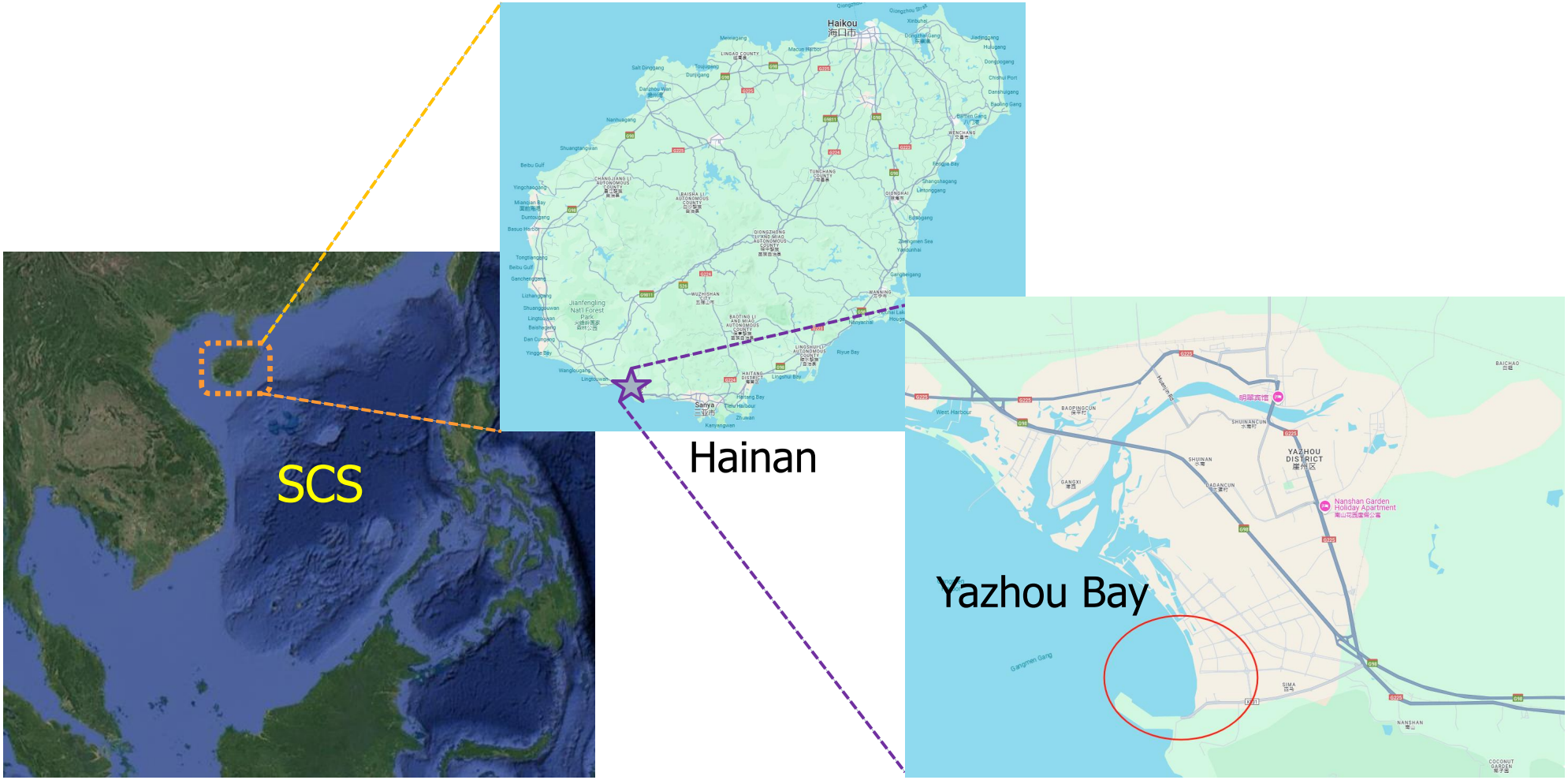
- ✓ Exchanging SOPs of national tsunami warning;
- ✓ Sharing the EQ. parameter determination experience;
- ✓ Talking about tsunami forecating technologies, like scenario database, on-the-fly tsunami model, and decision supporting system;
- ✓ Observing watch-standers' actions at SCSTAC.

Field Trip and Cultural Experience



Project of BSCSTAC (Sanya City, Hainan Province)

A new backup project for SCSTAC is being implemented through the cooperation between MNR and Hainan Province.



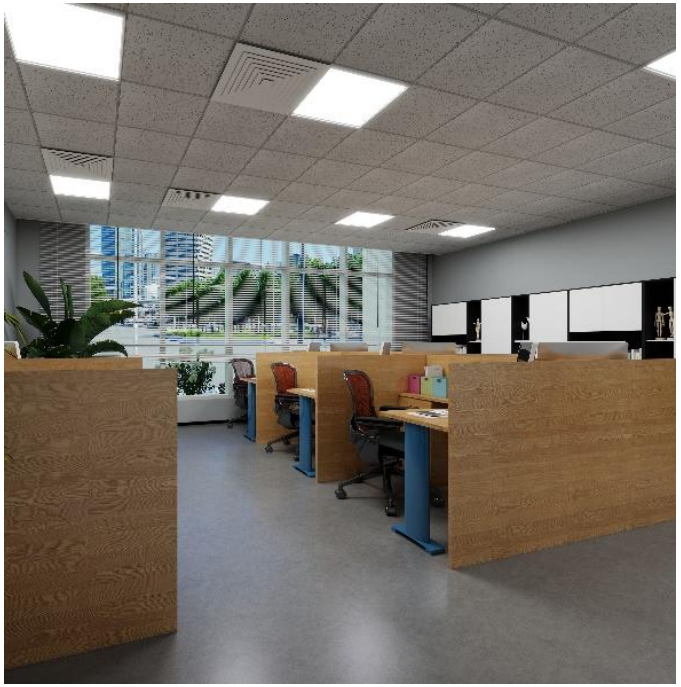
Project of BSCSTAC (Sanya City, Hainan Province)

Visions:

Fully functional backup for SCSTAC

Multi-hazard early warning and forecast for the SCS region

International exchanges and outreach activities



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Further Plans

From WG-SCS XII, following XXX session of ICG/PTWS

- Format revision of SCSTAC's Product Manual

  In progress

In the SCS region

- Enhancing earthquake detection and tsunami monitoring abilities
- Capacity building for non-seismic tsunami warning
- Promotion and application of tsunami warning technologies
- Continue the International Staff Programme
- Further exchange upon tsunami programme, like Tsunami Ready Recognition Programme

Thank You

tsu@nmefc.cn
South China Sea Tsunami Advisory Center, UNESCO/IOC