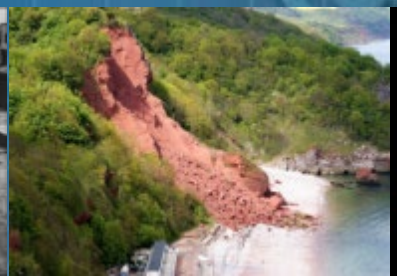
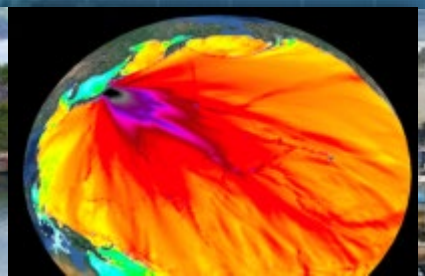
Tenth meeting of the ICG/PTWS Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea Region (ICG/PTWS WG-SCS), 28 & 30 September 2021 (0700-0830 UTC, online)

Tsunami Warning System and Services in China

National Progress Report in 2020~2021

National Tsunami Warning Center,

***Ministry of Natural Resources*, P. R. China**

Outlines

1. Earthquake Detecting and Sea Level Monitoring Capability

2. Tsunami Warning Technologies

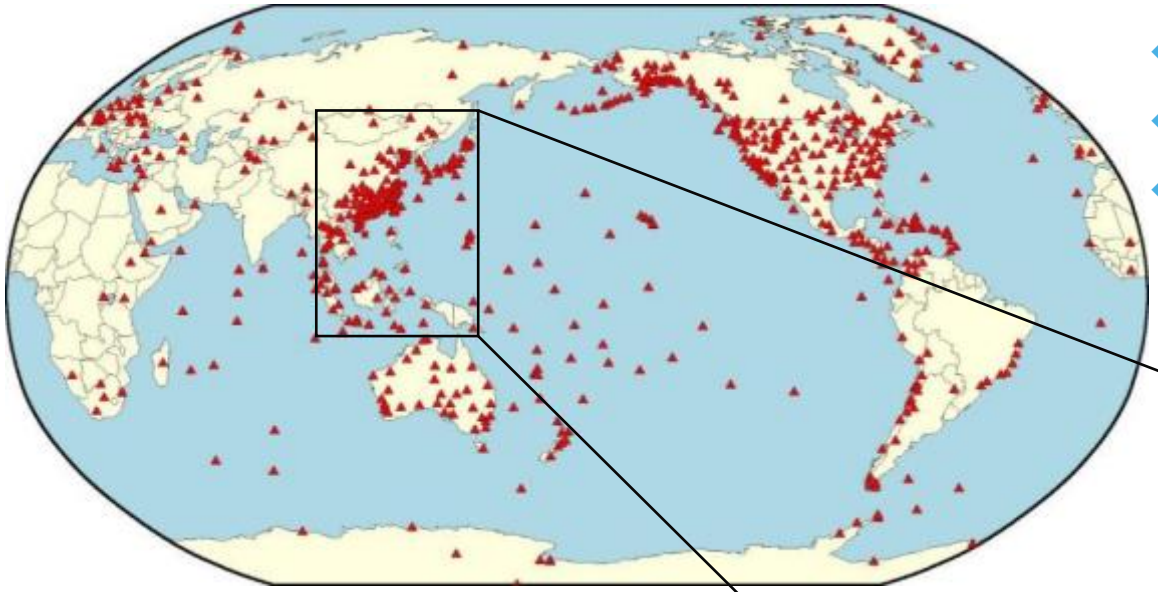
3. Tsunami Messages Dissemination

4. Mitigation and Others

1. Earthquake Detecting and Sea Level Monitoring Capability

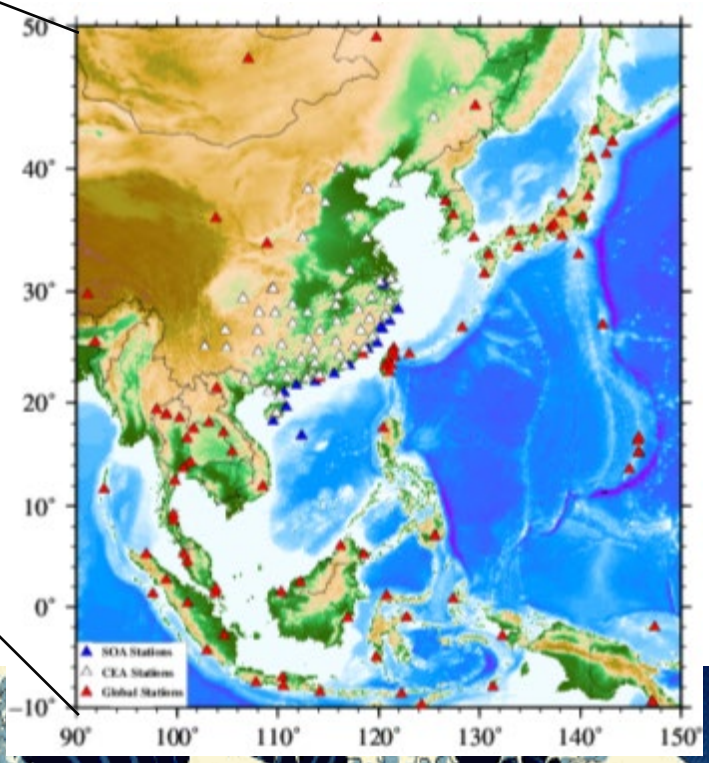
1.1 Global and Regional Seismic Monitoring

Global Seismic Station



- Antelope
- SeisComp3
- CEA EQIM
- PTWC, USGS earthquake info.: via GTS, FAX and Email

Regional Seismic Networks

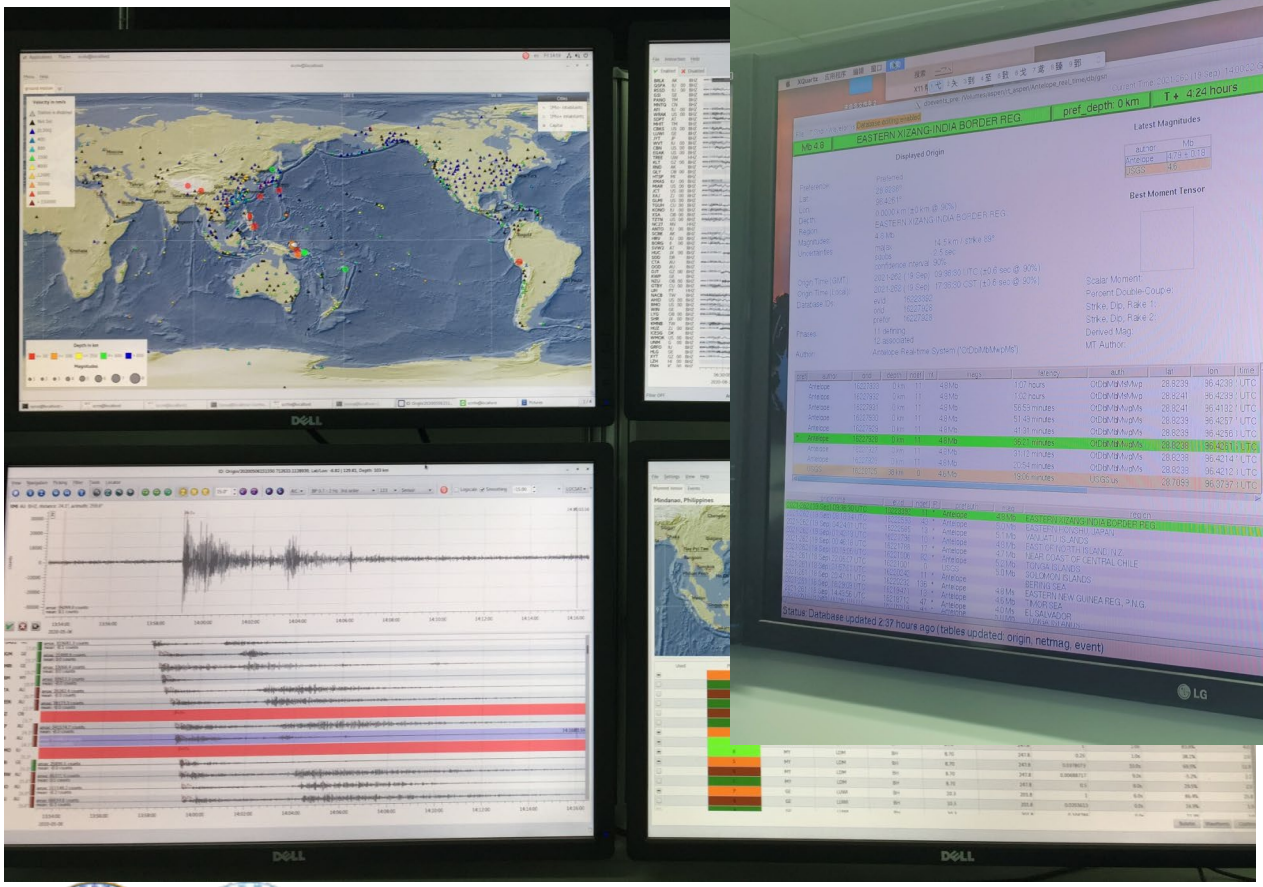


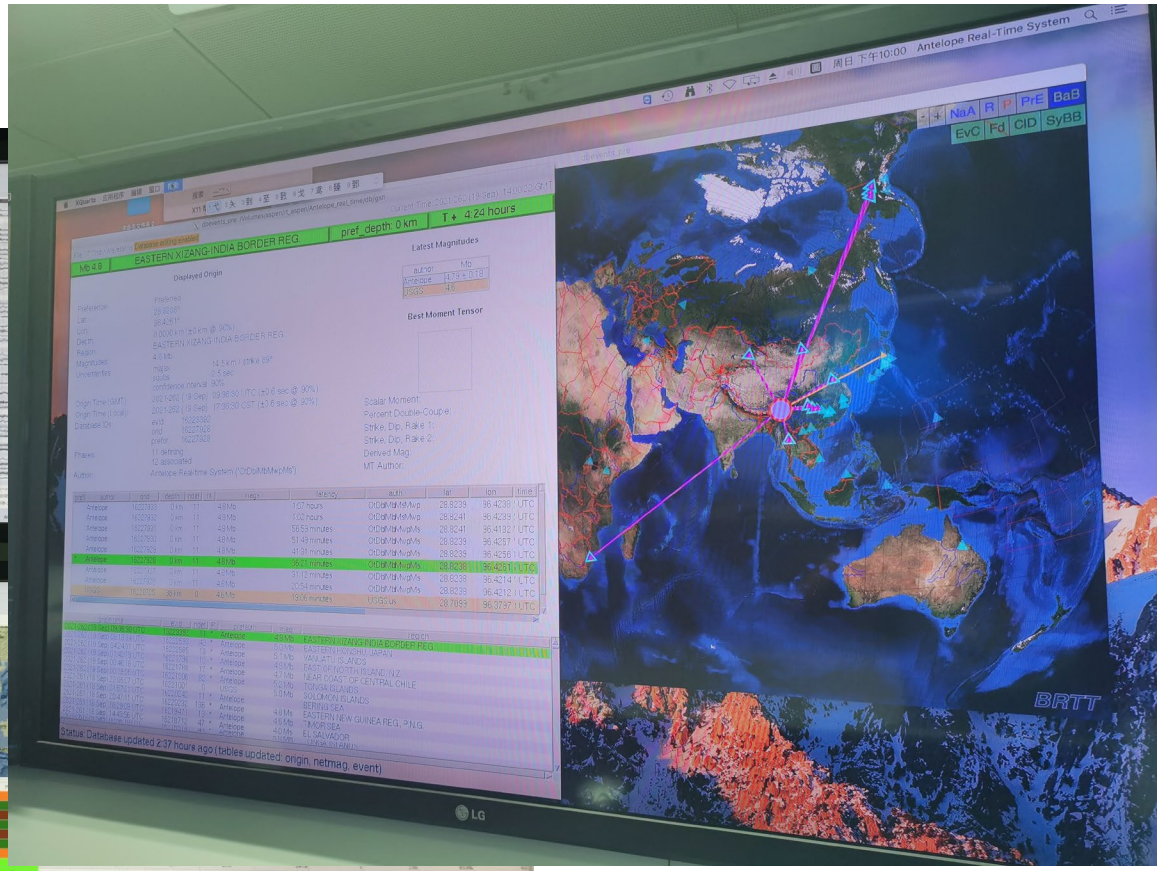
Real-time, broadband seismic waveform data from:

- MNR(27)
- CEA(54)
- IRIS + GEOFON+GEOSCOPE (~580)

1.2 Seismic Analysis and Earthquake Detecting

SeisComp3 with CMT module

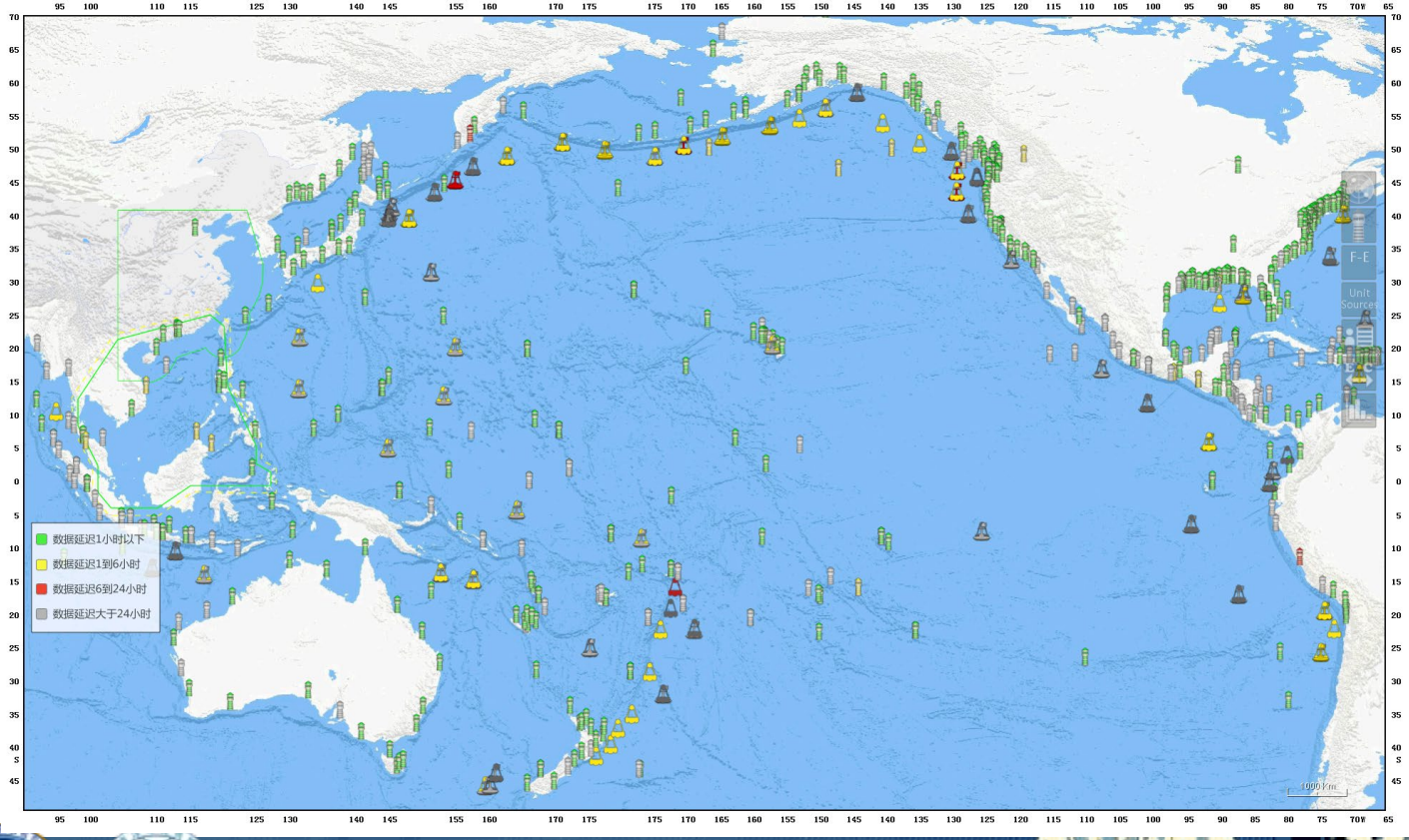




Antelope

1.3 Global Real-time Sea-level Dataset

- Real-time sea-level data from nearly **600** functional tidal gauges and Dart bouys via GTS and from sea-level monitoring facility website
- Metadata file and Tide Tool update following PTWC's Emails



Added

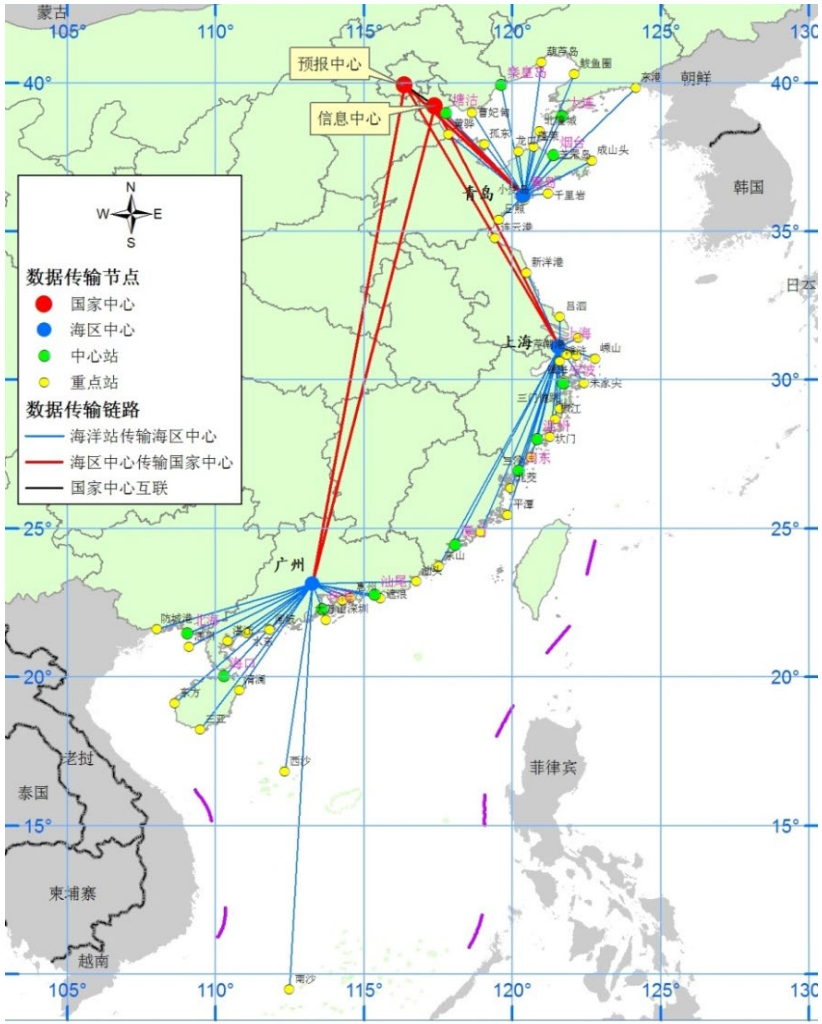
Tidal gauge(21):

Karachi Pakistan
Kerguelen Island
Mar del Plata
Fort Stanley
Cape Disappointment
Martinez-Amorco Pier
Imbituba
haif Haifa Israel
zygi Zygi Cyprus
ohig O'Higgins
Chuuk
Australia(10)

Dart Buoy(12):

Dnzd(NZ), dnzb(NZ)
Dnzj(NZ), dnzf(NZ)
Dnzk(NZ), dnzg(NZ)
Dnzl(NZ), dnzh(NZ)
Dryu(JP), dnzi(NZ)
Dhai(CA), Dat2

1.4 China Real-time Sea Level Monitoring

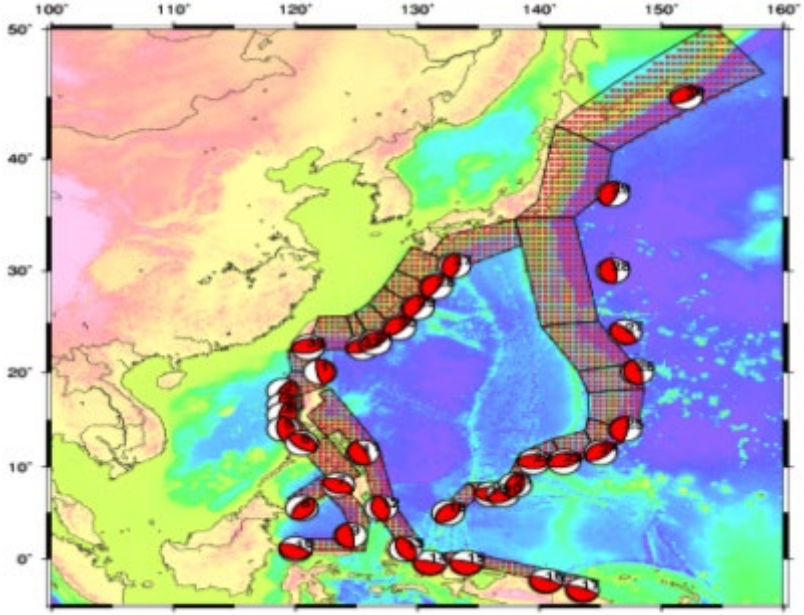


- 130~ tidal gauges along the Chinese coasts
- Data sharing via GTS for tsunami warning and mitigation system in the SCS region:
  - ✓ Shenzhen
  - ✓ Zhapo
  - ✓ Qinglan
  - ✓ Quarry Bay
  - ✓ Shek

2. Tsunami Warning Technologies

2.1 Two Sets of Tsunami Database

NW Pacific Scenario Database



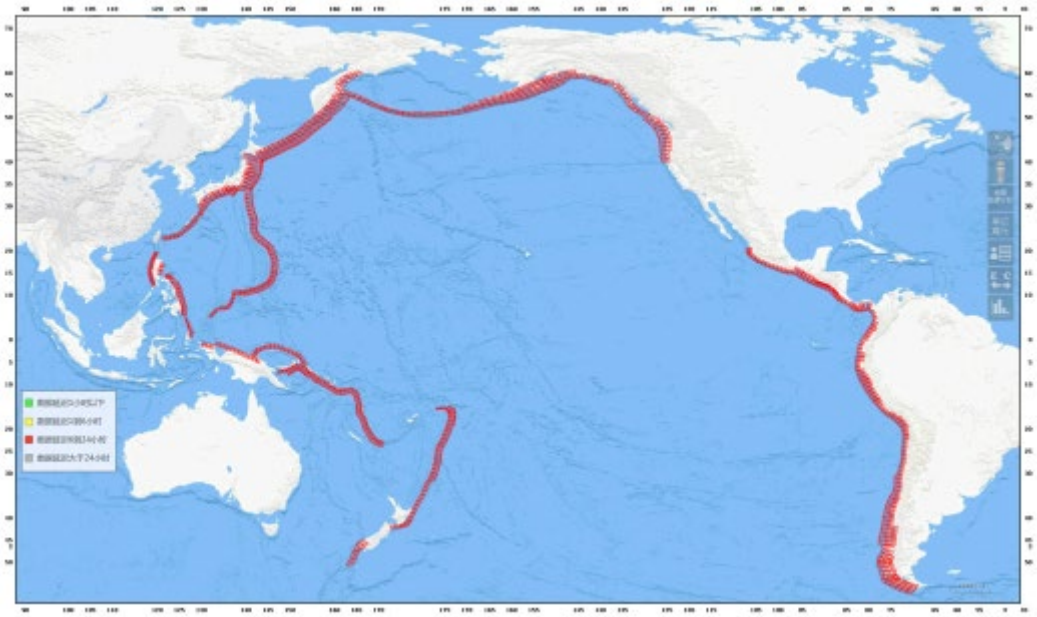
Source Coverage:

37 partitions, 1671 sources

Resolution: 0.5° ×0.5°

Totally: 60,156 tsunami scenarios

The Pacific Unit Source Database



Source Coverage:

Length: 100 km

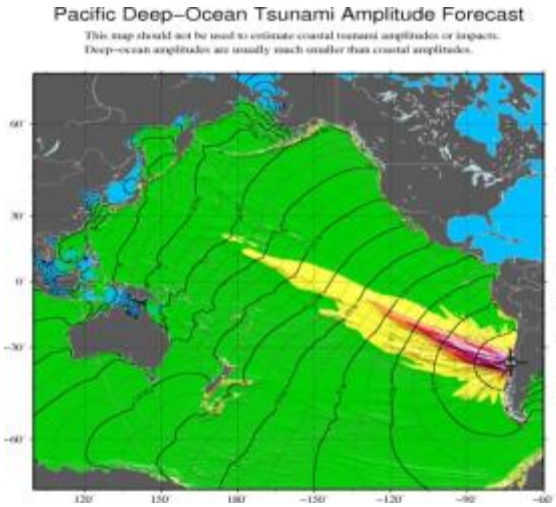
Width: 50 km

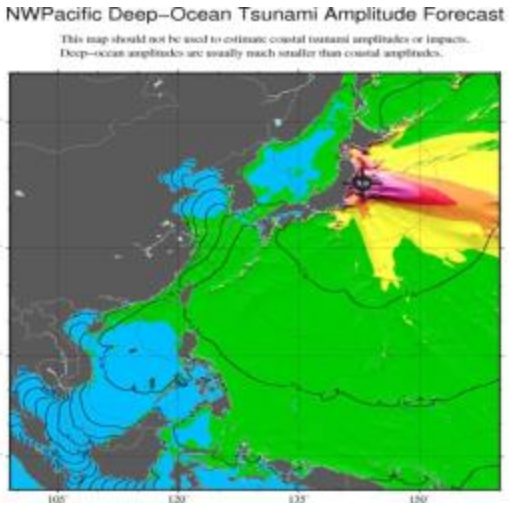
Totally: 1391 unit sources

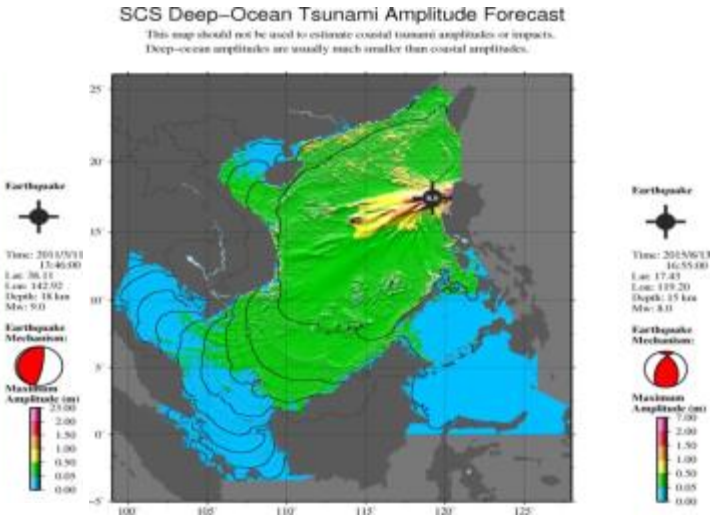
2.2 On-the-Fly Tsunami Forecast Model

Linear shallow water equation running performance on NVIDIA Tesla V100(GPU)

Forecast region	Space resolution	Forecast period (hours)	Consuming time (seconds)			Efficiency promotion	
			Series	OpenMP	GPU	OpenMP	GPU
Pacific Ocean	5 arc-min	32	6070	410	**45**	15	**135**
NW Pacific Ocean	4 arc-min	15	450	32	**4**	14	**113**
South China Sea	2 arc-min	15	467	31	**4**	15	**117**

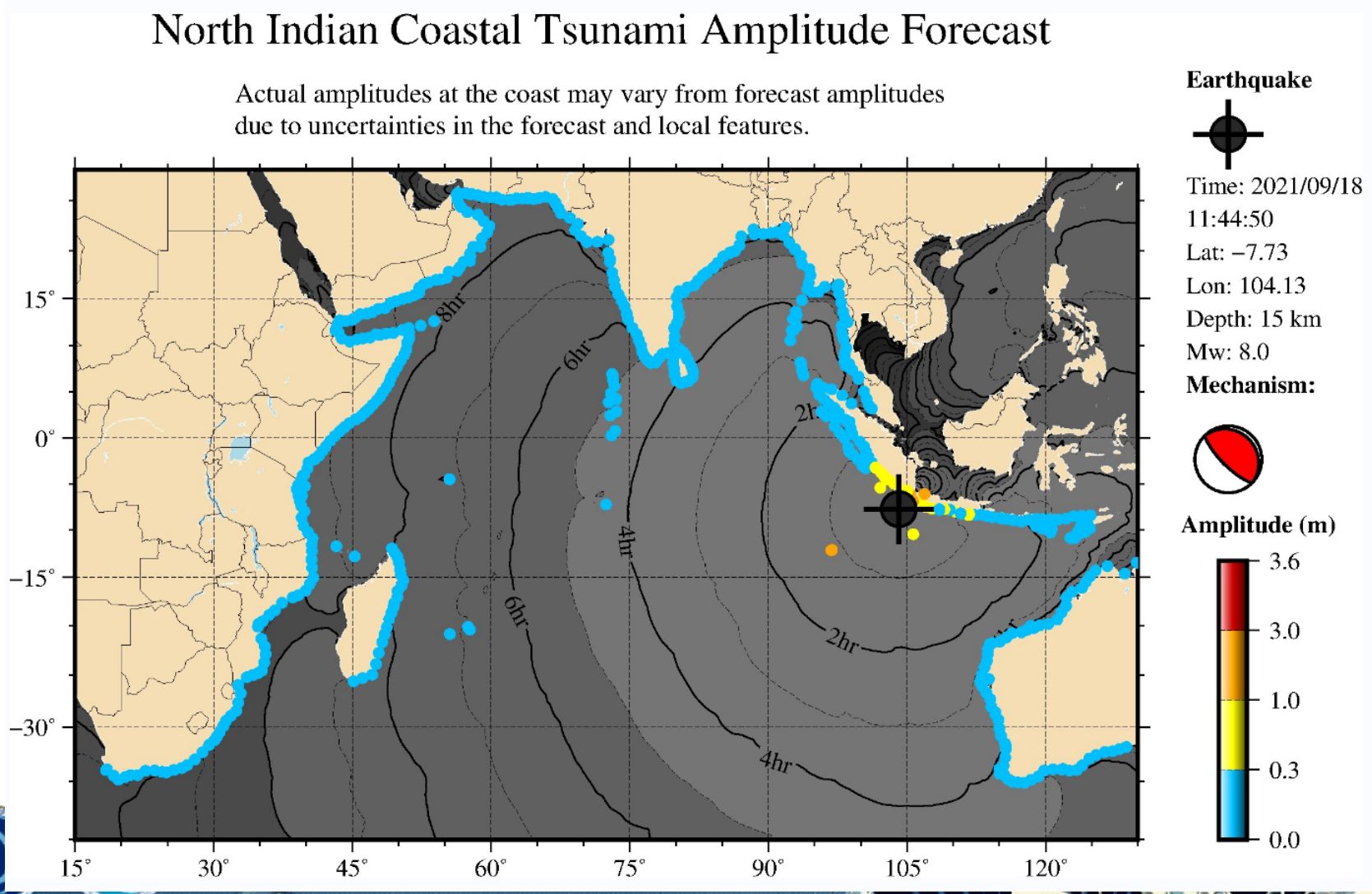






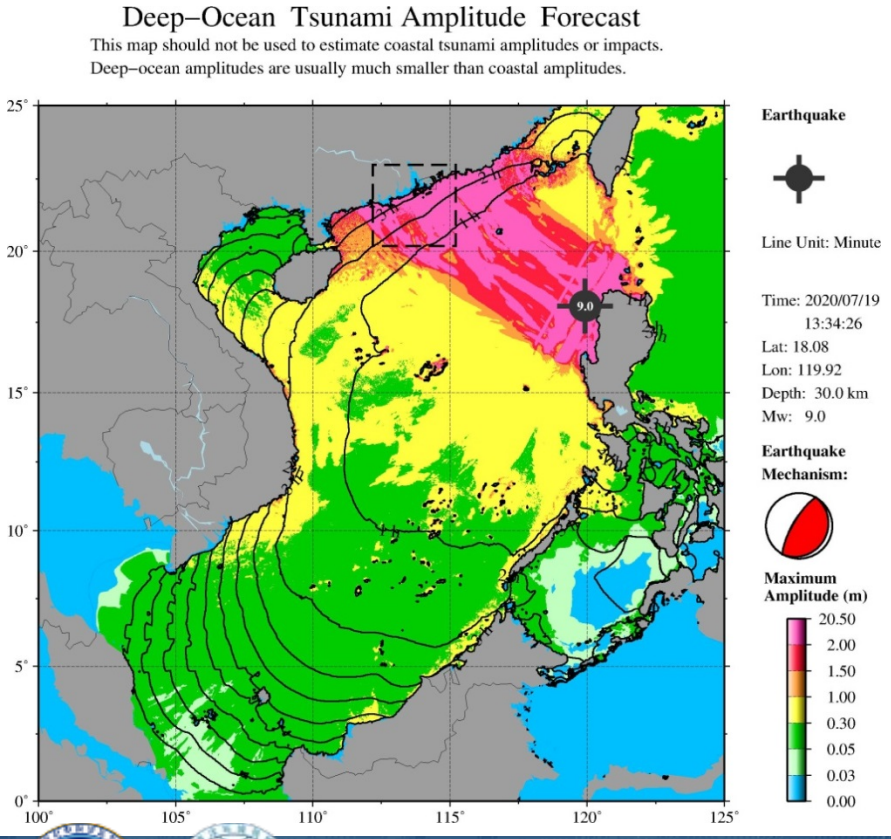
2.2 Tsunami Forecast in the North Indian Ocean

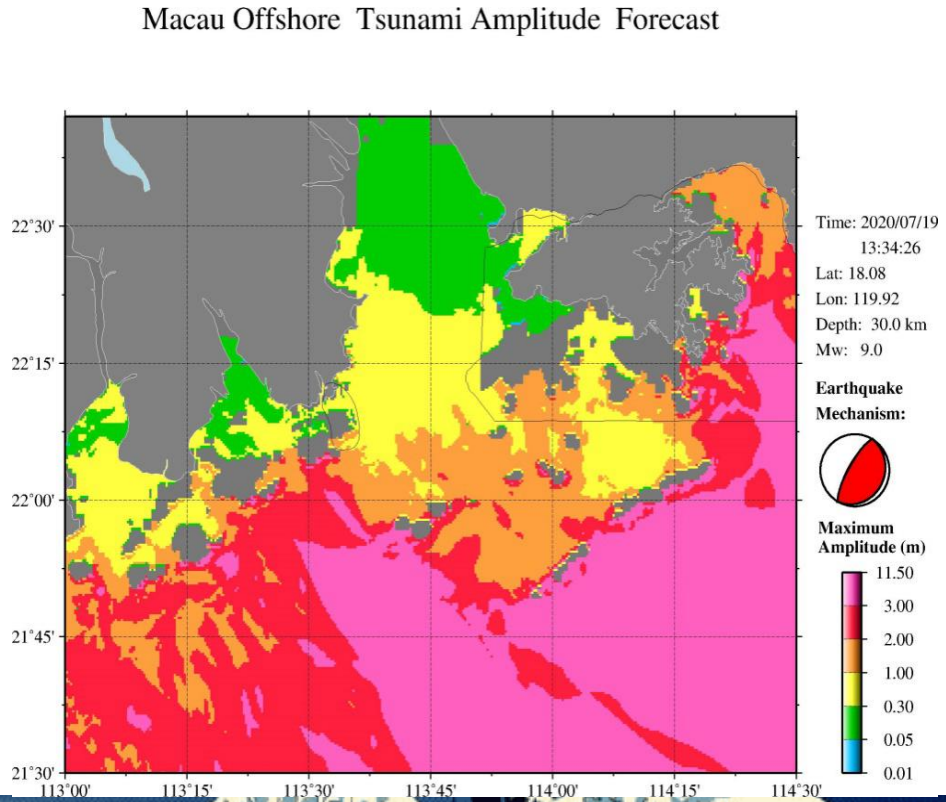
http://www.oceanguide.org.cn/hyyj/silkRoad/silkRoadMain.htm.



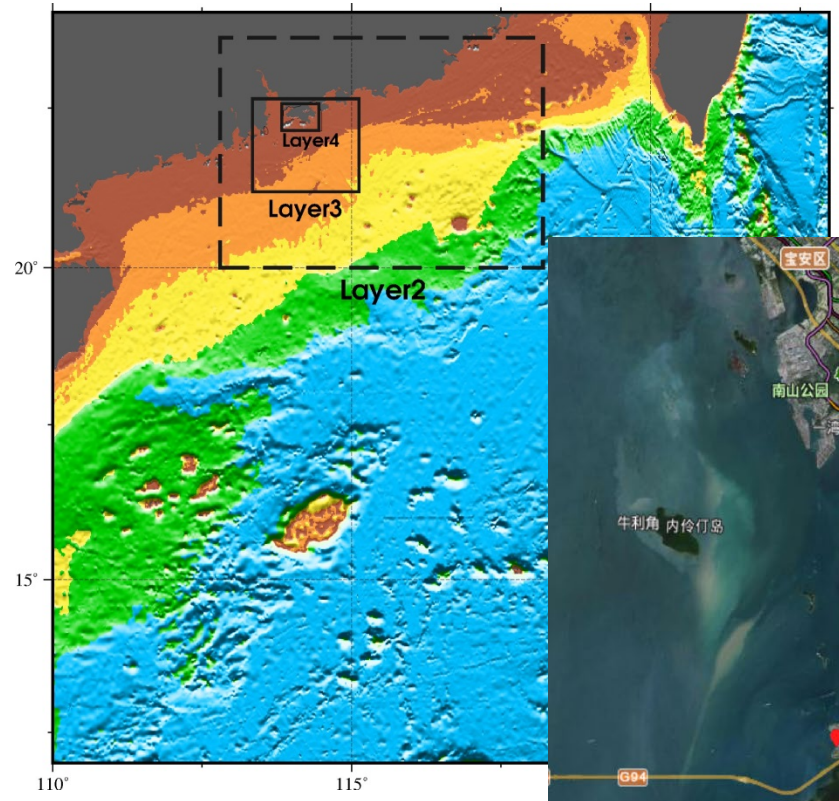
2.3 Refined model for Macau

- Two-layer nested model with 15 arc-sec grid space
- Time consuming less than 150 s





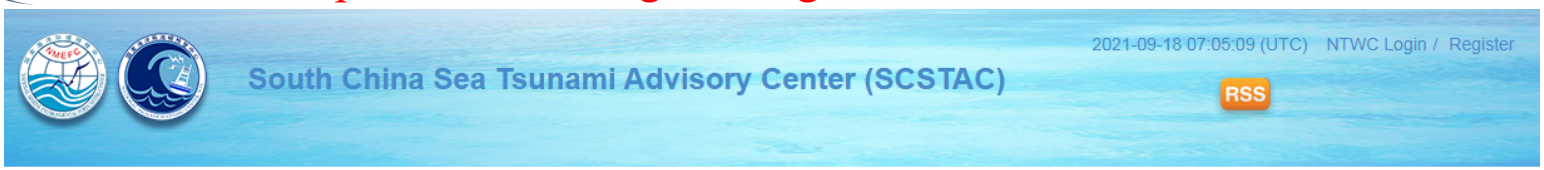
2.4 Refined model for Hong Kong



- Four-layer nested model with 90 m grid space
- Time consuming less than 3 minutes

2.5 UNESCO/IOC SCSTAC Website

http://scstac.oceanguide.org.cn/scstac/index.htm

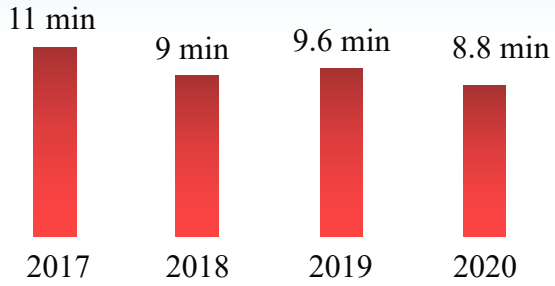


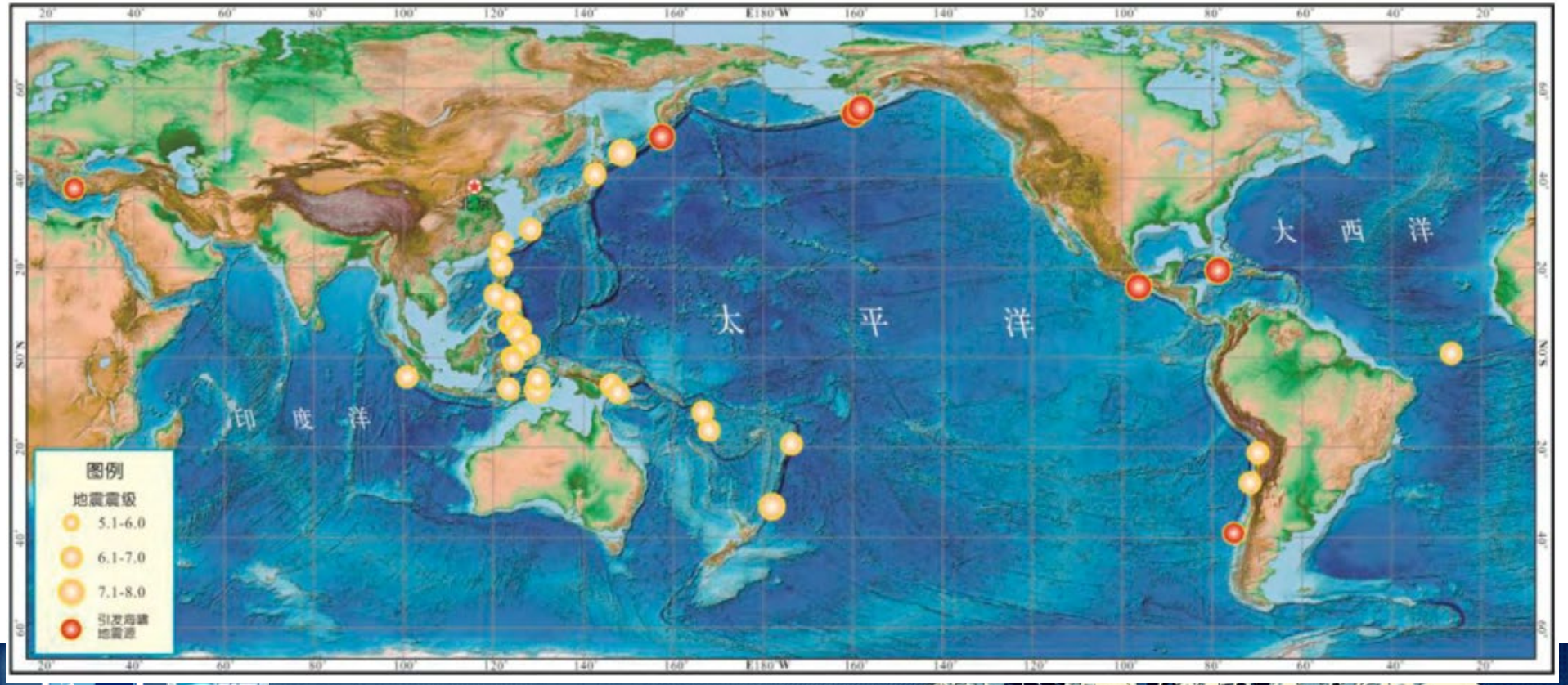
No	Mag	Origin (UTC)	Depth (km)	Lon (°)	Lat (°)	Location	Message
1	6.6	2021-07-26 12:09:00	30.0	122.06°E	0.81°S	SULAWESI, INDONESIA	Detail..
2	6.9	2021-07-23 20:49:00	104.3	120.50°E	13.80°N	MINDORO, PHILIPPINES	Detail..
3	6.1	2021-07-10 00:43:00	70.0	126.78°E	3.19°N	TALAUD ISLANDS, INDONESIA	Detail..
4	6.2	2021-06-03 10:09:00	15.0	126.33°E	0.40°N	NORTHERN MOLUCCA SEA	Detail..
5	6.2	2021-04-10 09:30:00	314.0	124.77°E	4.19°N	TALAUD ISLANDS, INDONESIA	Detail..
6	6.0	2021-02-07 04:22:00	20.0	125.26°E	6.84°N	MINDANAO, PHILIPPINES	Detail..
7	6.2	2021-01-06 20:59:00	183.7	122.89°E	0.02°S	MINAHASSA PENINSULA, SULAWESI	Detail..
8	6.5	2020-12-24 23:43:00	90.0	120.52°E	13.92°N	LUZON, PHILIPPINES	Detail..
9	6.4	2020-12-15 23:22:00	15.0	125.51°E	5.28°N	MINDANAO, PHILIPPINES	Detail..
10	6.4	2020-09-06 15:23:00	98.2	125.97°E	6.36°N	MINDANAO, PHILIPPINES	Detail..

3. Tsunami Message Dissemination

Major Earthquake and Tsunami in 2020

- Responded to 37 major Earthquakes
- Issued 62 tsunami information bulletins
- with average latency of 8.8 **mins** for the first message





Kermadec Island earthquake tsunami *in 2021*

EQ Time: 19:28 UTC Mar. 4

Max. Tsunami: Kingston Norfolk IS. 2239(UTC) 56 cm

	NTWC of China	PTWC	USGS
*M*w	7.9(first)	8.0(first)	8.1(final)
Location	29.57 N, 176.71 W	29.6 S, 176.0 W	29.723 S, 177.279 W
Depth	15 km	10 km	28.9 km
Latency(First)	15 min	9 min	/

Data source:

http://www.nmefc.cn/haixiao/haixiaoxxdetail.aspx?id=202103050343.html
https://ntwc.ncep.noaa.gov/events/PHEB/2021/03/04/21063003/1/WEPA40/WEPA40.txt
https://earthquake.usgs.gov/earthquakes/eventpage/us7000dflf/executive

Alaska Penensula earthquake tsunami *in 2021*

EQ Time: 06:16 UTC July 29 2021

Max. Tsunami: Sand Point ~ 51 cm (*the fourth crest*)

	NTWC of China	PTWC	USGS
*M*w	8.0(first)	8.1(first)	8.2(final)
Location	55.42 N, 157.78 W	55.5 N, 157.9 W	55.364 N, 157.888 W
Depth	15 km	17 km	35 km
Latency(First)	16 min	8 min	/

Data source:

http://www.nmefc.cn/haixiao/haixiaoxxdetail.aspx?id=202107291433.html
https://ntwc.ncep.noaa.gov/events/PHEB/2021/07/29/21210001/1/WEPA40/WEPA40.txt
https://earthquake.usgs.gov/earthquakes/eventpage/ak0219neiszm/executive

Mexico Guerrero earthquake tsunami *in 2021*

EQ Time: 0148 UTC Sep. 8

Tsunami: Acapulco Mexico 0204(UTC) 0.48 m

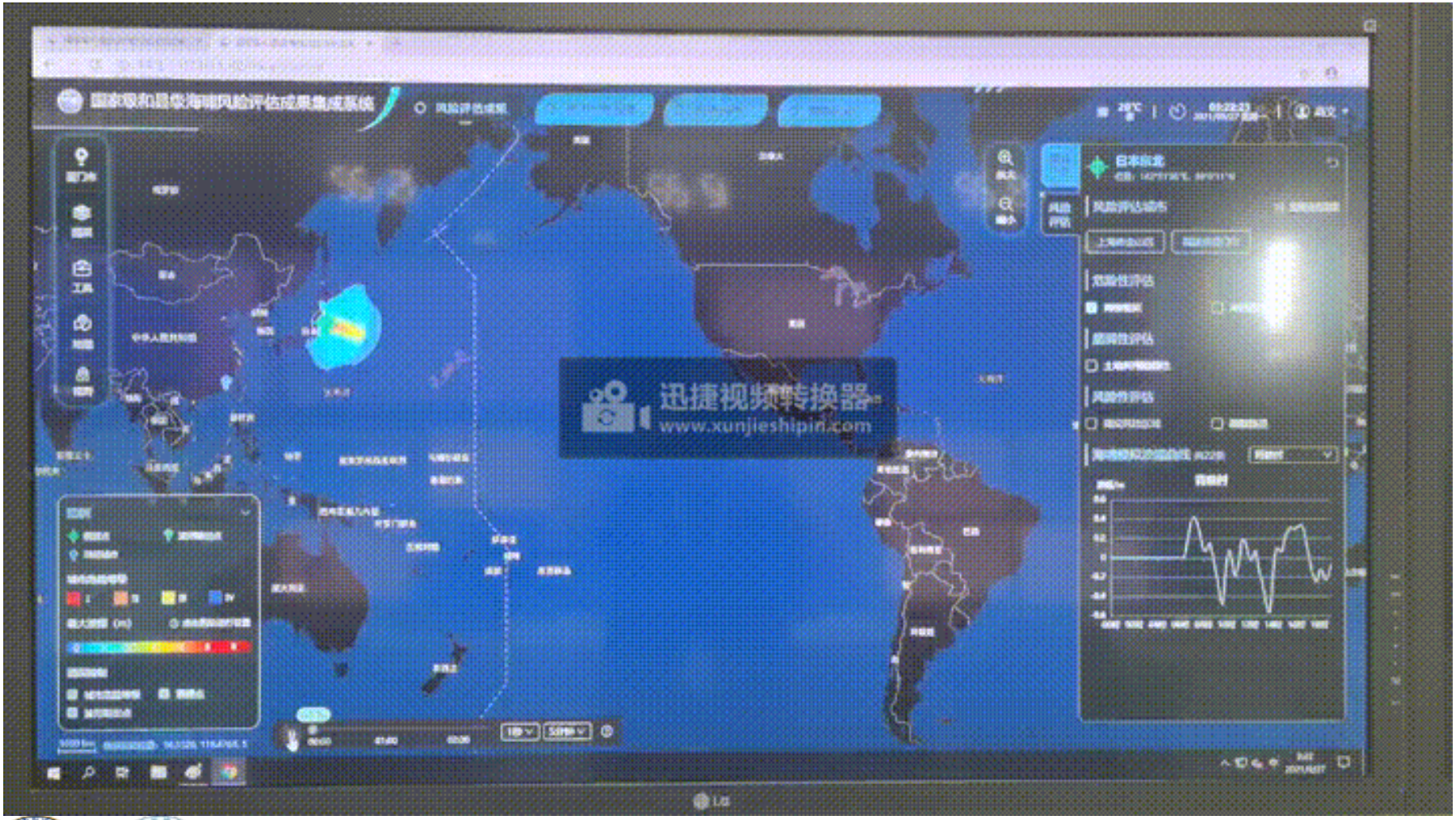
	NTWC of China	PTWC	USGS
*M*w	6.9(first)	7.4(first)	7.0(final)
Location	17.31 N, 99.27 W	17.1 N, 99.6°W	16.982 N, 99.773 W
Depth	15 km	50 km	20 km
Latency(First)	8 min	9 min	/

Data source:

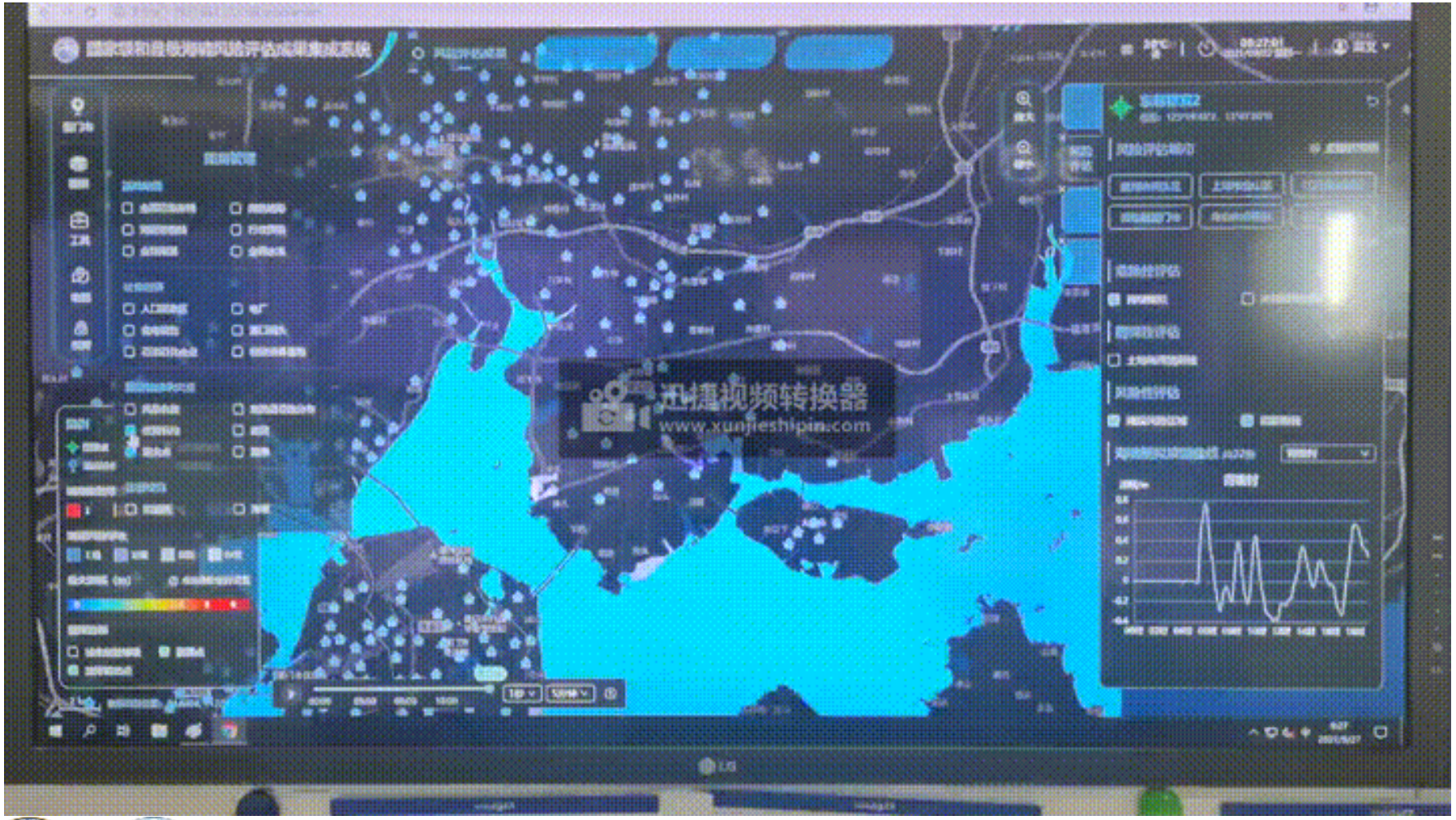
http://www.nmefc.cn/haixiao/haixiaoxxdetail.aspx?id=202109080956.html
https://ntwc.ncep.noaa.gov/events/PHEB/2021/09/08/21251050/1/WEPA40/WEPA40.txt
https://earthquake.usgs.gov/earthquakes/eventpage/us7000f93v/executive

4. Mitigation and Others

4.1 Tsunami Hazard Assessment System



4.1 Tsunami Hazard Assessment System



4.2 Domestic Tsunami Desk Exercise, Nov. 5 2020

Hypothesis Source: Earthquake with *M*w9.0 in Ryukyu trench
Warning: Catastrophic impact in Jiangsu, Shanghai, Zhejiang and Fujian
Dissemination: Warning Mes. Sent and Received Effectively in 10 minutes

4.3 Back-up Service Center Construction

◆Back-up SCSTAC(Hong Kong)

✓ Hardware and software construction

✓ Earthquake and tsunami detection evaluation

➢ Operation mechanism(*Discussing and evaluating*)

➢ SOP training for watch-stander of HKO(*Preparing*)

香港天文台 HONG KONG OBSERVATORY

臨近預報區域專業氣象中心 RSMC for Nowcasting

WMO

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

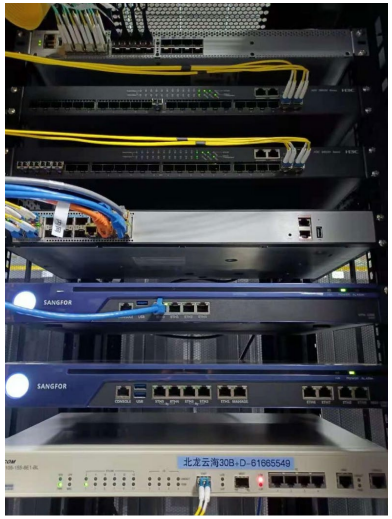
unesco

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)

◆ Back-up Tsunami Warning Center (Shunyi District, Beijing)

✓ Hardware and software construction

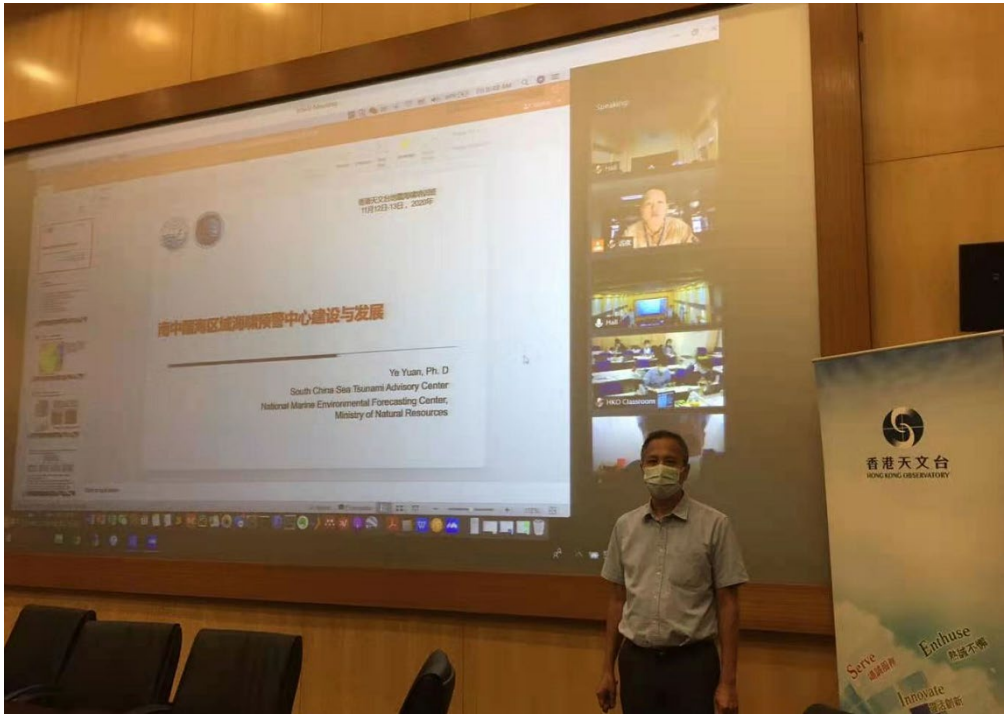
✓ Running in stand-by state



4.4 Training for HKO Staff, Nov. 12-13 2020

- Basic Earthquake and Tsunami knowledge
- Tsunami Warning Technology
- Tsunami DSS and Routine Operation

On-line



4.5 National Prevention and Mitigation Day

自然资源部举办“5·12全国防灾减灾日自然资源云讲堂”直播活动

2020-05-12　来源：自然资源部门户网站　作者：谢敏　【字号：大 中 小】【打印】【关闭】　分享到：

Network Cloudy Publicity of Tsunami Hazard

4.5 World Oceans Day in 2020

Network Broadcast about Tsunami Science And Alleviation Knowledge

4.5 World Oceans Day in 2021, Primary School

Thank You!