



ICG/PTWS XXIX Online Session

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

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# Outline

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- 1. Tsunami Warning System**
- 2. Full Operation of SCSTAC**
- 3. Tsunami Warning Capacity Enhancement**
- 4. Communication Test and Exercise**
- 5. Other Activities**
- 6. Further Plans**

# 1. Tsunami Warning System

## 1.1 The Area of Service for SCSTAC

The Area of Service (AoS) for the South China Sea Tsunami Warning and Mitigation System (SCSTWS) 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. A total of nine nations bordering the SCS region include Brunei, Cambodia, China, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam (in alphabetic order).



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

# 1. Tsunami Warning System

## 1.2 Tsunami Warning System of SCSTAC

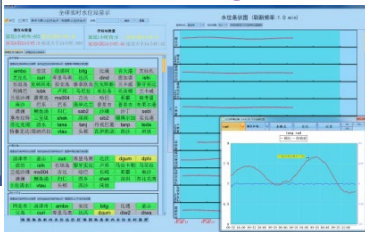
### Duty Room of South China Sea Tsunami Advisory Center



Earthquake information acquisition



Sea level monitoring



Tsunami scenario database



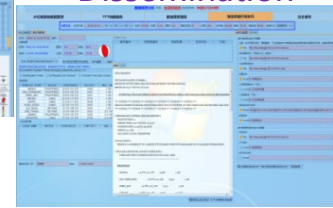
Tsunami parallel model



Tsunami analysis tool



Production & Dissemination



# 1. Tsunami Warning System

## 1.3 Operation of SCSTAC (Standard Operating Procedures )

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

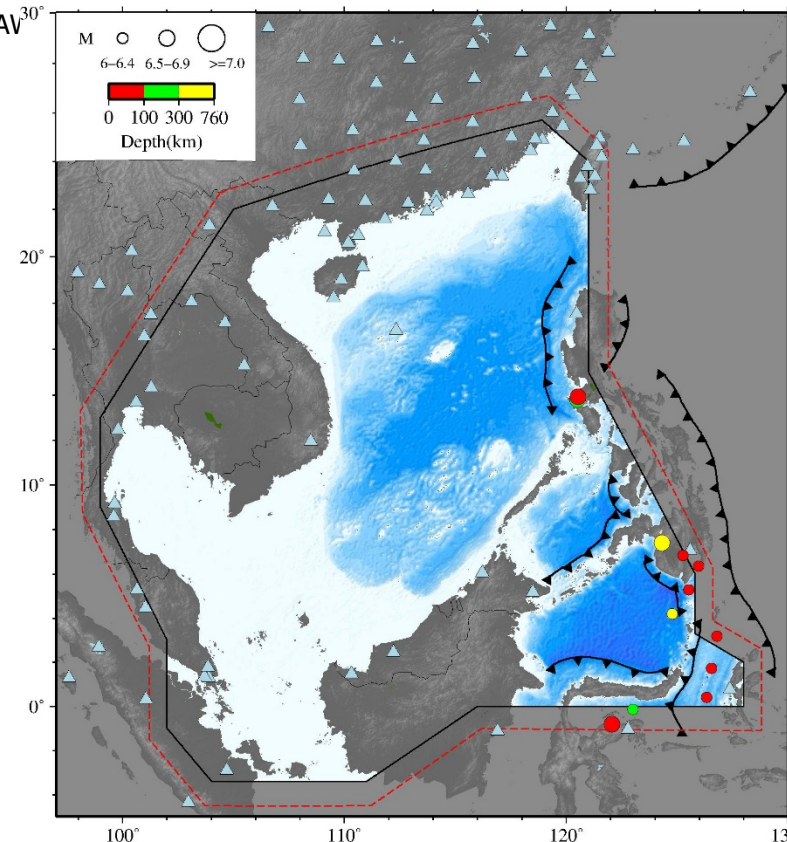
Bulletin type		Criteria	Content	Timeline
<b>Tsunami Information</b>	Only one bulletin	Mag. of 6.0-6.4; or on land; or depth ≥ 100km	EQ parameters and statement of 'No tsunami threat'	8-10 min
	Only one bulletin unless minor waves observed and should be reported	Mag. of 6.5-7.0	EQ parameters and statement of 'No tsunami threat'	8-10 min
<b>Tsunami Threat Message</b>	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 has passed or no significant tsunami observations

## 2. Full Operation of SCSTAC

### 2.1 Issued Tsunami Bulletins (Jul. 2020- Nov. 2021)

No	Mag	Origin Time (UTC)	Dep/km	Lon/°	Lat/°	Location
1	6.0	2021-10-11 12:34:00	15.0	126.33	0.88	NORTHERN MOLUCCA SEA
2	6.6	2021-07-26 12:09:00	30.0	122.06	-0.81	SULAWESI, INDONESIA
3	6.9	2021-07-23 20:49:00	104.3	120.50	13.80	MINDORO, PHILIPPINES
4	6.1	2021-07-10 00:43:00	70.0	126.78	3.19	TALAUD ISLANDS, INDONESIA
5	6.2	2021-06-03 10:09:00	15.0	126.33	0.40	NORTHERN MOLUCCA SEA
6	6.2	2021-04-10 09:30:00	314.0	124.77	4.19	TALAUD ISLANDS, INDONESIA
7	6.0	2021-02-07 04:22:00	20.0	125.26	6.84	MINDANAO, PHILIPPINES
8	6.1	2021-01-06 20:59:00	183.7	122.89	-0.02	MINAHASSA PENINSULA, SULAV
9	6.5	2020-12-24 23:43:00	90.0	120.52	13.92	LUZON, PHILIPPINES
10	6.4	2020-12-15 23:22:00	15.0	125.51	5.28	MINDANAO, PHILIPPINES
11	6.4	2020-09-06 15:23:00	98.2	125.97	6.36	MINDANAO, PHILIPPINES
12	6.1	2020-09-06 00:21:00	55.0	126.54	1.72	NORTHERN MOLUCCA SEA
13	6.5	2020-08-01 17:09:00	490.9	124.32	7.41	MINDANAO, PHILIPPINES

**Issued for 13 events**



## 2. Full Operation of SCSTAC

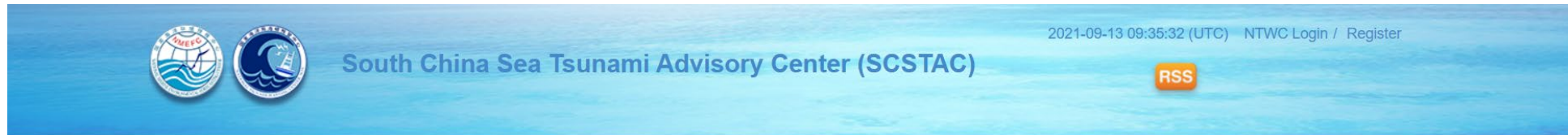
### 2.2 Evaluation of SCSTAC Key Performance Indicators for full Operation

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 ~7.9 min	Yes
Probability of detection of earthquakes with $M_w \geq 6.0$	100%	12 events with $M_w \geq 6.0$ , <b>100%</b>	Yes
Accuracy of preliminary earthquake parameters on hypocenter location/magnitude/depth	0.3° /0.2/30km	The difference for location/magnitude /depth contrasting with USGS <b>19km/0.13/15km</b>	Yes
Accuracy of the Estimated Time of Arrival (ETA) and amplitudes of the tsunamis actually is triggered	Within 10% of travel time	<b>No <math>M \geq 7.1</math></b> earthquakes occurred in AoS of SCSTAC	-
Percentage of Member States that receive products issued by SCSTAC	100%	GTS/Fax/email/website <b>100%</b>	Yes
Percentage of time the SCSTAC is operating and able to respond to a tsunami event	100%	24 hours × 365 days; two watch standers, <b>100%</b>	Yes
Regular communication tests	4 times per year	<b>each quarter</b>	Yes

# 2. Full Operation of SCSTAC

## 2.3 SCSTAC new website

<http://scstac.oceanguide.org.cn>



- Home
- Recent Events
- Tsunami Service
- Latest News
- Tsunami Education
- SCSTAC
- FAQ
- LINK
- Historical Events

**No Current Tsunami Information or Threat in Effect within the SCS Region !**

Latest Event Details

 [Tsunami Information](#)

**Earthquake:** **Magnitude:** 6.6 **Depth:** 30.0KM  
**Origin Time:** 2021-07-26 12:09:00(UTC) **Lat:** 0.81°S **Lon:**122.06°E  
**Location:** SULAWESI, INDONESIA [Detail...](#)

Events List [MORE+](#)

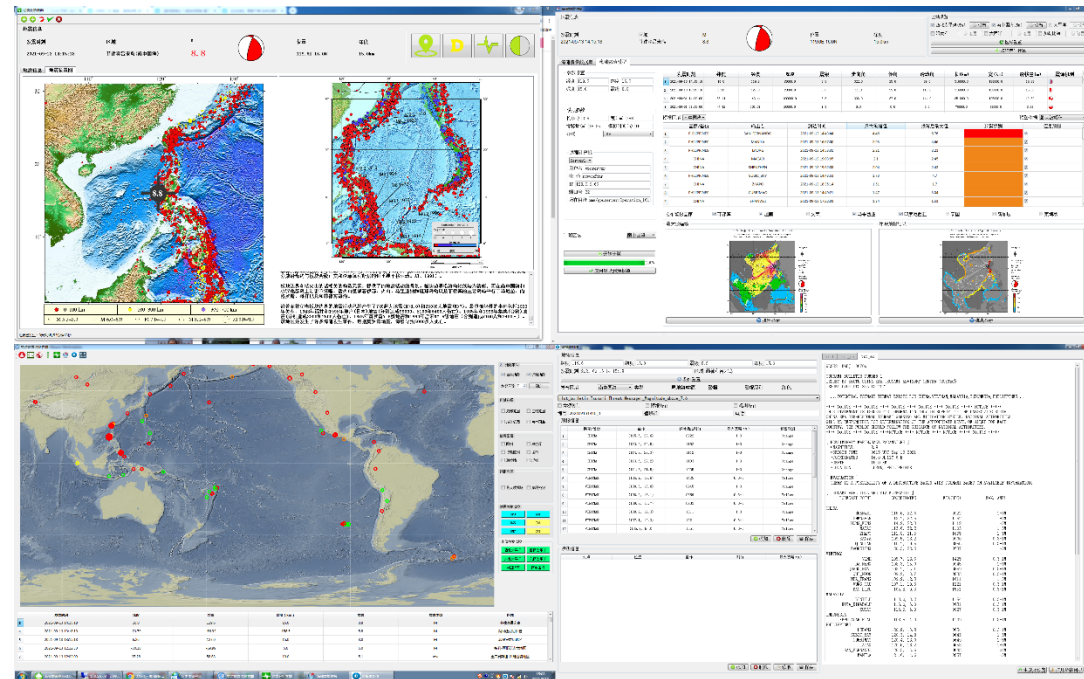
No	Mag	Origin (UTC)	Depth (km)	Lon (°)	Lat (°)	Location	Message
1	6.6	2021-07-26 12:09:00	30.0	122.06°E	0.81°S	SULAWESI, INDONESIA	<a href="#">Detail..</a>
2	6.9	2021-07-23 20:49:00	104.3	120.50°E	13.80°N	MINDORO, PHILIPPINES	<a href="#">Detail..</a>
3	6.1	2021-07-10 00:43:00	70.0	126.78°E	3.19°N	TALAUD ISLANDS, INDONESIA	<a href="#">Detail..</a>
4	6.2	2021-06-03 10:09:00	15.0	126.33°E	0.40°N	NORTHERN MOLUCCA SEA	<a href="#">Detail..</a>
5	6.2	2021-04-10 09:30:00	314.0	124.77°E	4.19°N	TALAUD ISLANDS, INDONESIA	<a href="#">Detail..</a>
6	6.0	2021-02-07 04:22:00	20.0	125.26°E	6.84°N	MINDANAO, PHILIPPINES	<a href="#">Detail..</a>



# 3. Tsunami Warning Capacity Enhancement

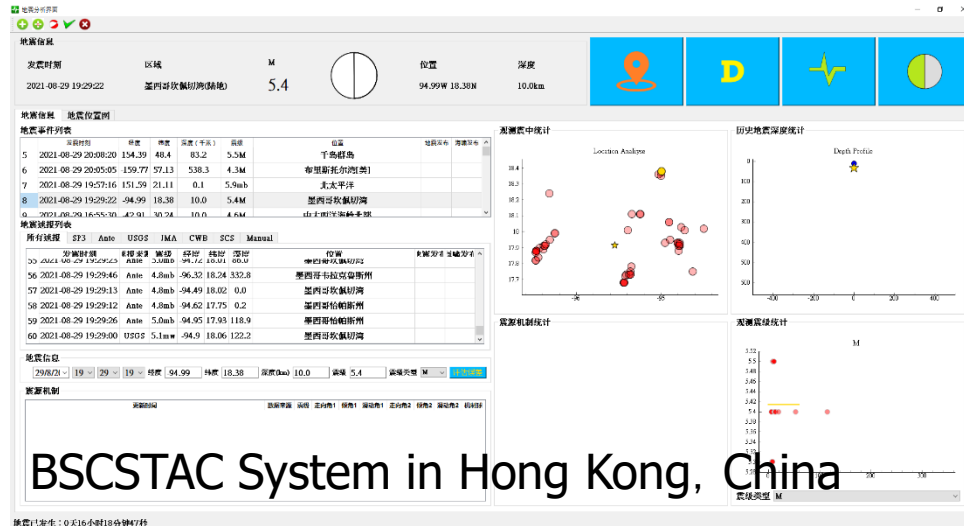
## 3.1 Smart Tsunami Information process System at SCSTAC based on Python

- Real-time monitoring, receiving and processing of seismic and sea level data
- Tsunami scenario database
- GPU parallel tsunami numerical simulation
- Automatic generation and release of tsunami warning products
- An integrated decision support system for tsunami warning
- User-friendly, comprehensive, well-maintained and open source software



# 3. Tsunami Warning Capacity Enhancement

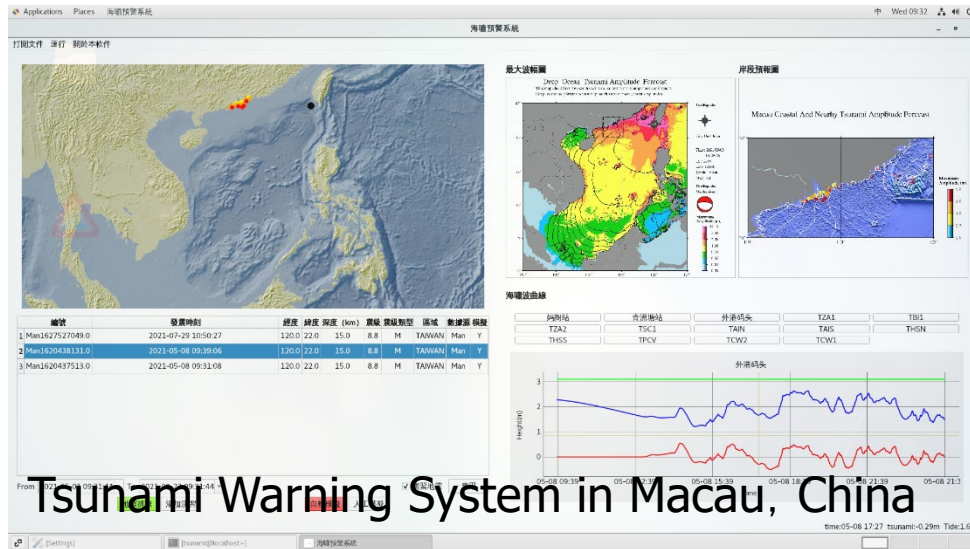
## 3.2 Tsunami warning technology extension



BSCSTAC System in Hong Kong, China



Technical staff from SCSTAC installed tsunami simulation system in Macau(onsite)



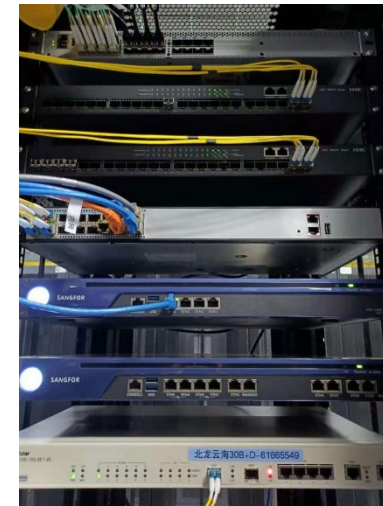
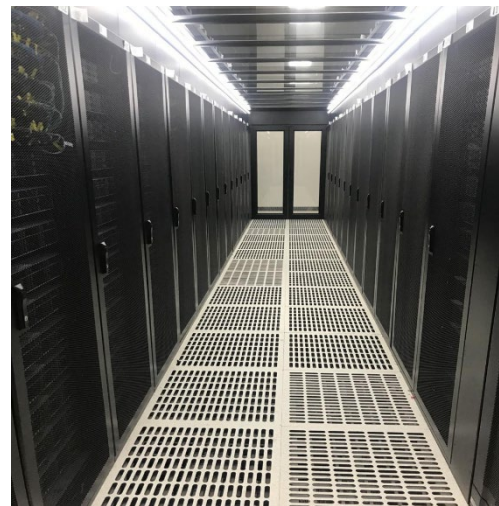
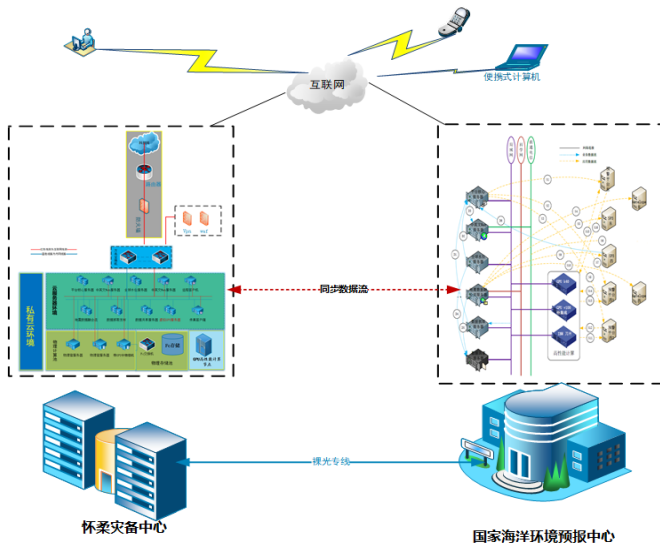
Tsunami Warning System in Macau, China



SMG-NMEFC tsunami warning meeting(online)

# 3. Tsunami Warning Capacity Enhancement

## 3.3 Backup tsunami warning system in Huairou District Beijing, China



- Implement independent function backup
- The synchronization of data but not dependence

# 3. Tsunami Warning Capacity Enhancement

## 3.4 Backup South China Sea Tsunami Advisory Center (Hong Kong)



臨近預報區域專業氣象中心  
RSMC for Nowcasting



亞洲航空氣象中心  
AAMC Asian Aviation Meteorological Center



南中國海區域海嘯預警中心備份中心(香港)  
Backup South China Sea Tsunami Advisory Center (Hong Kong)

Setting up of Backup SCSTAC in Hong Kong, China

Activation of  
BSCSTAC

Scheduled Activation

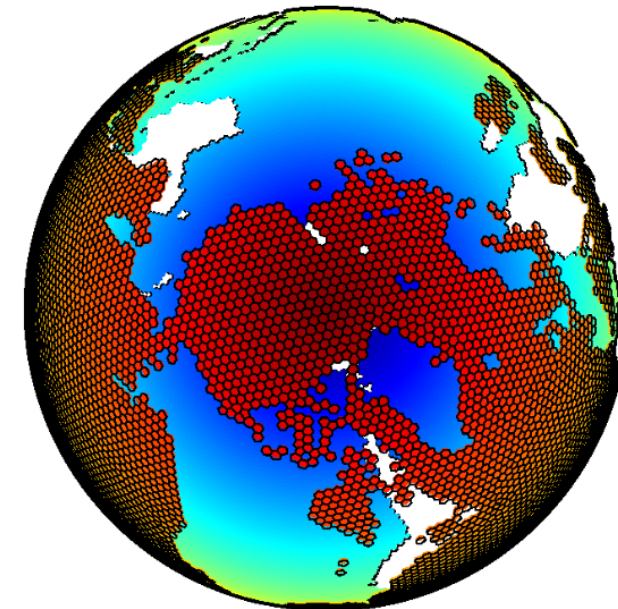
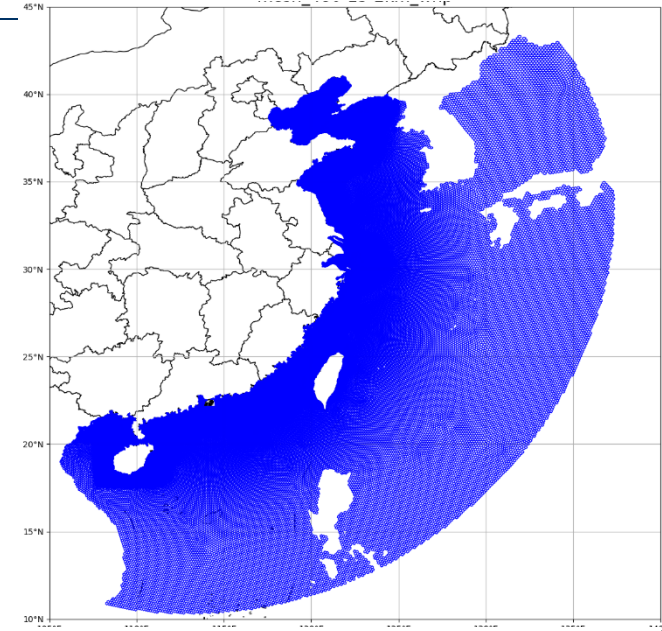
Non-scheduled  
Activation

5 online meetings on BSCSTAC establishment

# 3. Tsunami Warning Capacity Enhancement

## 3.5 New generation tsunami simulation model

- 2D depth-averaged shallow water equations in vector invariant form
- Unstructured hexagonal mesh generation algorithm by SCVT
- Finite volume discretization
- Third-order/fourth-order Runge–Kutta scheme
- Arakawa C-grid
- Global and regional simulation ability
- GPU-accelerated



# 4. SCSTAC Communications Tests and Exercise

## 4.1 Communications tests

- SCSTAC conducted 2 communications tests on 28 Jan, 28 May 2021. 6 Member States were responded for dummy information
- Thanks to the coordination of the secretariat and the Member States,



### SCSTAC COMMUNICATIONS TEST

ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)

ISSUED AT 0600Z 28 MAY 2021

THIS IS A TEST BULLETIN

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.

RECIPIENTS ARE REQUESTED TO PLEASE RESPOND BACK TO THE SOUTH CHINA SEA

TSUNAMI ADVISORY CENTER.

PLEASE RESPOND VIA ONE OF THE FOLLOWING MEANS

\*TEL:+86-10-62104561

\*EMAIL:TSU@NMEFC.CN

\*FAX:+86-10-62173638

THANK YOU FOR YOUR PARTICIPATION IN THIS COMMUNICATION TEST



Fax



Email



GTS

# 4. SCSTAC Communications Tests and Exercise

## 4.2 Exercise Pacific Wave 2020

- ❑ **Post-Exercise Evaluation Forms are to be completed by each participating agency and forwarded to the country Exercise Pacific Wave 2020 National Contact, or the country Tsunami National Contact (TNC).**
- ❑ **The National Contact will compile the country Post-Exercise Evaluation Form and complete and submit this online no later than 21 December 2020.**



# 5. Other Activities

## 5.1 Technical Training Activities for Watching Standers

- ❑ **Seismic Analysis**
  - Earthquake Location/Magnitude/Depth
  - Operation seismic monitoring system
  - Rapid Characterization of Tsunami Source
- ❑ **Sea Level Data Analysis**
  - Detect/Confirm tsunami waves
  - Refine the tsunami waves
- ❑ **Tsunami Forecasting**
  - TTT/COMCOT
- ❑ **Message Dissemination**
- ❑ **Routine Drill**

**Enhancing the capability of tsunami warning**





# 5. Other Activities

## 5.2 International meeting



PTWS SC 23/06/2021



Steering Committee Meeting (Virtual) 21-23 September 2021

ICG/PTWS WG-SCS, 28 & 30 September 2021

## 6. Further Plans

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- ❑ continues to SCSTAC Communication Test
- ❑ Conducts an online Training Workshop on Tsunami Forecasting and Risk Assessment for Tsunami Warning Operators in the South China Sea region, on 9-10 December 2021 hosted by China,
- ❑ continues to provide opportunities for in-person education, outreach and training activities in the region(regional training workshop/short-term international staff) depend on the COVID-19 epidemic situation



# Thank You

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