

Tsunami Warning, Mitigation and Plans for Tsunami Ready

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Earthquake and Sea Level Monitoring Capability

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Tsunami Warning SOPs

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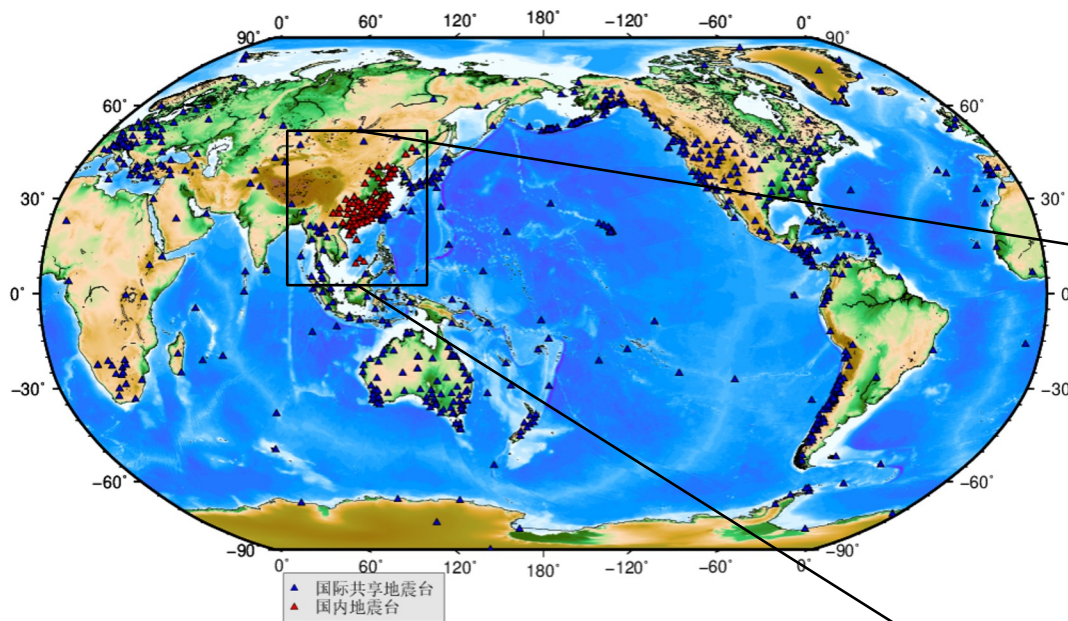
Tsunami Mitigation

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Future Work

Earthquake and Sea Level Monitoring Capability

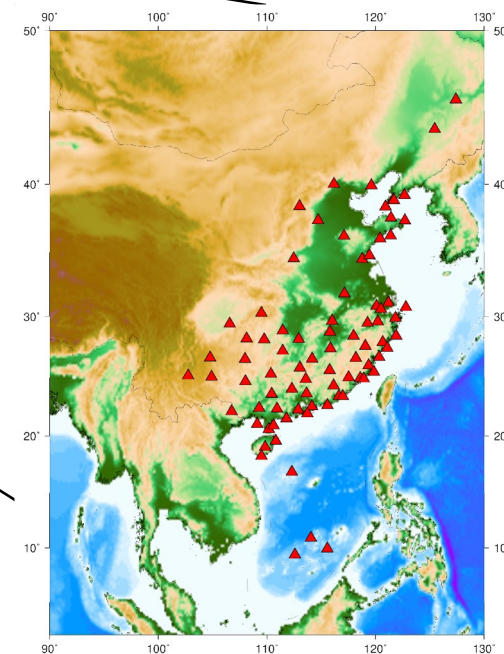
Global Seismic Station



- Antelope
- SeisComp
- CEA-EQIM
- USGS, EMSC, et.al.

Real-time, broadband seismic waveform data from:

- MNR(28)
- CEA(54)
- IRIS + GEOFON+ GEOSCOPE(~600)



Regional Seismic Networks

Earthquake and Sea Level Monitoring Capability

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 since 2020

Tidal gauge:

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.....

Dart Buoy:

Dnzd(NZ), dnoz(NZ)

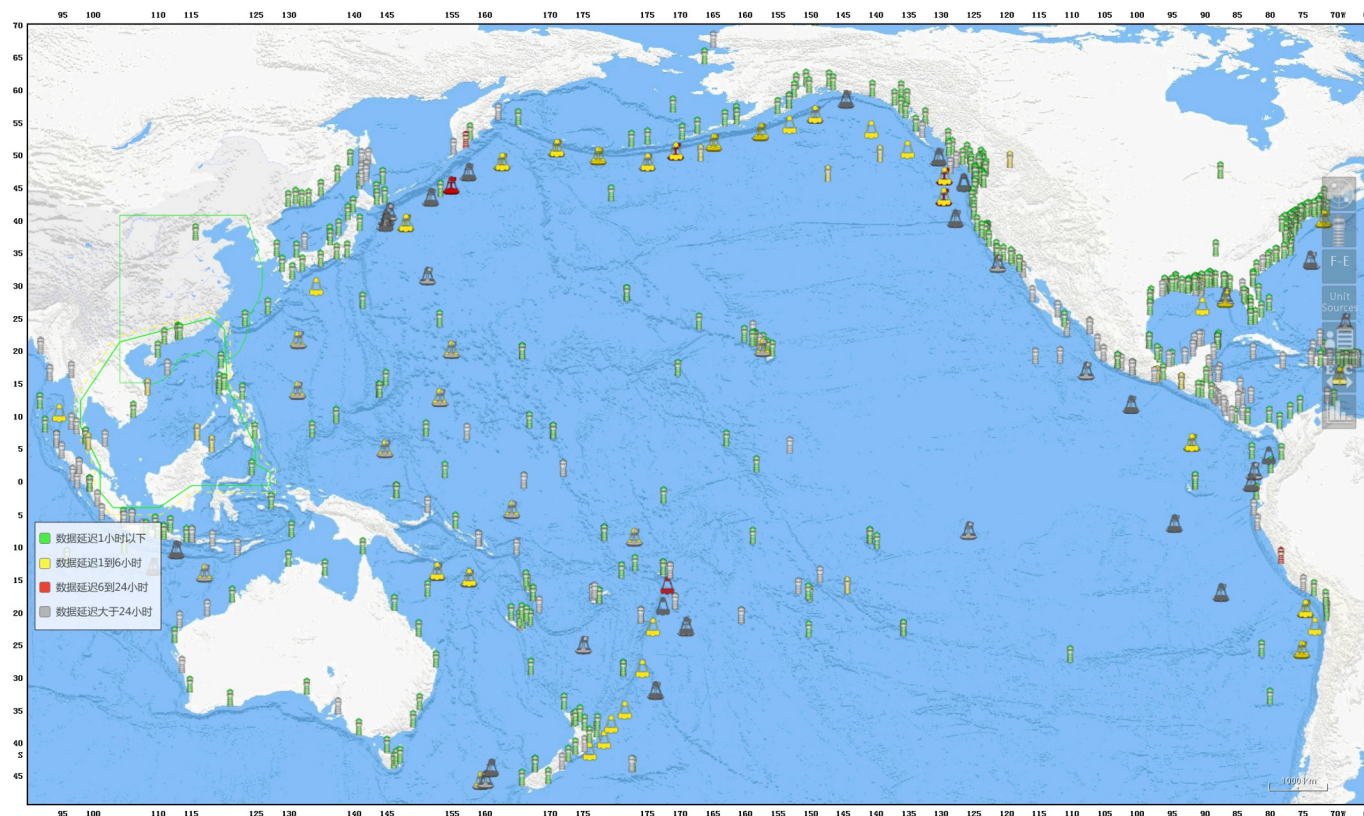
Dnzj(NZ), dnzf(NZ)

Dnzk(NZ), dnzg(NZ)

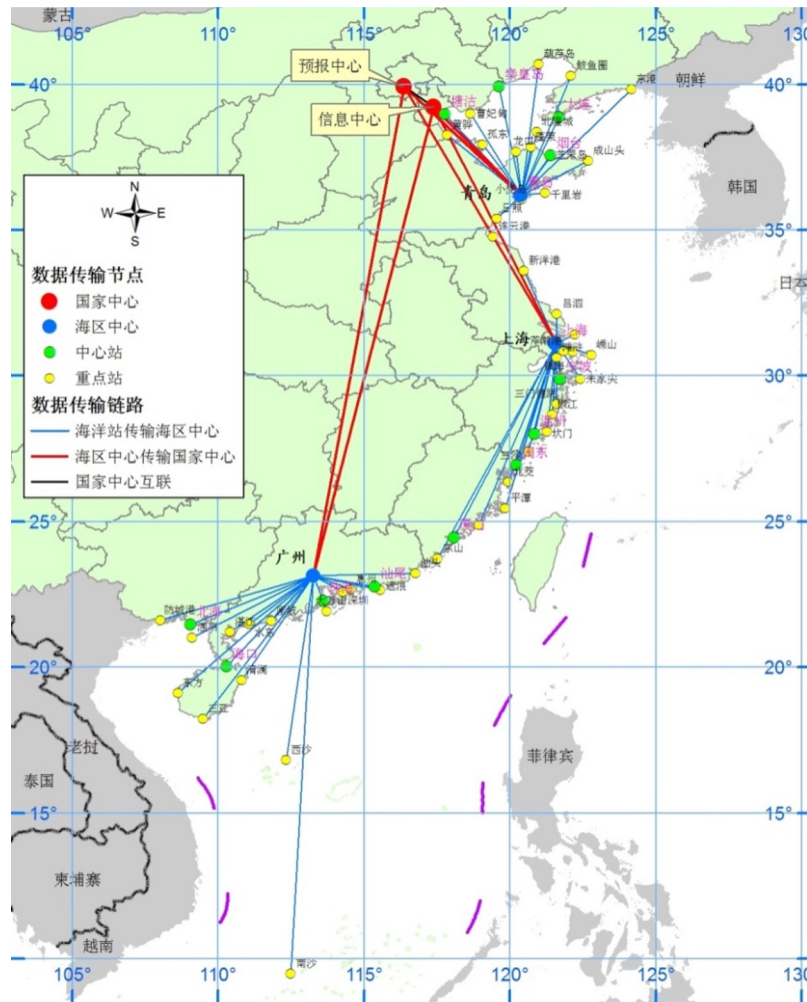
Dnzl(NZ), dnzh(NZ)

Dryu(JP), dnzi(NZ)

Dhai(CA).....



Earthquake and Sea Level Monitoring Capability



130~ tidal gauges along the Chinese coasts

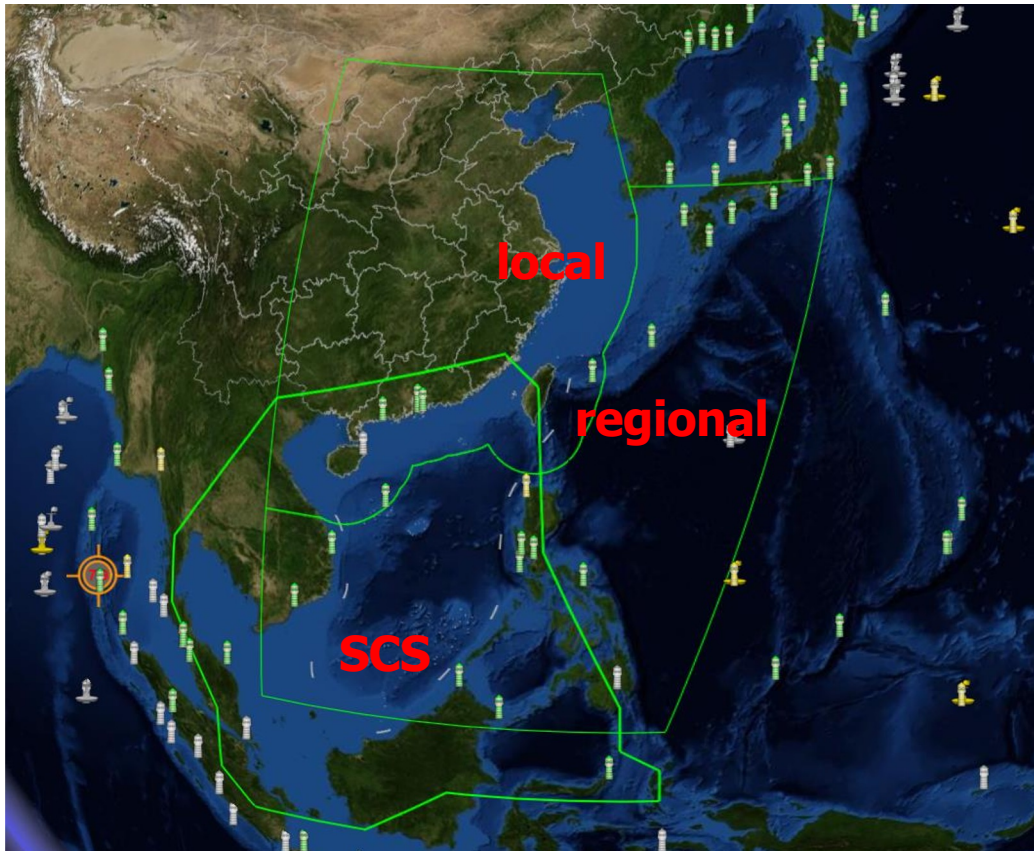
Data sharing via GTS for tsunami warning and mitigation system in the SCS region:

Shenzhen

Zhapo

Qinglan

Tsunami Warning SOPs



Tsunami bulletin issued

- ◆ Local : $M \geq 5.5$
- ◆ SCS : $M \geq 6.0$
- ◆ Regional 、 Distant and Other Oceans : $M \geq 6.5$

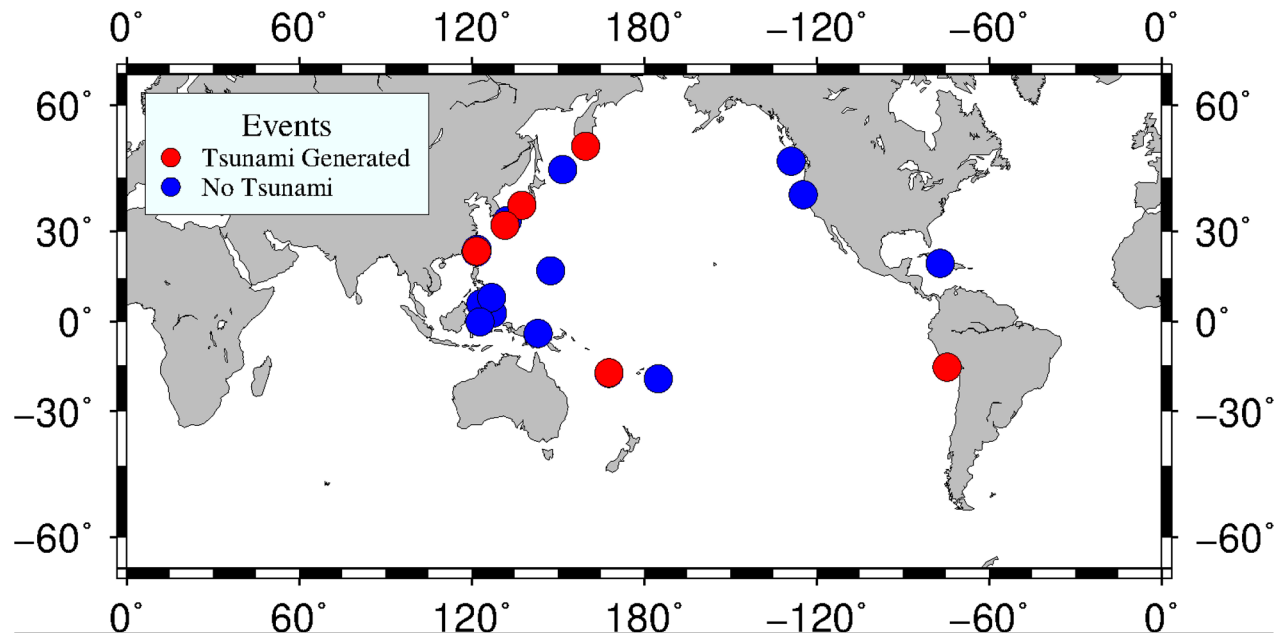
Tsunami bulletin with quantitative forecast

- ◆ Local : $M \geq 7.1$
- ◆ SCS : $M \geq 7.1$
- ◆ Regional and Distant : $M \geq 7.6$
- ◆ Other Oceans : No quantitative forecast

Tsunami Warning Messages in 2024

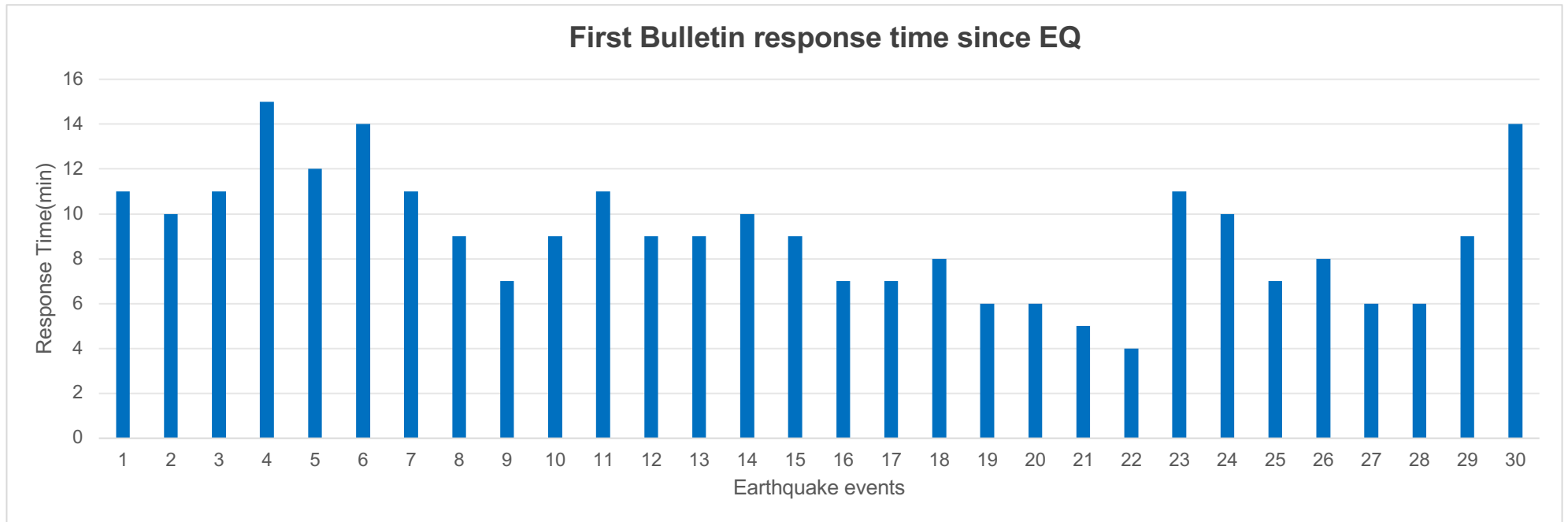
In 2024, totally issued

- ◆ 53 bulletins
- ◆ 30 earthquake events
- ◆ 6 earthquake events generated tsunami waves



Time	M	Location	Lat	Lon	Amp (cm)
2024-0101-1510	7.4	NEAR WEST COAST OF HONSHU, JAPAN	37.55	137.49	81
2024-0403-0758	7.3	TAIWAN, CHINA	23.81	121.74	105
2024-0628-1336	7.1	NEAR COAST OF PERU	-15.88	-74.55	20
2024-0808-1542	7.1	KYUSHU, JAPAN	31.85	131.57	50
2024-0818-0310	6.8	OFF EAST COAST OF KAMCHATKA	52.07	159.68	0.25
2024-1217-0947	7.2	VANUATU ISLANDS REGION	-17.75	167.75	26

Tsunami Warning Messages in 2024

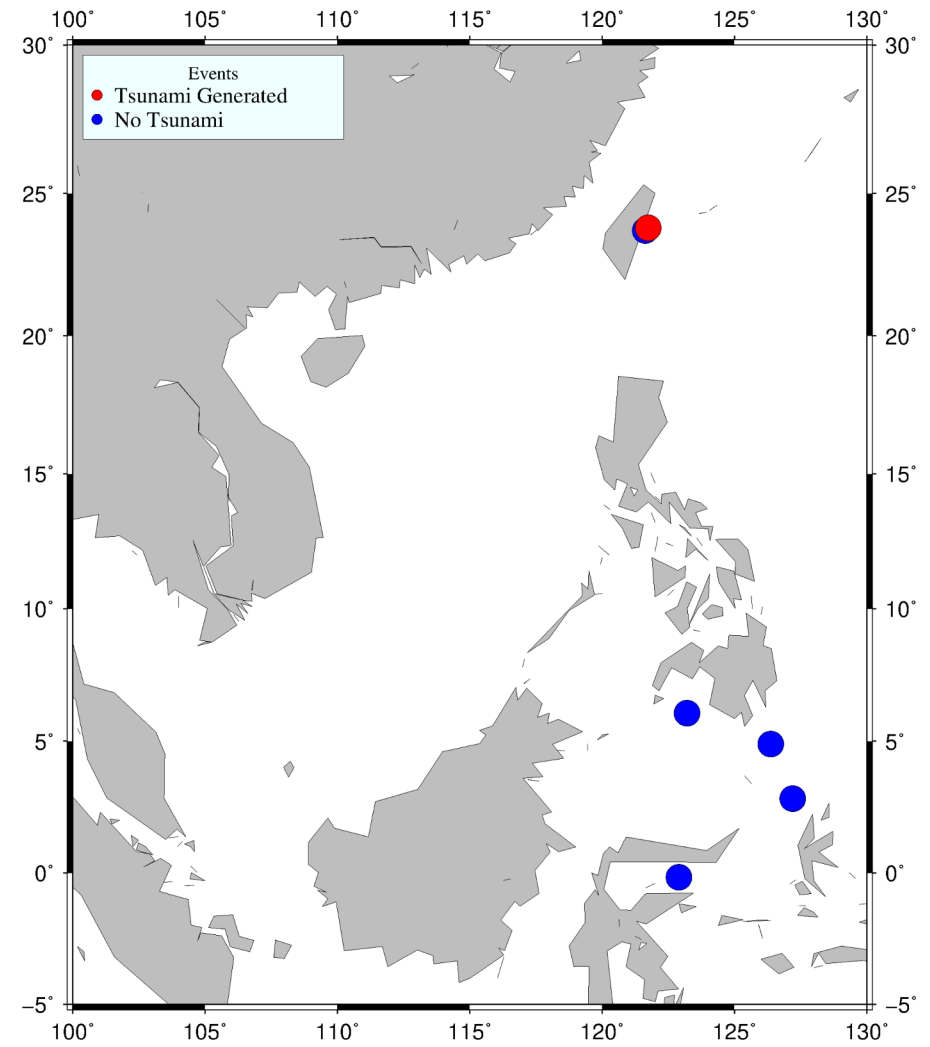


- average \sim 9min;
- mostly within 10min.

Tsunami Warning Messages in 2024

6 Earthquakes, 7 Bulletins.

No	Origin	Mag	Depth (km)	Location	Lat (°)	Lon (°)
1	2024-0109-0448	6.7	102	TALAUD ISLANDS, INDONESIA	4.89	126.37
2	2024-0403-0758	7.3	12	TAIWAN,CHINA	23.81	121.74
3	2024-0409-1748	6.6	70	NORTHERN MOLUCCA SEA	2.82	127.2
4	2024-0423-0226	6.1	15	TAIWAN,CHINA	23.72	121.63
5	2024-0711-0213UTC	6.3	613	MINDANAO, PHILIPPINES	6.06	123.21
6	2024-0923-1951UTC	6.1	140	MINAHASSA PENINSULA, SULAWESI	-0.17	122.9



Tsunami Warning SOPs

自然资源部海啸预警中心

黄色

海啸警报

时间: 2025年7月30日10时19分

编号: 海啸2025-0730-0724-4

签发: 于福江

海啸黄色警报

自然资源部海啸预警中心根据《海洋灾害应急预案》，发布海啸黄色警报。

2025年07月30日07时24分（北京时间），堪察加东岸远海海域（52.53°N, 160.16°E）发生8.8级地震。震源深度为20千米（震源参数修订）。自然资源部海啸预警中心根据最新监测分析结果，此次地震已经引发海啸，预计会对我国部分沿岸造成灾害性影响。

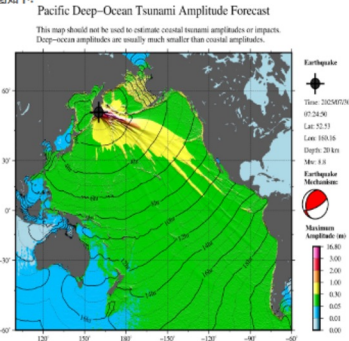
预报信息如下(预报结果修订):

省份	预报区域	预报点	预计抵达时间 (BJT)	最大波幅 (厘米)	预警级别
台湾	花蓮	花蓮	13:23	30~100	黄色
台湾	台东北	富冈	13:26	30~100	黄色
台湾	屏东东	屏东东	13:30	30~100	黄色
台湾	台南南	大武	13:30	30~100	黄色
台湾	宜兰	宜兰县	13:37	30~100	黄色
台湾	屏东西	后壁湖	13:39	30~100	黄色
台湾	台北东	台北东	13:41	30~100	黄色
浙江	舟山南	朱家尖	18:04	30~100	黄色
上海	上海	佘山	19:09	30~100	黄色

* 预计抵达时间：海啸初始抵达某一预报点的预测时间。

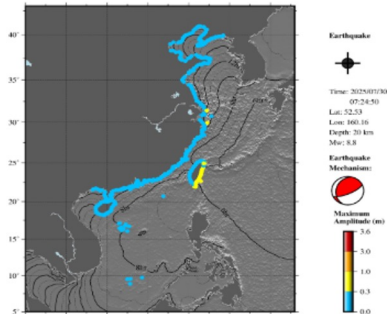
* 最大波幅：相对于观测站平均海平面超量的高度。

最大海啸波幅预报图如下:



岸段预报图如下: CHINA Coastal Tsunami Amplitude Forecast

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



水位监测信息如下:

站名	位置	坐标	时间 (BJT)	最大波幅 (厘米)
浮标21416	俄罗斯	48.1° N, 163.5° E	08:00	90.0
浮标21414	美国	48.97° N, 178.16° E	09:00	30.0

* 最大海啸波幅：相对于观测站平均海平面超量的高度。

自然资源部海啸预警中心将继续跟踪分析地震和海啸监测数据，并及时发布信息。

海啸防御指南（黄色警报）：

- 1、政府及相关部门按照职责做好海啸防灾减灾工作。2、身处海中、沙滩及沿岸低洼地区的人员，当收到海啸警报后，或者出现海啸来临前的征兆时一感到地面有强烈震动、发现海水突然退却或听到像即将来临的火车一样咆哮声，应停止一切活动，立刻跑往高处或稳固建筑物的高层。3、沿岸居民收到海啸警报后，应立即通知各自家人，依照应急预案或政府安排有秩序及安全地撤离到疏散点或撤离至受影响区外的安全地方。4、所有海啸预警都必须认真对待，海啸的破坏力与沿岸地形有很大关系，海啸因为海岸的某一处可能会很小而在几公里外的另一处可能会很大，所以即使小的海啸也不能掉以轻心。5、应当一直呆在安全区域内，直到政府部门发布解除警报的信号为止。

注：根据地震参数测定结果和海啸波幅预报结论，海啸预警产品分为海啸信息和海啸警报两类。其中，海啸信息指发生的地震事件预计不会产生海啸，或不会对我国沿岸造成重要影响；海啸警报指发生的地震事件预计会对我国沿岸造成重要影响。根据《海洋灾害应急预案》标准，海啸警报按照沿岸最大海啸波幅预报结果和可能造成的灾害性影响可分为黄色、橙色和红色三级。

值班咨询人员：唐冉 01062104561

自然资源部 监制

Tsunami Bulletin for Domestic Area

Tsunami Warning SOPs

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WESS21 BABJ 030011

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

...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

[ 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@NMEEFC.CN

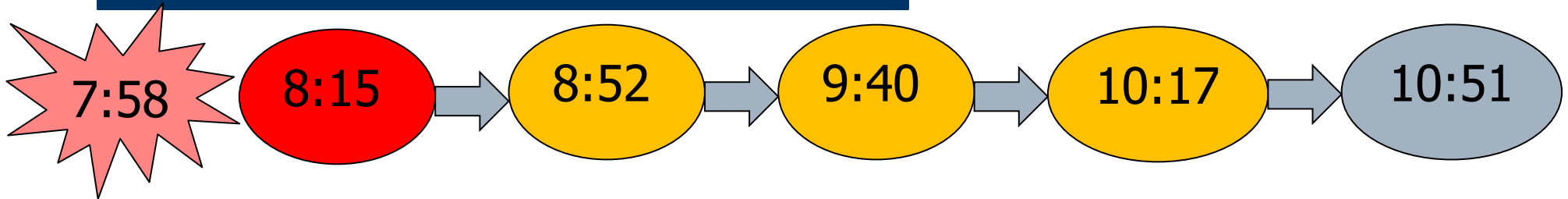
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Tsunami Bulletin for SCSTAC

Dissemination



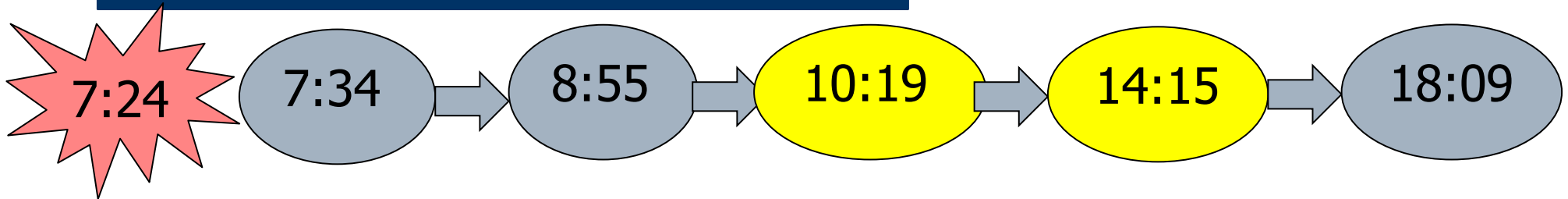
M 7.3 - 2024 Taiwan,China Earthquake



Response :

- **8:15** The preliminary magnitude is estimated at M7.5. A first-stage tsunami red alert has been issued, with tsunami warnings issued for areas surrounding the epicenter.
- **8:52** According to the CEA, the magnitude of this earthquake is M7.3. A second tsunami warning has been issued, with the alert level downgraded to orange.
- **9:40** Issued the third tsunami warning, maintaining the orange alert, updated with a 30 cm tsunami wave observed in Ishigaki Island, Japan.
- **10:17** Issue the fourth tsunami warning, maintaining the orange alert. Continue updating actual observations, with tsunami waves exceeding 1 meter detected at the epicenter in Hualien.
- **10:51** Tsunami warning lifted.

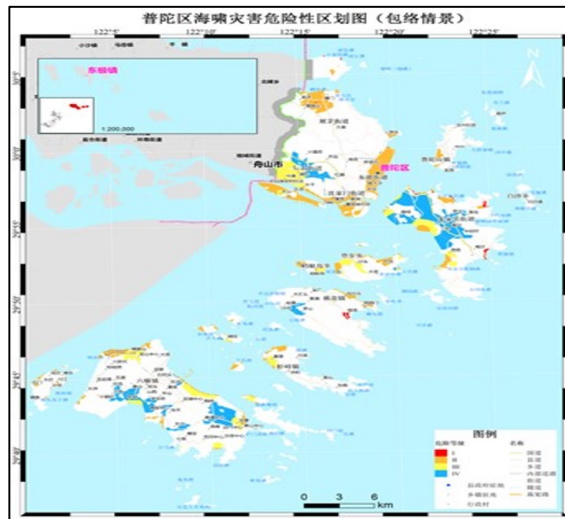
M 8.8 - 2025 Kamchatka Peninsula, Russia Earthquake



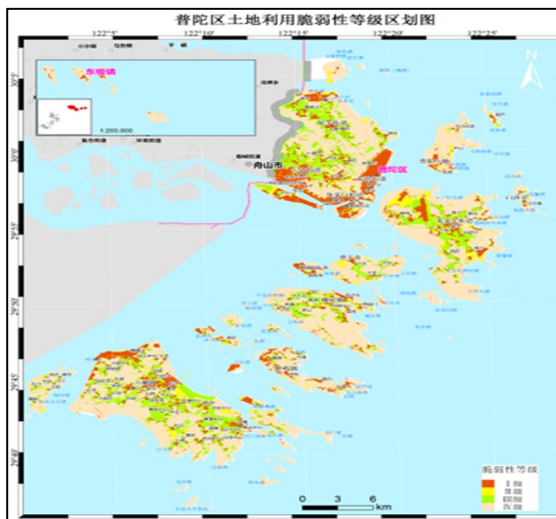
Response :

- **7:34** The preliminary magnitude is estimated at M7.6. Issued the first tsunami advisory, warning coastal areas near the epicenter. Preliminary assessments indicated the earthquake could trigger a tsunami
- **8:55** Magnitude revised to M8.7. Tsunami advisory remains in effect.
- **10:19** Magnitude revised to M8.8. Based on the latest numerical calculations and real-time monitoring data, the alert level was upgraded to Yellow.
- **14:15** Updated relevant real-time monitoring information.
- **18:09** Tsunami warning lifted.

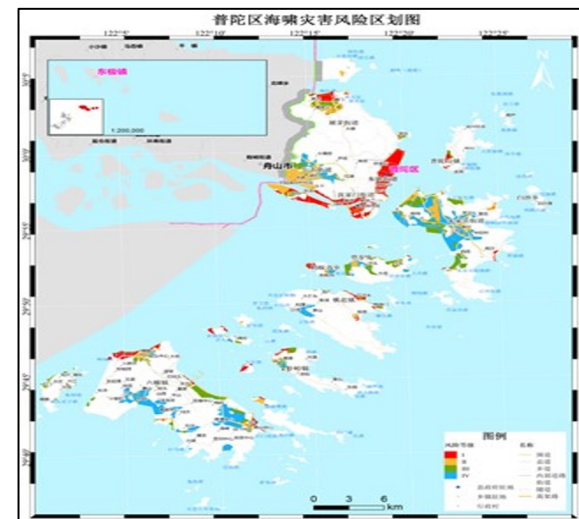
Tsunami Mitigation-Hazard Assessment



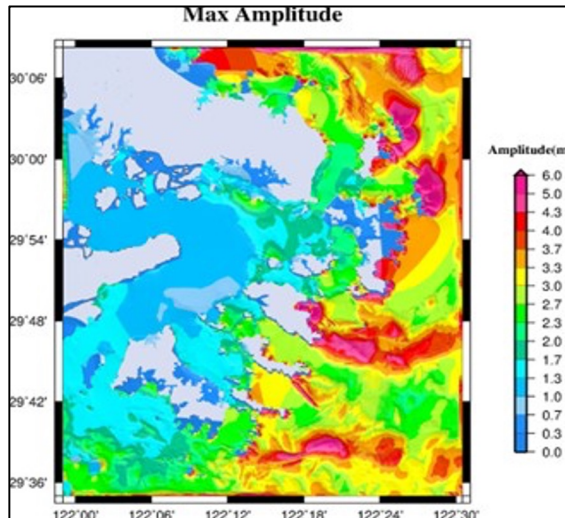
Hazard



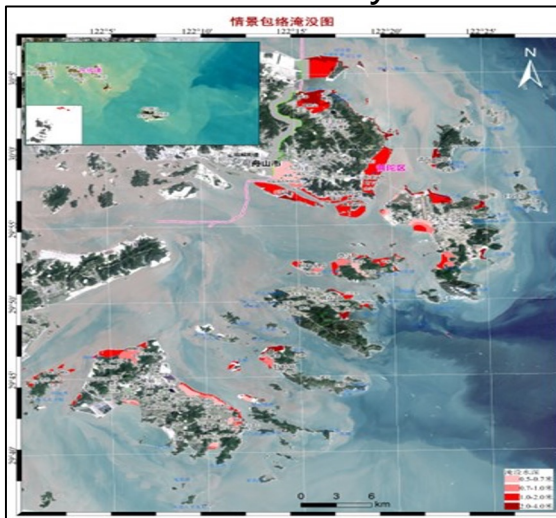
Vulnerability



Risk



Max Amp



Inundation



Evacuation

Tsunami Mitigation- Domestic Tsunami Desk Exercise, 2024

Hypothesis Source: Earthquake with $M_w9.0$ in Nankai Trough

Warning: Catastrophic impact in Jiangsu, Shanghai, Zhejiang, Fujian, Taiwan, Guangdong, Hongkong and Macau

Dissemination: Warning Mes. Sent and Received Effectively in 10 minutes



Tsunami Mitigation-Tsunami Drill in Shantou University 2024



Science Lecture

Evacuation Drill

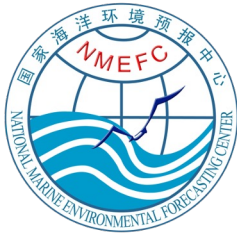


Tsunami Mitigation-Publicity



Future Work

- ◆ Strengthen earthquake and water level monitoring capabilities
- ◆ Optimize the tsunami warning SOPs and conduct tsunami warning training
- ◆ Expand dissemination ways for tsunami products
- ◆ Improve tsunami awareness for public
- ◆ Conduct community-level tsunami hazard risk assessments



Thank You
