

# SCS Sub-regional Tsunami Exercise for Introducing and Testing SCSTAC Tsunami Advisory Products during PacWave 17

January 2017

Task Team on Establishment of the SCSTAC

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## **1. Background**

The South China Sea region, which covers the South China Sea and its adjoining basins including Sulu Sea and Celebes Sea, is identified as one of the most vulnerable regions to major tsunamigenic earthquakes due to the high seismicity of the Manila Trench, Cotabato Trench, Negros Trench and Sulawesi Trench. According to historical records, a number of devastating tsunamis have occurred in the region. For example, the tsunami generated by the M8.1 earthquake which hit Moro Gulf of the Celebes Sea in 1976 resulted in over 8,000 dead or missing. The recent Mw 7.0 earthquake in 2006 off South Taiwan, China, which produced a minor tsunami along the North SCS coasts, once again raised attention and awareness of tsunami hazard of the region. The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) took the establishment of the SCS Tsunami Warning and Mitigation System as a priority action in the PTWS Medium-Term Strategy 2014-2021.

The ICG/PTWS-XXV Session in Vladivostok, Russia 2013 approved the proposal of the South China Sea Tsunami Warning and Mitigation System within the framework of ICG/PTWS submitted by SCS Regional Working Group (WG-SCS), and decided to accept China's offer to host the South China Sea Tsunami Advisory Center (SCSTAC) and recommends to initiate the establishment of the SCSTAC under the guidance of the WG-SCS [ICG/PTWS-XXV.3 (Rec. 7-10)]. According to Implementation Plan for the SCS Tsunami Warning and Mitigation System [ICG/PTWS-WG-SCS-II/3 Annex IV], a sub-regional tsunami exercise among the Member States should be conducted in 2016 to test the performance of tsunami service and advisory products. The WG-SCS at its 5th Meeting at Manila, 2-3 March 2016 instructed IOC Secretariat to circulate the document "Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System" to all WG-SCS Member States for final comments.

The Steering Committee Meeting for ICG/PTWS at Honolulu from 29 June to 2 July 2016 agreed to take the opportunity to include testing of the SCSTAC Tsunami Advisory Products at PacWave17 to be conducted on 15 to 17 February 2017. The 2<sup>nd</sup> Task Team meeting on the Establishment of the SCSTAC (TT-SCSTAC II, Beijing, 24-26 October 2016) decided to encourage all SCS Member States to participate at PacWave 17 exercise to test the SCSTAC products, as well as the effectiveness and availability of the established communication channels between the SCSTAC and each NTWCs.

## **2. PacWave17**

The ICG/PTWS at its 26th session (ICG/PTWS-XXVI, Honolulu, United States of America, 22–24 April 2015) approved the conduct of Exercise Pacific Wave 2017 (PacWave17) during the first Quarter of 2017. The exercise intends to

support the development of improved tsunami products and procedures, including the Enhanced Products of the Pacific Tsunami Warning Center and the Northwest Pacific Tsunami Advisory Center (NWPTAC) of the Japan Meteorological Agency (JMA).

The Steering Committee for ICG/PTWS (SC-ICG/PTWS, Honolulu, from 29 June to 2 July 2016) further decided that PacWave17 would take place during the period 15-17 February 2017, so that the post-exercise evaluation questionnaire can be returned by 10 March 2017. The aim of PacWave17 is to test the NWPTAC and the PTWC Enhanced Products. The SC for ICG/PTWS also considered the progress of SCSTAC Tsunami Advisory Products, and further decided to take the opportunity to include testing of the SCSTAC products at PacWave17. The draft exercise plan for the SCS Member States to participate at the PacWave 17 was discussed and agreed upon by the participants of TT-SCSTAC II held on 24-26 October 2016 in Beijing.

### **3. Exercise Aim**

In accordance with Implementation Plan of the SCS Tsunami Warning and Mitigation System [ICG/PTWS-WG-SCS-II/3 Annex IV], as well as Recommendations of TT-SCSTAC II 2016, the aim of the exercise is to test the Tsunami Advisory Products for the SCS Tsunami Warning and Mitigation System, as well as the effectiveness and availability of the established communication channels between the SCSTAC and each NTWCs.

### **4. Exercise Objective**

Objective 1: Test communications from the SCSTAC to Member States in the region;

Objective 2: Test whether the SCSTAC products are interpreted by SCS Member States accurately;

### **5. The SCS Tsunami Advisory Products**

In response to Recommendation ICG/PTWS-XXV.3 and ICG/PTWS-WG-SCS-III/IV/V, TT-SCSTAC has finalized the SCSTAC advisory products by two-year efforts. The SCS tsunami advisory products aim to provide quantitative tsunami threat forecasting to national recipients by incorporating the state-of-the-art forecasting skills such as tsunami scenario database, as well as real-time numerical modeling based on rapid CMT solution. The advisory products comprise of a suite of text messages and graphical products, in pace with the PTWC and NWPTAC's Enhance Products. As the SCSTAC advisory products will be available to all MSs in parallel with the PTWC products, to avoid confusion and misunderstanding, the SCSTAC issues tsunami threat levels in terms of numerical forecasting on maximum wave amplitudes relative to the tide within four categories, which are: i) less than 0.3 m, ii) 0.3 to less than 1 m, iii) 1 m to 3 m, and iv) greater than 3 m.

Basically, SCSTAC Tsunami Advisory Products consist of an initial bulletin and accompanied graphical forecasting maps mainly based on the preliminary earthquake parameters. Whether a country to be put into 'threat area' depends on conservative output of the tsunami scenario database. Once the rapid WCMT solution is available to the SCSTAC, the subsequent products will come up quickly by running a real-time tsunami model.

More details on SCSTAC Tsunami Advisory Products please refer to the technical document "Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System".

### 5.1 Geographical coverage

The SCS Tsunami advisory products are issued when a major earthquake with moment magnitude 6.0 or greater is detected in the Area of Service (AoS) of the SCSTAC (Figure 1). The recipient countries comprise of Brunei, Cambodia, China, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam.

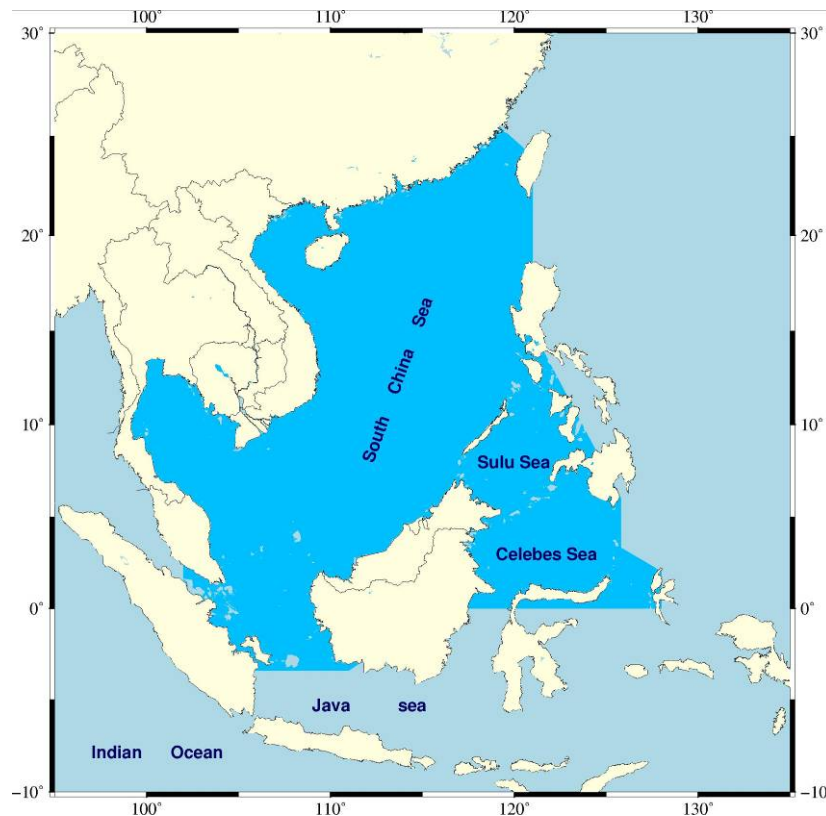


Figure 1 the SCSTAC Area of Service (AoS)

### 5.2 Description of Products

- Text Bulletin

Text bulletin is available to the public and NTWCs. Typically the SCSTAC text message contains earthquake parameters, tsunamigenic potential, tsunami amplitude and ETA forecasts for 57 Coastal Forecast Points, tsunami

observations, and recommended actions.

- Coastal Forecast Points

Tsunami amplitude and Estimated Time of Arrival (ETA) are provided for 57 coastal forecast points in the SCS region. These coastal forecast points were agreed-upon points chosen by the SCS Member States during the 3rd, 4th and 5th WG-SCS Meeting in Hong Kong, Jakarta and Manila, respectively. They correspond to coastal cities and sea-level gauges. (referring to Appendix I). In the tsunami threat message, all forecast points with maximum amplitude greater than 0.3 meter are listed in groups that are entitled as Member States. Tsunami amplitude estimates are grouped into four bins of '<0.3 m; 0.3 to less than 1 m; 1 to 3 m and above 3 m'.

- Tsunami Energy Map

The tsunami energy map gives the color-filled distribution of maximum tsunami amplitude in the SCS region. Direction of tsunami energy beam and the threatened areas can be easily identified by different color scale. The contour map of Tsunami Travel Time (TTT) is shown in light-gray lines and overlapped on tsunami energy map.

- Coastal Forecast Map

The coastal forecast Map gives a detailed view of tsunami threat on coasts in the SCS region. It divides the SCS coastlines into a number of Model Output Points. Each point is colored according to the tsunami amplitude of the model grid points closest to the point. The tsunami energy map is also overlapped in gray-shading style with illuminated effect and further have TTT contour lines placed upon.

### 5.3 Dissemination of Products

Text messages are available to National Tsunami Warning Centers (NTWCs) via WMO GTS, Website, Email and Facsimile, while scientifically more complex graphical products should only be accessible to NTWCs and Tsunami Warning Focal Points (TWFPs) via excluded channels such as Email or Access-restricted website in order to minimize public confusion and misunderstanding. The GTS header code will not be available to the SCSTAC until it is officially authorized by the IOC to start operation.

### 6. Participating Countries

The recipient countries of the SCSTAC Tsunami Advisory Products, including **Brunei, Cambodia, China, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam**, are encouraged to participate at the exercise.

### 7. Exercise Date

As a part of Exercise PacWave 17, the SCS sub-regional tsunami exercise for

testing SCS Tsunami Advisory Products will take place within the period of 15-17 February 2017. The specific timelines for the exercise please refer to the ANNEX III Master Schedule of Events List.

## 8. Exercise Scenario

According to tectonic settings and historical events within the SCS region, as well as exercise scenarios proposed by ICG/PTWS Task Team on PacWave Exercise and SCS Member States, two scenarios are preliminarily suggested, including Mw 9.0 great earthquake at Manila Trench and Mw 8.5 earthquake at North Sulawesi Trench. The former scenario potentially affect Brunei, China, Malaysia, Philippines, Thailand and Vietnam, while the other scenario may pose threat to Indonesia, Malaysia and Philippine. The participating countries are recommended to choose one scenario to exercise. Details for 2 exercise scenarios are summarized as follows:

Location	Latitude	Longitude	Depth	Magnitude
Manila Trench	15.44	119.36	35 km	9.0
North Sulawesi Trench	1.24	122.41	25 km	8.5

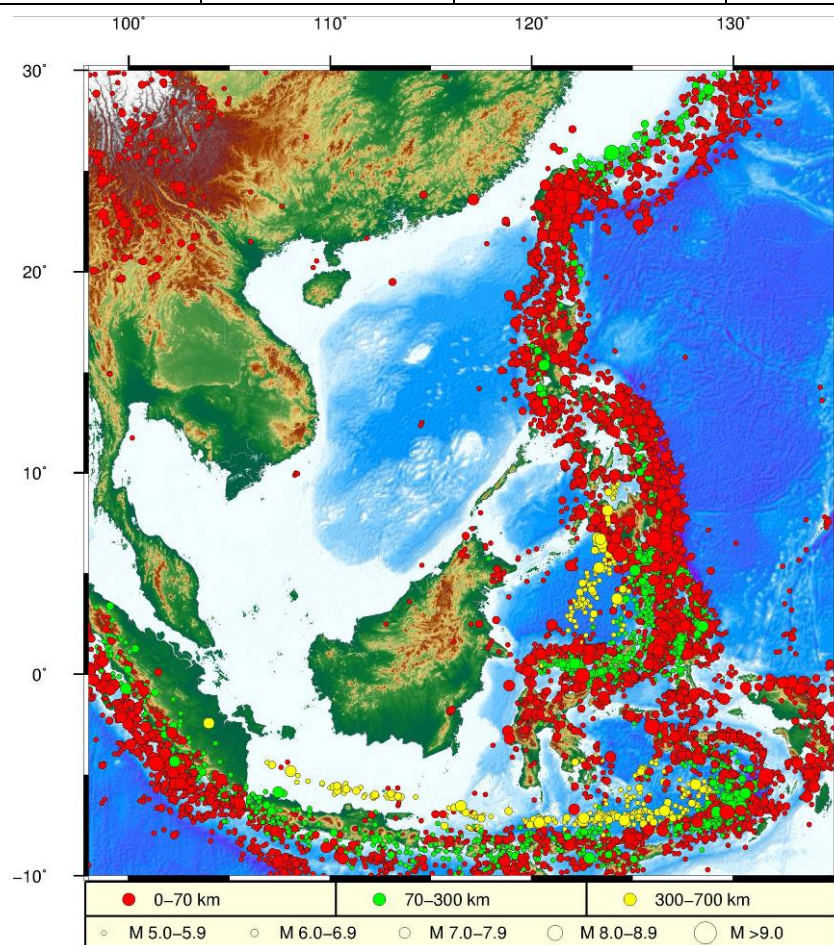


Figure 2 Historical seismicity in the SCS region

## **9. Exercise Type**

The exercise is recommended to be a Tabletop Exercise and the participating countries are not required to conduct the exercise down to community levels.

Participants are presented with a situation or problem that they are required to discuss and for which they have to formulate the appropriate response or solution. Normally, the exercise requires no simulation other than the scenario and/or prewritten exercise injects. An exercise controller or moderator introduces a simulated scenario to participants and, as the exercise advances (in time), exercise problems and activities (injects) are further introduced. This type of exercise is used to practice problem solving and coordination of services with or without time pressures. There is no deployment or actual use of equipment or resource.

An example of a Tabletop Exercise may involve only key stakeholders, such as the National Tsunami Warning Center and the National Disaster Management Office, discussing their response to a tsunami threat in a particular area, where the only injects are tsunami messages from the Tsunami Service Providers [The IOC Manual and Guides 58, “How to Plan, Conduct and Evaluate IOC Tsunami Wave Exercises” (IOC/2011/MG/58, 2013, English)].

## **10. Electronic Resources**

In coordination with ICG/PTWS Task Team on PacWave Exercise, the SCSTAC advisory products for the exercise will be posted to the website of [www.pacwave.info](http://www.pacwave.info).

## **11. Exercise Participation**

All WG-SCS Member States are encouraged to participate in the exercise to test their interpretation to the SCS Tsunami Advisory Center, and connection/communication to the SCSTAC via established pathways. At a minimum, to meet the objectives of the exercise, it is recommended that the National Tsunami Warning Center and the National Disaster Management Office to participate.

## **12. Exercise Products**

The templates of SCSTAC Tsunami Advisory Products corresponding to the 2 scenarios are attached as Annex II. A suite of SCSTAC text messages and graphical products in accordance with the Master Schedule of Events List for the exercise will be prepared in coordination with ICG/PTWS Task Team on PacWave Exercise, and thus provided online at the Exercise PacWave 17 (<http://www.pacwave.info>) in advance to help participating countries plan and prepare. The ZIP files containing all messages issued by SCSTAC for the scenarios of M9.0 at Manila Trench and M8.5 at North Sulawesi Trench will be available for downloading on **1 February 2017**. National and local products corresponding to the selected scenario can be prepared prior to the exercise.



### **13. Exercise Delivery/Format**

The injection of SCSTAC exercise products to the National Tsunami Warning Center will follow PacWave 17's practice. For a Table-top exercise, it is flexible for the Exercise Planning Team to decide whether the exercise scenario messages are made known to national, provincial and local agencies prior to the exercise. During the exercise, the Exercise Control Team may choose to feed the bulletins into the exercise at times of their own choosing.

### **14. Master Schedule of Events List**

The Master Schedule of Events List (MSEL) is a detailed sequence of events used by the Exercise Control Team to ensure that the exercise runs smoothly. It gives the timeline for issuance of international products from Tsunami Service Providers. Each country's Exercise Control Team will be responsible for executing the Master Schedule of Events List.

The MSEL for the exercise are given in ANNEX III, by coordinating with the ICG/PTWS Task Team on PacWave Exercise.

### **15. Post-exercise Evaluation**

With the assistance of the ICG/PTWS Task Team on PacWave Exercise, a post-exercise evaluation will be conducted with the participation of the SCS regional Member States. To meet the objectives of SCS sub-regional exercise, a special survey section for the SCSTAC will be created on [www.surveymonkey.com](http://www.surveymonkey.com) to highlight the feedback of NTWCs and TWFPs on the SCSTAC Tsunami Advisory Products. All participating countries are asked to complete the official PacWave17 Exercise Evaluation Form by **27 February 2017**. So a preliminary summary report can be drafted to report on the 6<sup>th</sup> SCS Regional Working Group Meeting scheduled on 1-3 March 2017.

The post-exercise evaluation form with the purpose to test the SCSTAC Tsunami Advisory Products can be found in ANNEX IV.

## ANNEX I. Coastal Forecast Points for the SCSTAC Tsunami Advisory Products

Table List of Coastal Forecast Points for the SCSTAC Tsunami Advisory Products

COUNTRY/PLACE	LOCATION	LATITUDE	LONGITUDE
BRUNEI	MUARA	5.0°N	115.1°E
CAMBODIA	SIHANOUKVILLE	10.6°N	103.6°E
CHINA	SANYA	18.2°N	109.5°E
CHINA	SHANWEI	22.75°N	115.3°E
CHINA	HONG_KONG	22.3°N	114.2°E
CHINA	MACAO	22.2°N	113.6°E
CHINA	SHENZHEN	22.5°N	113.9°E
CHINA	ZHAPO	21.5°N	111.8°E
CHINA	QINGLAN	19.6°N	110.9°E
CHINA	KAOHSIUNG, TAIWAN	22.5°N	120.3°E
INDONESIA	TABUKAN_TENGAH	3.6°N	125.6°E
INDONESIA	PANGKALPINANG	2.1°S	106.1°E
INDONESIA	KEPULAUAN_RIAU	4.0°N	108.5°E
INDONESIA	KUALA_INDRAGIRI	0.5°S	103.8°E
INDONESIA	SINGKAWANG	1.0°N	109.0°E
INDONESIA	TARAKAN	3.3°N	117.6°E
INDONESIA	MELONGUANE	4.1°N	126.6°E
INDONESIA	TOLI-TOLI	1.1°N	120.7°E
INDONESIA	GORONTALO	0.5°N	123.0°E
INDONESIA	MANADO	1.6°N	124.9°E
INDONESIA	JAILOLO	1.1°N	127.5°E
MALAYSIA	K_TERENGGANU	5.3°N	103.2°E
MALAYSIA	BINTULU	3.2°N	113.0°E
MALAYSIA	KOTA_KINABALU	6.0°N	116.0°E
MALAYSIA	LAHAD_DATU	4.9°N	118.4°E
MALAYSIA	SANDAKAN	5.9°N	118.1°E
MALAYSIA	KUDAT	6.9°N	116.9°E
PHILIPPINES	DAVAO	6.9°N	125.7°E
PHILIPPINES	LEGASPI	13.1°N	123.7°E
PHILIPPINES	LUBANG	13.8°N	120.2°E
PHILIPPINES	SUBIC_BAY	14.82°N	120.3°E
PHILIPPINES	CURRIMAO	18.0°N	120.4°E
PHILIPPINES	LAOAG	18.2°N	120.6°E
PHILIPPINES	SAN_FERNANDO	16.6°N	120.3°E
PHILIPPINES	MANILA	14.6°N	121.0°E
PHILIPPINES	ILOILO	10.7°N	122.5°E

PHILIPPINES	PUERTO_PRINCESA	9.8°N	118.8°E
PHILIPPINES	ZAMBOANGA	7.0°N	122.3°E
PHILIPPINES	MAIMBUNG	5.9°N	121.0°E
PHILIPPINES	COTABATO_CITY	7.3°N	124.2°E
PHILIPPINES	GENERAL_SANTOS	6.1°N	125.2°E
SINGAPORE	SINGAPORE	1.3°N	103.9°E
THAILAND	PRACHUAP_KRK	11.8°N	99.8°E
THAILAND	PATTAYA	12.8°N	100.9°E
THAILAND	NAKHON_SI_TMR	8.4°N	100.0°E
THAILAND	NARATHIWAT	6.5°N	101.8°E
THAILAND	SONGKHLA	7.2°N	100.6°E
THAILAND	SAMUI_ISLAND	9.5°N	100.1°E
THAILAND	BANGKOK	13.4°N	100.6°E
THAILAND	TRAT	12.0°N	102.6°E
VIETNAM	VINH	18.6°N	105.7°E
VIETNAM	QUI_NHON	13.7°N	109.2°E
VIETNAM	QUANG_NGAI	15.1°N	108.9°E
VIETNAM	NHA_TRANG	12.3°N	109.2°E
VIETNAM	DA_NANG	16°N	108.3°E
VIETNAM	VUNG_TAU	10.34°N	107.071°E
VIETNAM	HAI_PHONG	20.7°N	106.9°E

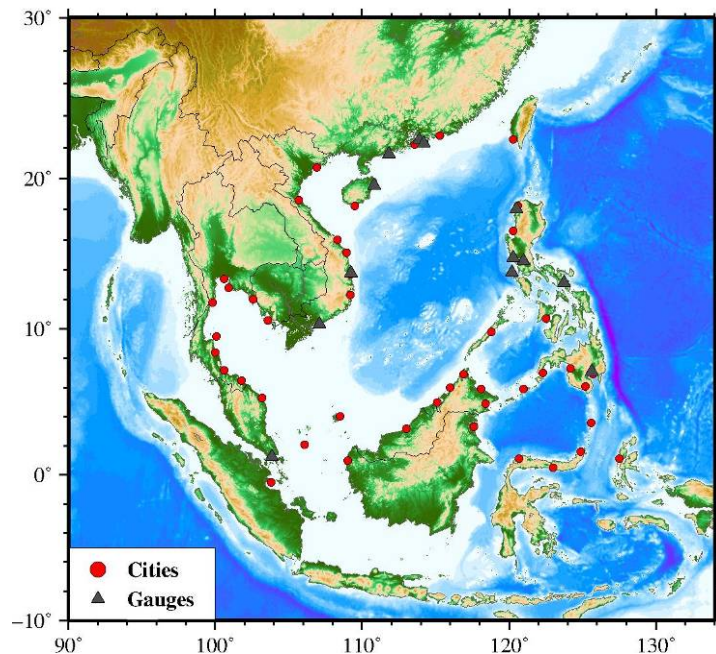


Figure Coastal Forecasting Points for the SCS advisory products

## ANNEX II. Templates of SCSTAC Tsunami Advisory Products

### ● M9.0 Scenario at the Manila Trench

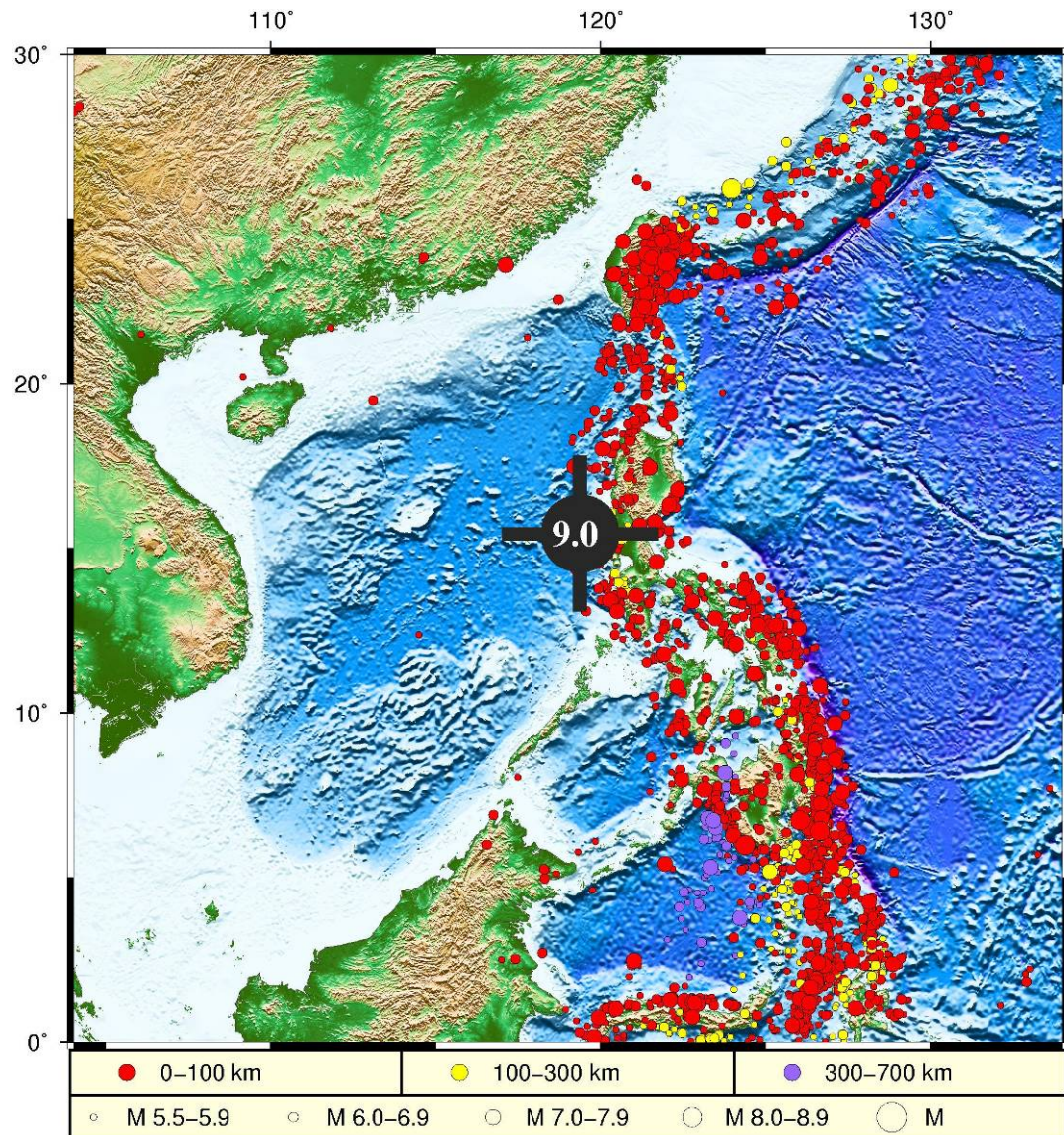


Figure II.1 Earthquake scenario in Manila Trench

### 1. Text Product

-----BEGINNING OF BULLETIN -----

WMO HEADING (To be determined)

TSUNAMI BULLETIN NUMBER 1

ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)

ISSUED AT 0110 UTC Feb 16 2017

...POTENTIAL TSUNAMI THREAT EXISTS FOR BRUNEI, CHINA, INDONESIA, MALAYSIA,  
PHILIPPINES, SINGAPORE, THAILAND, VIETNAM...

\*\*\*\* 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 9.0  
 \*ORIGIN TIME 0100 UTC Feb 16 2017  
 \*COORDINATES 15.44 N, 119.36 E  
 \*DEPTH 35.0 KM  
 \*LOCATION LUZON, PHILIPPINES

[ EVALUATION ]

THERE IS A POSSIBILITY OF A DESTRUCTIVE BASIN-WIDE TSUNAMI BASED ON AVAILABLE INFORMATION.

[ TSUNAMI AMPLITUDE AND ETA FORECASTS ]

FORECAST POINT	COORDINATES	ETA (UTC)	MAX. AMPL
-----			
BRUNEI			
MUARA	5.00 N, 115.10 E	0513	1-3M
CHINA			
QINGLAN	19.60 N, 110.90 E	0339	>3M
SANYA	18.20 N, 109.50 E	0350	1-3M
SHANWEI	22.75 N, 115.30 E	0442	>3M
ZHAPO	21.50 N, 111.80 E	0518	>3M
HONG_KONG	22.30 N, 114.20 E	0535	>3M
MACAO	22.20 N, 113.60 E	0559	>3M
SHENZHEN	22.50 N, 113.90 E	0639	1-3M
KAOSHIUNG	22.50 N, 120.30 E	0221	>3M
INDONESIA			
KEPULAUAN_RIAU	4.00 N, 108.50 E	0547	1-3M
MALAYSIA			
KOTA_KINABALU	6.00 N, 116.00 E	0409	1-3M
SANDAKAN	5.90 N, 118.10 E	0551	0.3-1M
LAHAD_DATU	4.90 N, 118.40 E	0622	0.3-1M
BINTULU	3.20 N, 113.00 E	0623	1-3M
K_TERENGGANU	5.30 N, 103.20 E	1047	0.3-1M
PHILIPPINES			
SAN_FERNANDO	16.60 N, 120.30 E	0133	>3M
CURRIMAO	18.00 N, 120.40 E	0134	>3M



LUBANG	13.80 N,120.20 E	0136	>3M
LAOAG	18.20 N,120.60 E	0143	>3M
SUBIC_BAY	14.82 N,120.30 E	0211	>3M
ILOILO	10.70 N,122.50 E	0303	1-3M
MANILA	14.60 N,121.00 E	0328	>3M
PUERTO_PRINCESA		9.80 N,118.80 E	03331-3M
MAIMBUNG	5.90 N,121.00 E	0412	0.3-1M
SINGAPORE			
SINGAPORE	1.30 N,103.90 E	1306	0.3-1M
THAILAND			
NARATHIWAT	6.50 N,101.80 E	1315	0.3-1M
PATTANE	7.00 N,101.30 E	1410	0.3-1M
VIETNAM			
QUI_NHON	13.70 N,109.20 E	0334	>3M
NHA_TRANG	12.30 N,109.20 E	0404	>3M
DA_NANG	16.00 N,108.30 E	0424	>3M
VUNG_TAU	10.34 N,107.07 E	0636	1-3M
VINH	18.60 N,105.70 E	0832	1-3M
BAC_LIEU	9.30 N,105.80 E	1027	0.3-1M

-----

\* THIS LIST IS GROUPED BY COUNTRIES, AND COUNTRY NAMES IS ORDERED ACCORDING TO THREAT LEVELS.

\* ETA - ESTIMATED TSUNAMI ARRIVAL TIME FOR INITIAL WAVE. NOTING THAT IN SOME COASTAL AREA 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, WHICH ARE 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 THE LARGEST, AND WAVE ACTIVITIES MAY VARY SIGNIFICANT ALONG COASTS DUE TO LOCAL FEATURES.

#### [ RECOMMENDED ACTIONS ]

\* LOCAL AUTHORITIES SHOULD PAY CLOSE ATTENTION ON THEIR NATIONAL TSUNAMI WARNING CENTER'S EVALUATION 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 [WWW.SCSTAC.ORG](http://WWW.SCSTAC.ORG).

\* TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER AND NORTHWEST PACIFIC TSUNAMI ADVISORY CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.

\* TEL: +86-10-62104561

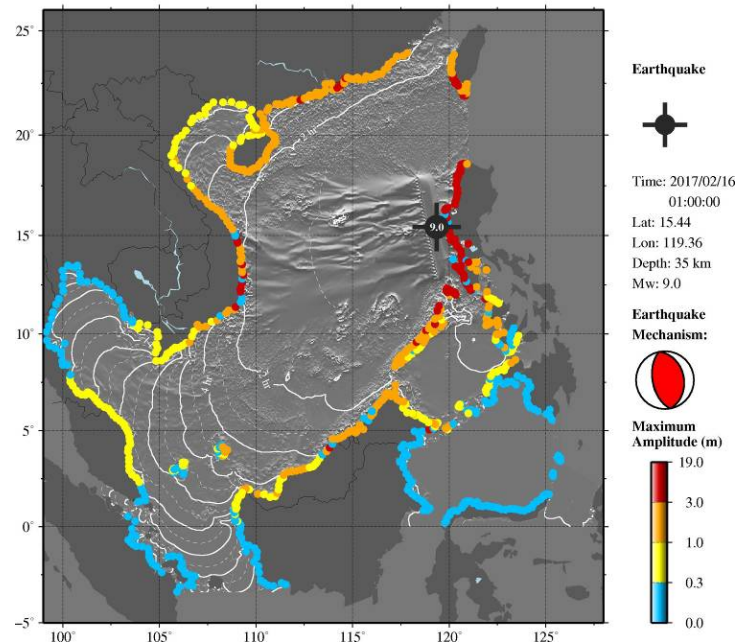
\* EMAIL: TSU@NMEFC.GOV.CN

-----END OF BULLETIN-----

## 2. Graphic Products

### SCS Coastal Tsunami Maximum Amplitude

Actual amplitudes at the coast may vary from forecast amplitudes due to uncertainties in the forecast and local features.



### SCS Deep-Ocean Tsunami Amplitude Forecast

This map should not be used to estimate coastal tsunami amplitudes or impacts. Deep-ocean amplitudes are usually much smaller than coastal amplitudes.

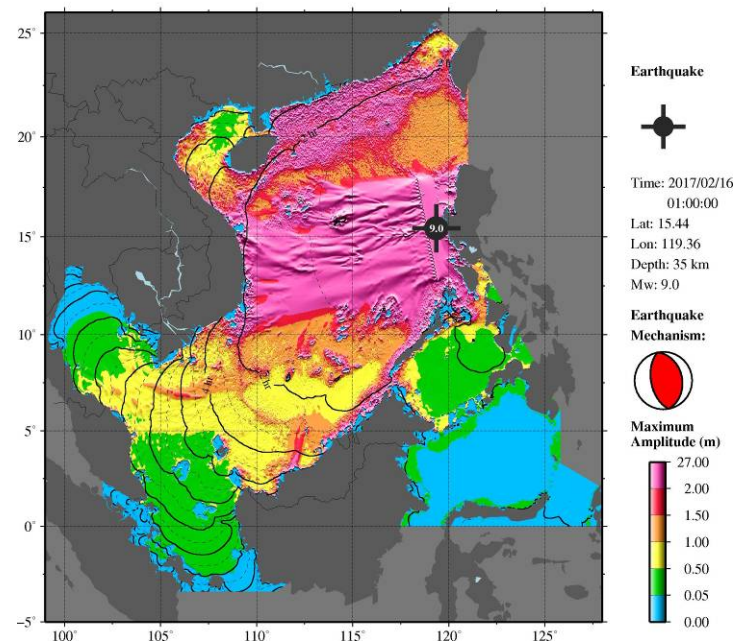


Figure II.2 Coastal Amplitude Map (a) and Tsunami Energy Map (b).

### ANNEX III. Master Schedule of Events Lists

Scenario →	Manila Trench						North Sulawesi Trench	
Center →	PTWC		NWPTAC		SCSTAC		SCSTAC	
Date & Time (UTC)	#	TYP	#	TYP	#	TYP	#	TYP
15 Feb 1400								
1407								
1435								
1500								
1600								
1700								
1800								
1900								
2000								
2100								
2107								
<b>2120</b>								
2135								
<b>2140</b>								
2200								
2300								
<b>2310</b>								
16 Feb 0000								
<b>0010</b>								
0100	Quake						Quake	
0107	1	TI					1	TI
<b>0120</b>			1	TI	1	TI		
0135	2	TFR					2	TFR
<b>0140</b>			2	TFR	2	TFR		
0200	3	TFP						
0230	4	TFH					3	TS
0300	5	TS						
<b>0310</b>			3	TS	3	TS		
0400	5	TS					4	TS
<b>0440</b>			4	TS	4	TS		
0500	6	TS						
0600	7	TS					5	TS
<b>0610</b>			5	TS	5	TS		
0700	8	TS						
<b>0740</b>			6	TS	6	TS		
0800	9	TS					6	TS
0900	10	TS						
<b>0910</b>			7	TS	7	TS		
1000	11	TS						
<b>1040</b>			8	TS	8	TS		
1100	12	TS						
1200	13	TS						
<b>1210</b>			9	TS	9	TS		
1300	14	TS					7	TL
<b>1340</b>			10	TS	10	TS		
1400	15	TS						
1500	16	TS						
<b>1510</b>			11	TS	11	TS		
1600	17	TS						
<b>1640</b>			12	TS	12	TL		
1700	18	TL						
1800								
1900								
2000								
2100								
2200								
2300								
17 Feb 0000								
0100							26	TL



Message Types: TI = PTWC/NWPTAC/SCSTAC Initial Text Message  
TFR = PTWC/NWPTAC/SCSTAC text Message with a Forecast for the Regional near  
the Earthquake  
TFP = PTWC Products with a Pacific-wide Forecast  
TFH = PTWC Products with a Forecast for Shallow Marginal Seas (High-Resolution  
Forecast Model Run)  
TS = PTWC/NWPTAC/SCSTAC Text Message with Tsunami Observations  
TL = PTWC/SCSTAC Last Message for this Event

Note 1) Dummy messages will be issued at the time of the earthquake for each scenario.

Note 2) Participating countries may shift the schedule to adapt it to their own timetable.

## ANNEX IV. Post-Exercise Evaluation Form

As a part of the Post-Exercise Evaluation Forms for the PacWave 17, this form is used to highlight the feedback of NTWCs and TWFPs on the SCSTAC Tsunami Advisory Products. All participating countries in the SCS region are asked to complete the Evaluation Form by 27 February 2017. So a preliminary summary report can be drafted to report on the 6<sup>th</sup> SCS Regional Working Group Meeting scheduled on 1-3 March 2017.

Any questions on the evaluation form or SCSTAC tsunami advisory products can reach Dr. Ye Yuan at SCSTAC by email:

Ye Yuan (email: [yuanye@nmefc.gov.cn](mailto:yuanye@nmefc.gov.cn); [yuanye\\_ouc@163.com](mailto:yuanye_ouc@163.com))

### OBJECTIVE 1

*Test communications from the SCSTAC Tsunami Service Providers to SCS Member States.*

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
1.1	Did your country Tsunami Warning Focal Point receive the kick-off message on Exercise from SCSTAC?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2	If yes, when did you receive the message(s)?	Please state the time:			
1.3	How did you receive the message(s)?  <input type="radio"/> Fax  <input type="radio"/> Email	Please list how you received the message			

### OBJECTIVE 2

*Evaluate the format and content of the SCSTAC Tsunami Advisory Products*

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
2.1	Are the SCSTAC Tsunami Advisory Products (including Text Message and Graphical Products) useful in helping you assess your	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
	<p>national tsunami threat? Please specify the reason if you think it is not useful.</p> <ul style="list-style-type: none"> <li>Text Message with forecasts on Coastal Forecast Points</li> <li>Tsunami Energy Map with Tsunami Travel Time contours overlapped</li> <li>Coastal Amplitude Forecast Map with Tsunami Travel Time contours overlapped</li> </ul>				
2.2	<p>Please rank the usefulness of each product, where 1 denote most useful, whereas 3 denote least useful. Please mark in the Comment Column.</p> <ul style="list-style-type: none"> <li>Text Message with forecasts on Coastal Forecast Points</li> <li>Tsunami Energy Map with Tsunami Travel Time contours overlapped</li> <li>Coastal Amplitude Forecast Map with Tsunami Travel Time contours overlapped</li> </ul>	Y	N	C	NA
2.3	<p>Which pathways does your institution/agency prefer to receive the SCSTAC products?</p> <ul style="list-style-type: none"> <li>Fax for Text Message</li> <li>Email for Text Message and Graphical Products</li> <li>Password-protected Website for Text Message and Graphical Products</li> <li>GTS for Text Messages</li> <li>Dedicated software to receive the products and alert the watchstander, like CISN</li> </ul>	Y	N	C	NA
2.4	<p>Is your institution/agency satisfied with the format and content of the SCSTAC Tsunami Advisory Products? Indicate Yes or No. If No, please specify the advice on improvement.</p> <ul style="list-style-type: none"> <li>Text Message with forecasts on Coastal Forecast Points</li> </ul>	Y	N	C	NA

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
	<div><div>_____.</div><div>_____.</div><div><div>Tsunami Energy Map with Tsunami Travel Time contours overlapped</div><div>_____.</div><div>_____.</div></div><div><div>Coastal Amplitude Forecast Map with Tsunami Travel Time contours overlapped</div><div>_____.</div><div>_____.</div></div></div>				
2.5	<div>Do you have any suggestions or comments, other than those listed above, to help us improve the SCSTAC Tsunami Advisory Products? If Yes, please comment.</div> <div><div>_____.</div><div>_____.</div></div>	Y	N	C	NA

### OBJECTIVE 3

*Test whether the SCSTAC Tsunami Advisory Products are interpreted by SCS Regional Member States accurately and in a timely manner.*

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
3.1	Was the SCSTAC Tsunami Advisory Products understood by the National Tsunami Warning Centre (NTWC)/National Disaster Management Office (NDMO).	Y	N	C	NA

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
3.2	The SCSTAC Tsunami Advisory Products do assisted with decision making, e.g., warning levels, earthquake parameters, estimated arrival times, forecast wave heights, etc.	Y	N	C	NA
3.3	Is NTWC/NDMO prepared to receive and utilize the SCSTAC Tsunami Advisory Products in later 2017 while the SCSTAC start its trial operation. <ul style="list-style-type: none"> <li>• Currently ready</li> <li>• Will be ready</li> <li>• Need to revise current Standard Operating Procedures (SOP)</li> <li>• Need to conduct a SCS sub-regional training workshop on SCSTAC operations and products</li> </ul>	Y	N	C	NA