Eleventh meeting of the ICG/PTWS Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea Region (ICG/PTWS WG-SCS), Guangzhou, 25 - 27 September 2023

# Tsunami Warning Operation and Services in China during 2022 ~ 2023

## (National Report)

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**National Marine Environmental Forecasting Center(NTWC)**

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

# Outlines

1. Earthquake and Tsunami Monitoring Capability

2. Tsunami Warning Technologies and Operation

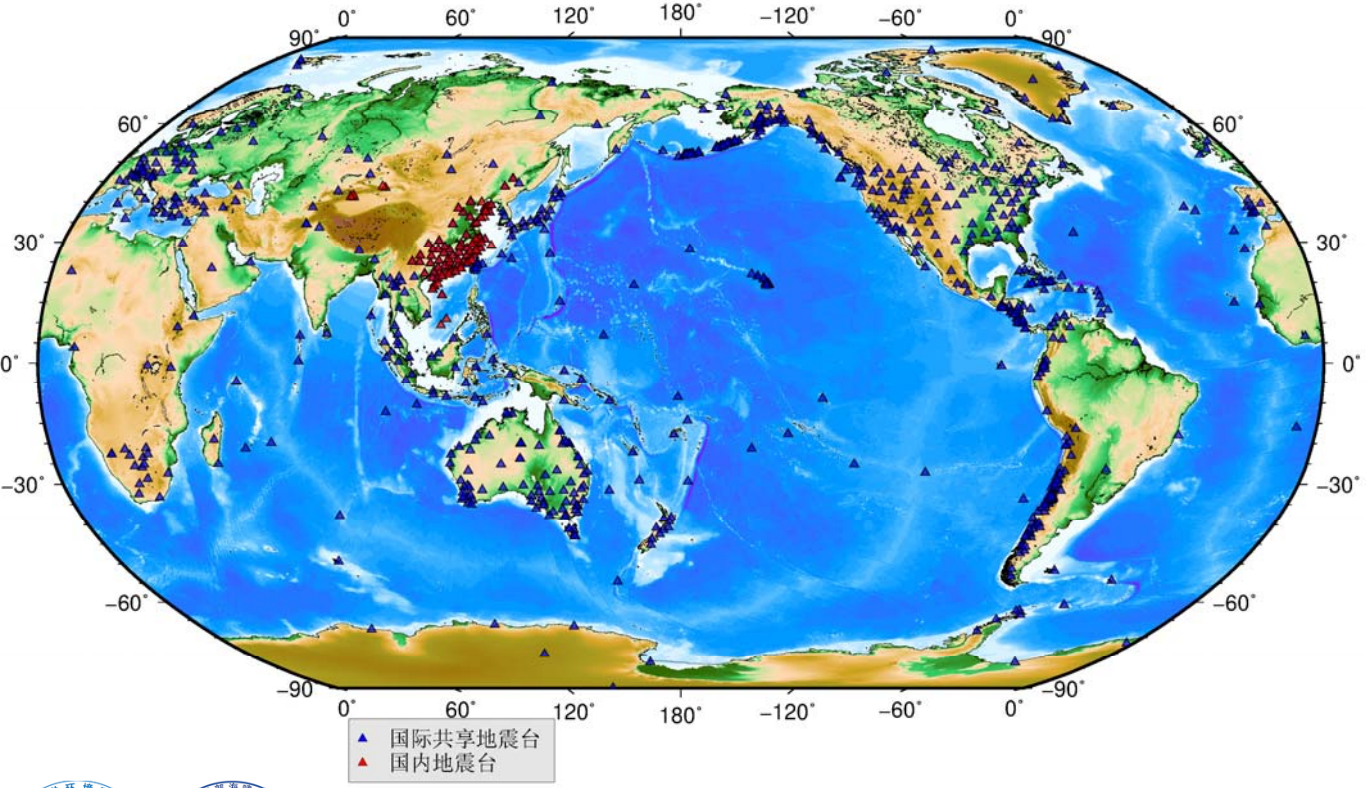
3. Tsunami Mitigation and Publicity

4. Internatonal Communication and Coordination

# 1. Earthquake and Tsunami Monitoring Capability

# 1.1 Global Seismic Monitoring

Global shared Seismic Station




Real-time, broadband seismic waveform data from:

- MNR(27)
- CEA(54)
- IRIS
- GEOFON
- GEOSCOPE

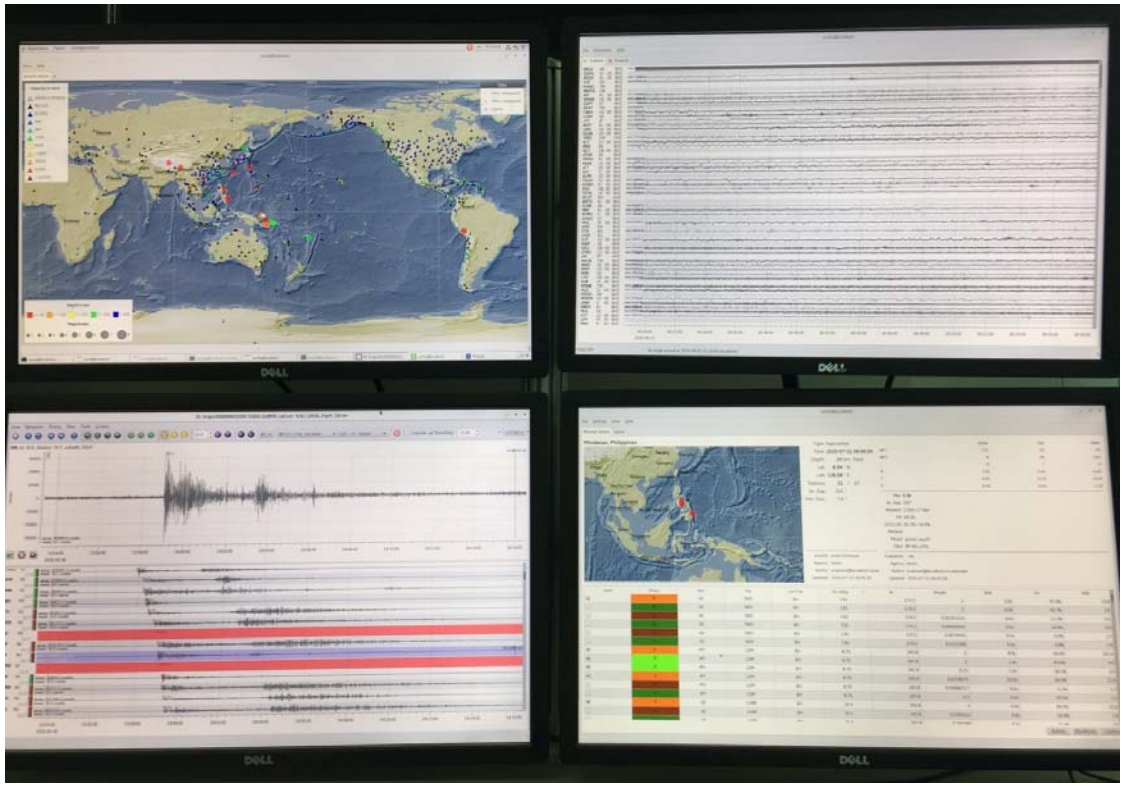
- （700+）

Earthquake Rapid Information Report

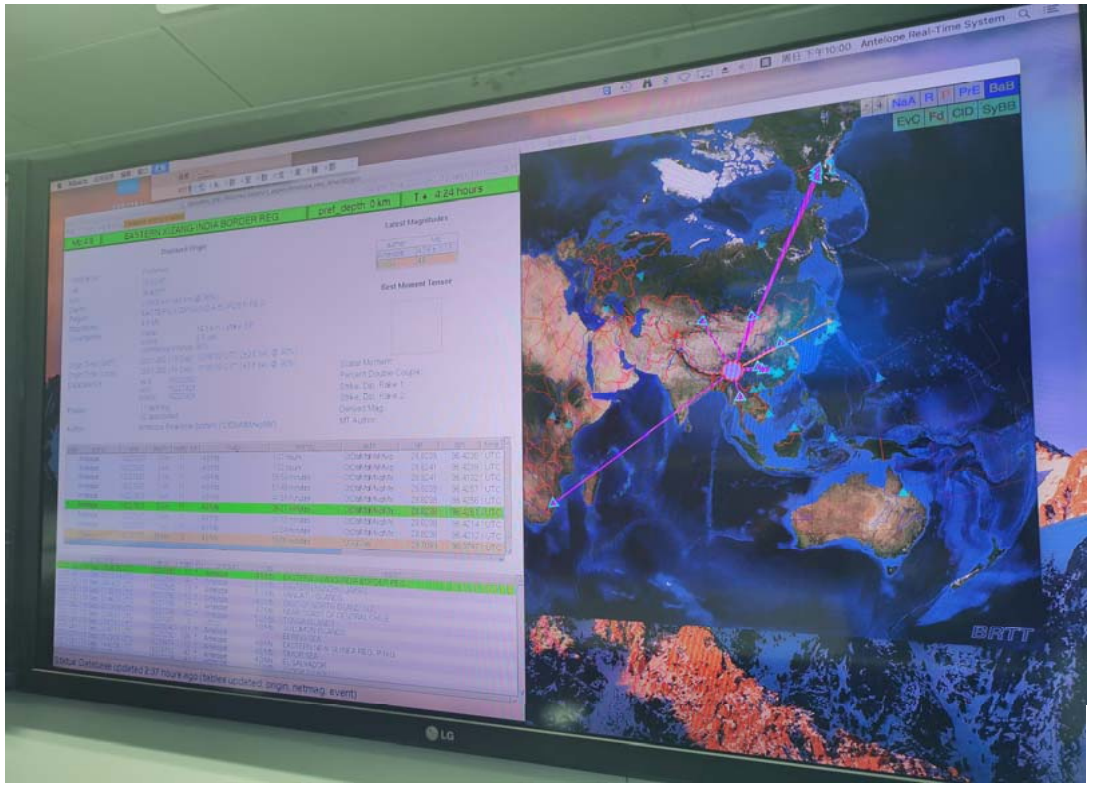
- Antelope
- SeisComp3
- CEA EQIM
- PTWC, USGS earthquake info

# 1.2 Seismic Analysis and Earthquake Detecting

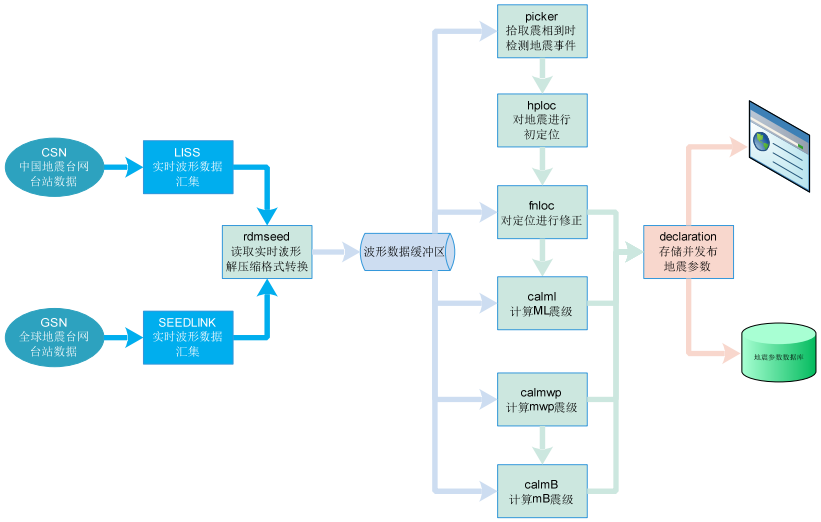
SeisComp3



Antelope



# 1.2 Seismic Analysis and Earthquake Detecting



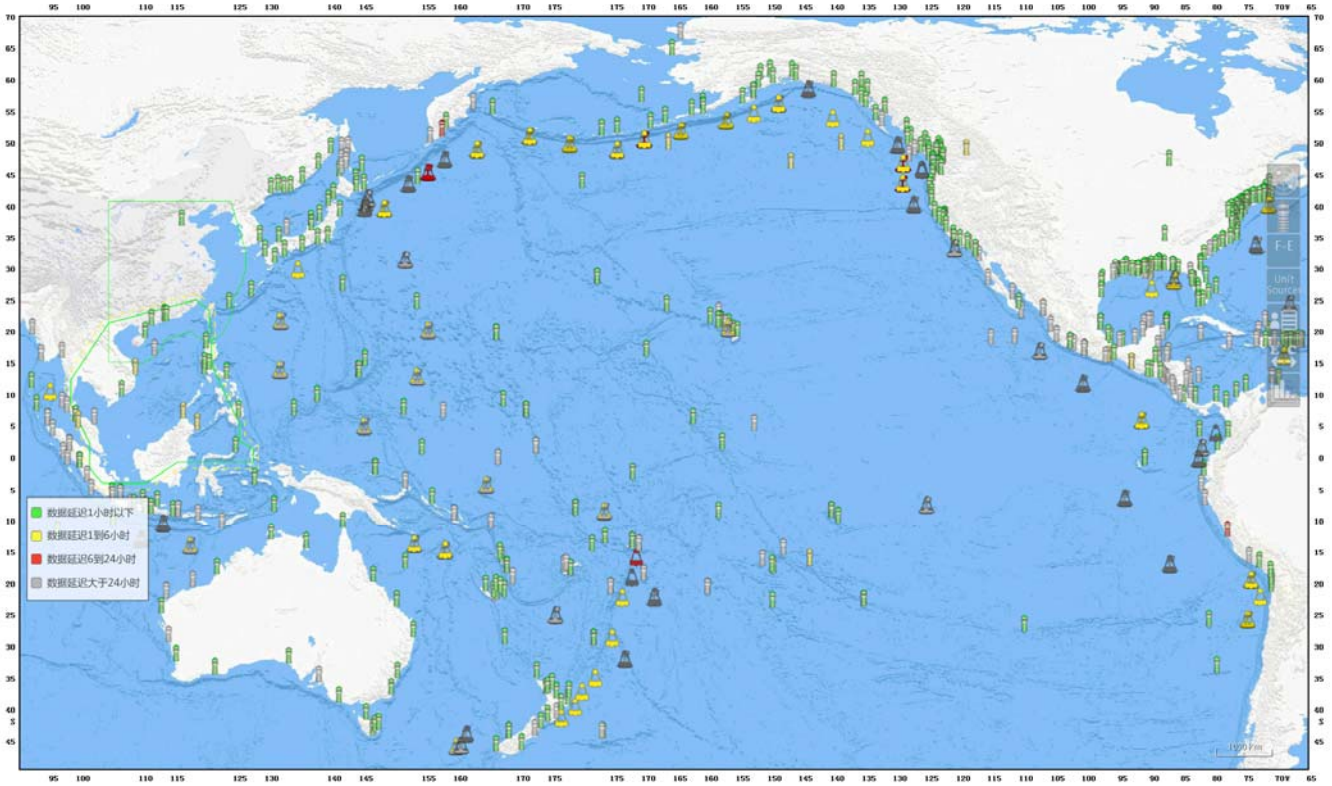

System function module architecture diagram

- 7×24h Running with good stability
- Global earthquakes (M>6.0) in near real-time;
- Autonomous and controllable usage

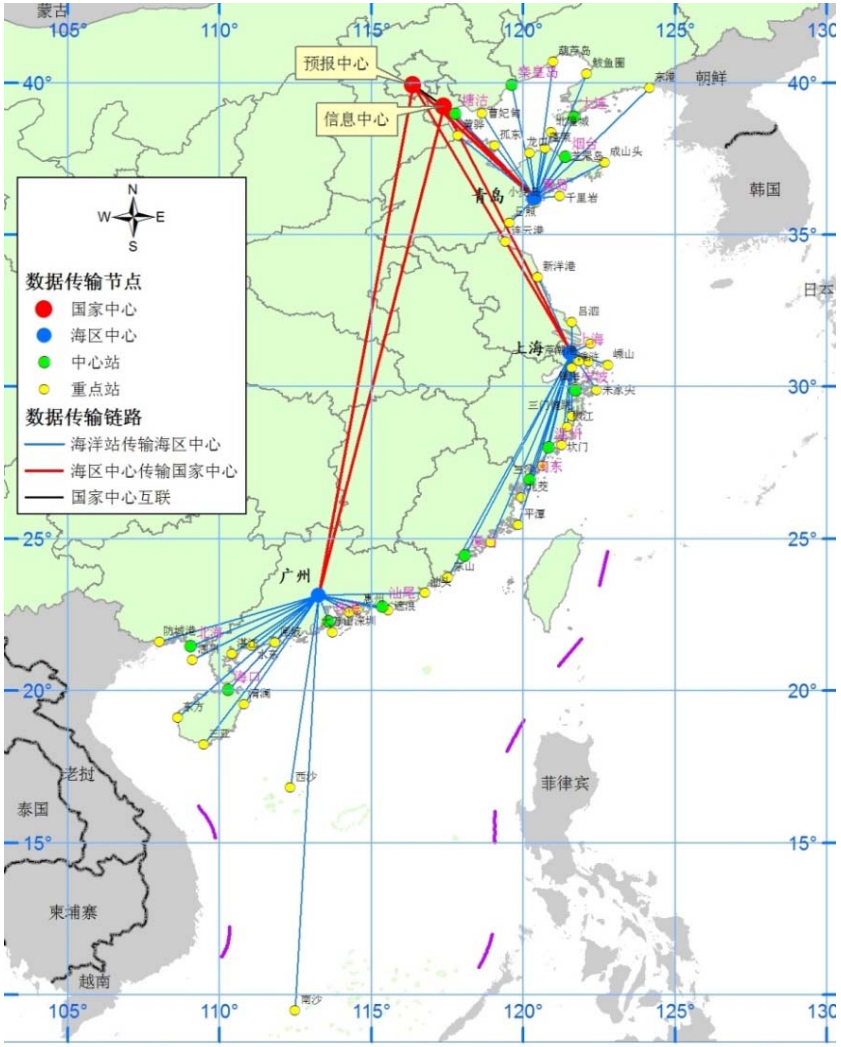

**Independent developed Global Earthquake Automatic Detecting and Location System**

# 1.3 Global 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



# 1.4 China Real-time Sea Level Station




- 130~ tidal gauges along the Chinese coasts
- Data sharing via GTS for tsunami warning and mitigation system in the SCS region:

✓ Shenzhen (Chinese Mainland)

✓ Zhapo (Chinese Mainland)

✓ Qinglan (Chinese Mainland)

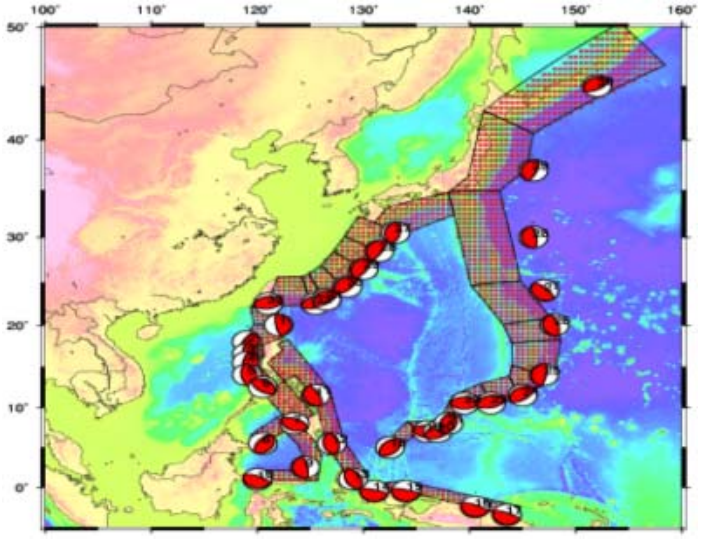
✓ Quarry Bay (Hongkong)

✓ Shek (Hongkong)

# 2. Tsunami Warning Technologies

# 2.1 Two Sets of Tsunami Database

## NW Pacific Scenario Database



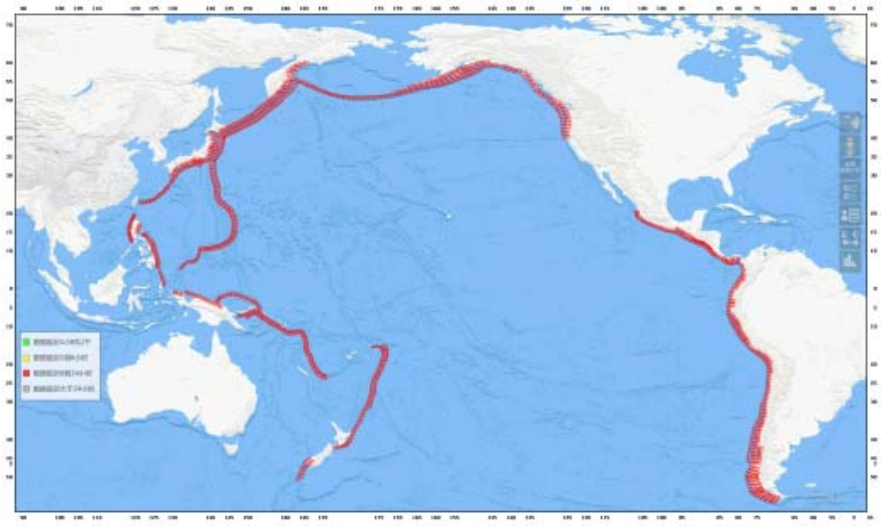

**Source Coverage:**

37 partitions, 1671 sources

Resolution: 0.5° ×0.5°

**Totally:** 60,156 tsunami scenarios

## The Pacific Unit Source Database



**Source Coverage:**

Length: 100 km

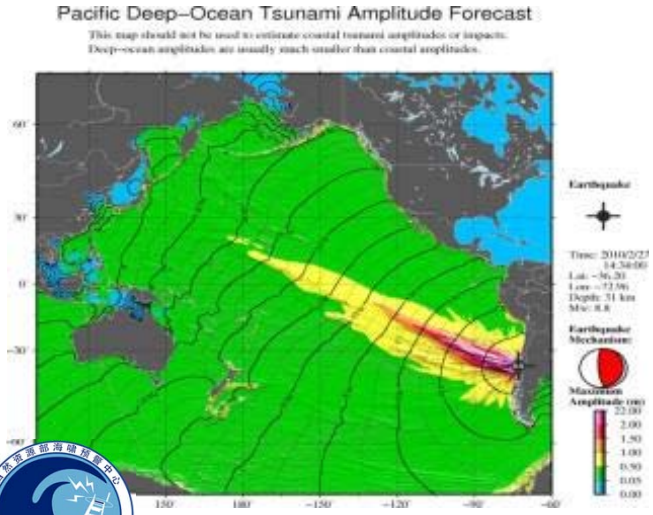
Width: 50 km

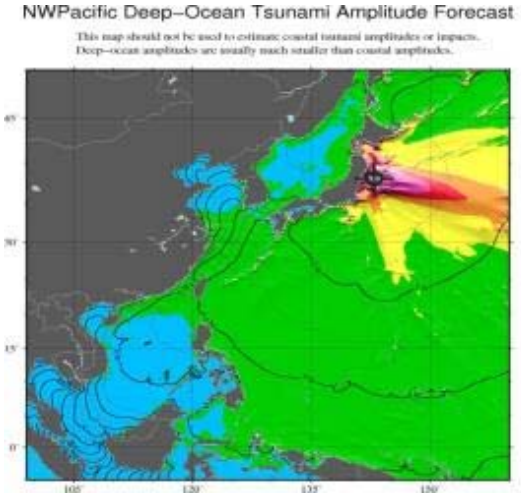
**Totally:** 1391 unit sources

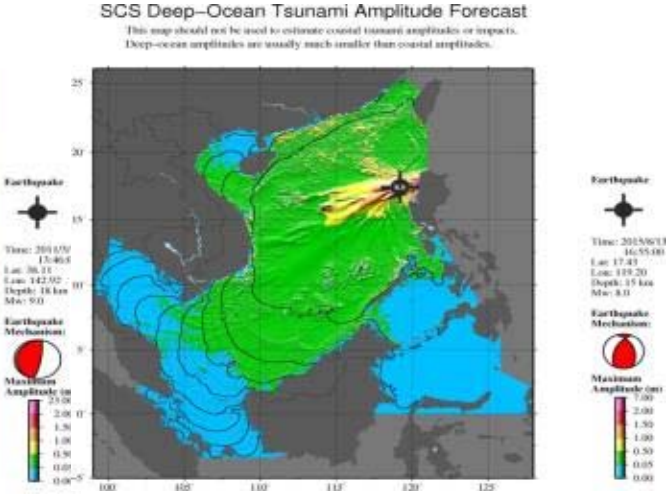
# 2.2 On-the-Fly Tsunami Forecast Model

**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** |

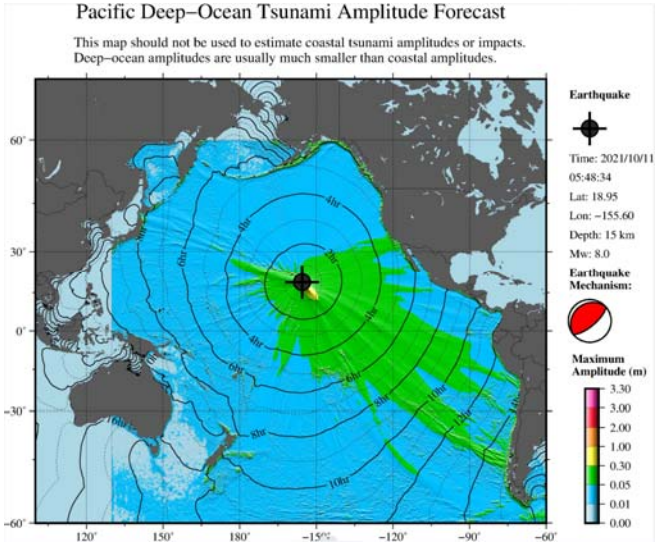


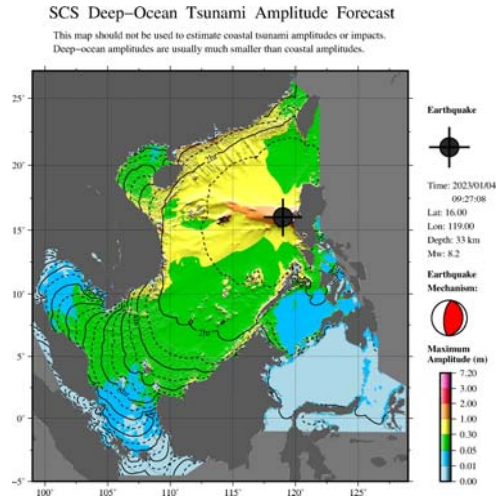



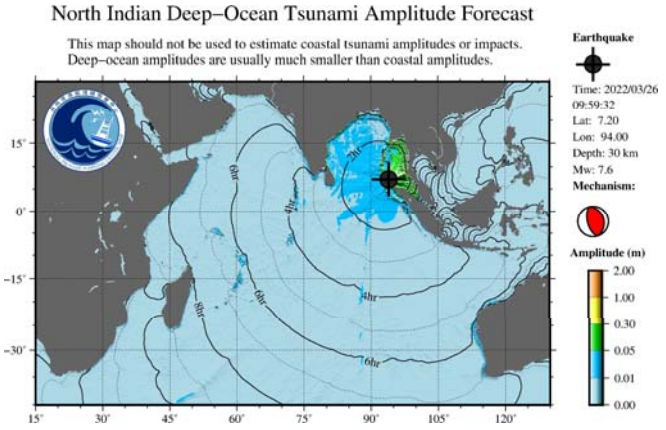



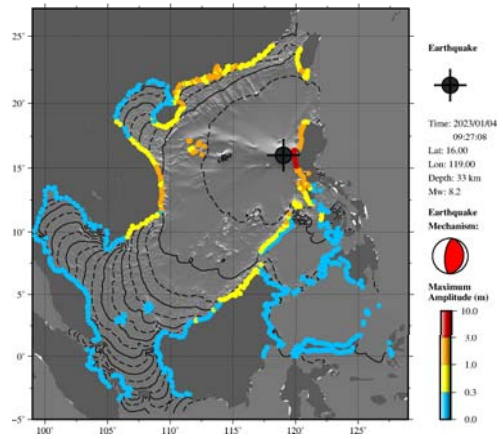
# 2.3 Coverage Expanding of Tsunami Modeling

- Total six regions
- **Pacific Ocean**
- **South China Sea**
- **Indian Ocean**
- North Atlantic Ocean
- Mediterranean Sea
- Caribbean Sea



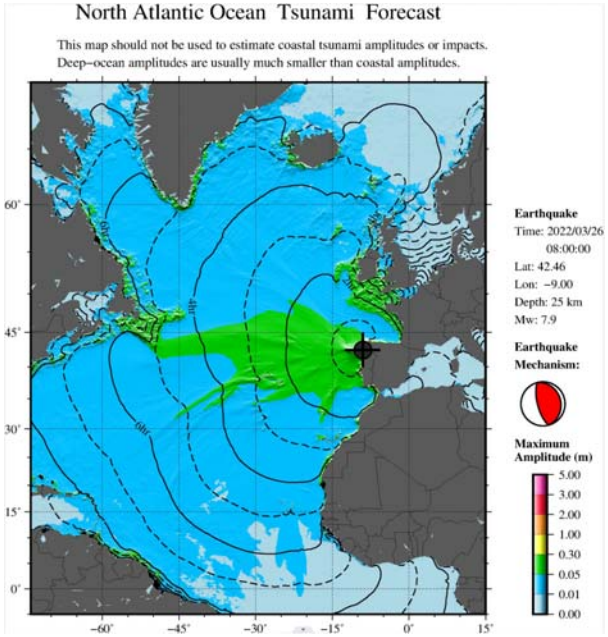



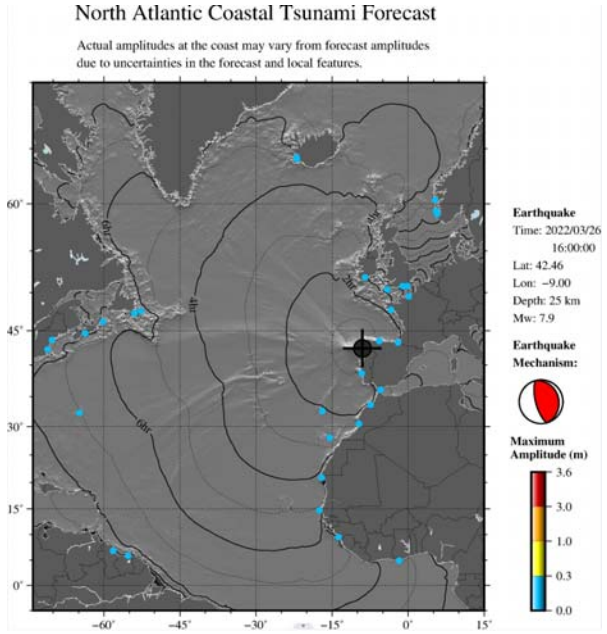



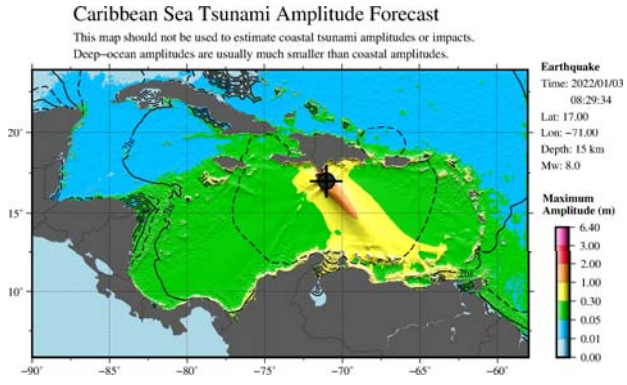



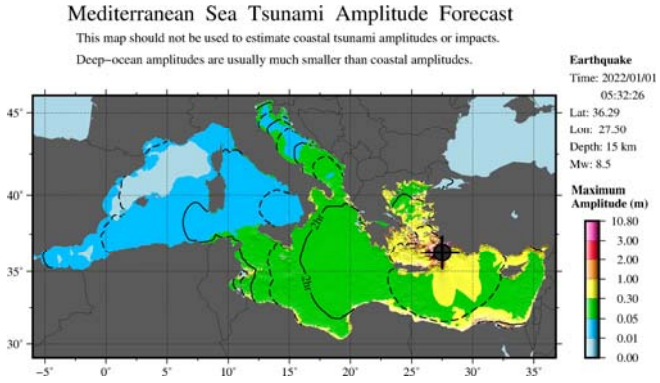
# 2.3 Coverage Expanding of Tsunami Modeling

- Total six areas
- Pacific Ocean
- South China Sea
- Indian Ocean
- **North Atlantic Ocean**
- **Mediterranean Sea**
- **Caribbean Sea**



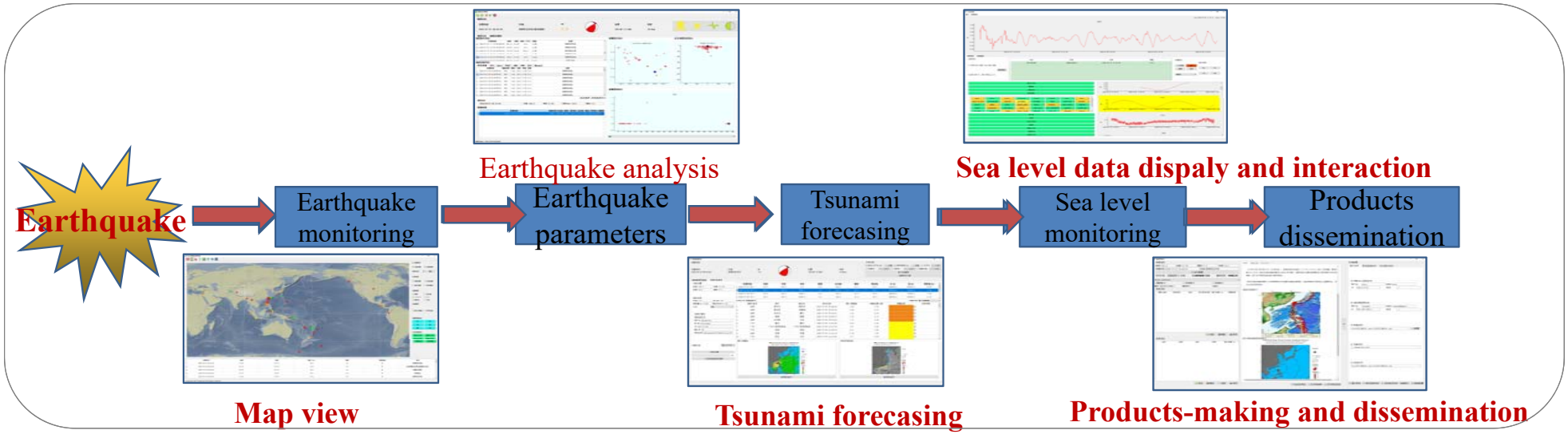



# 2.4 Smart Tsunami Information Processing System

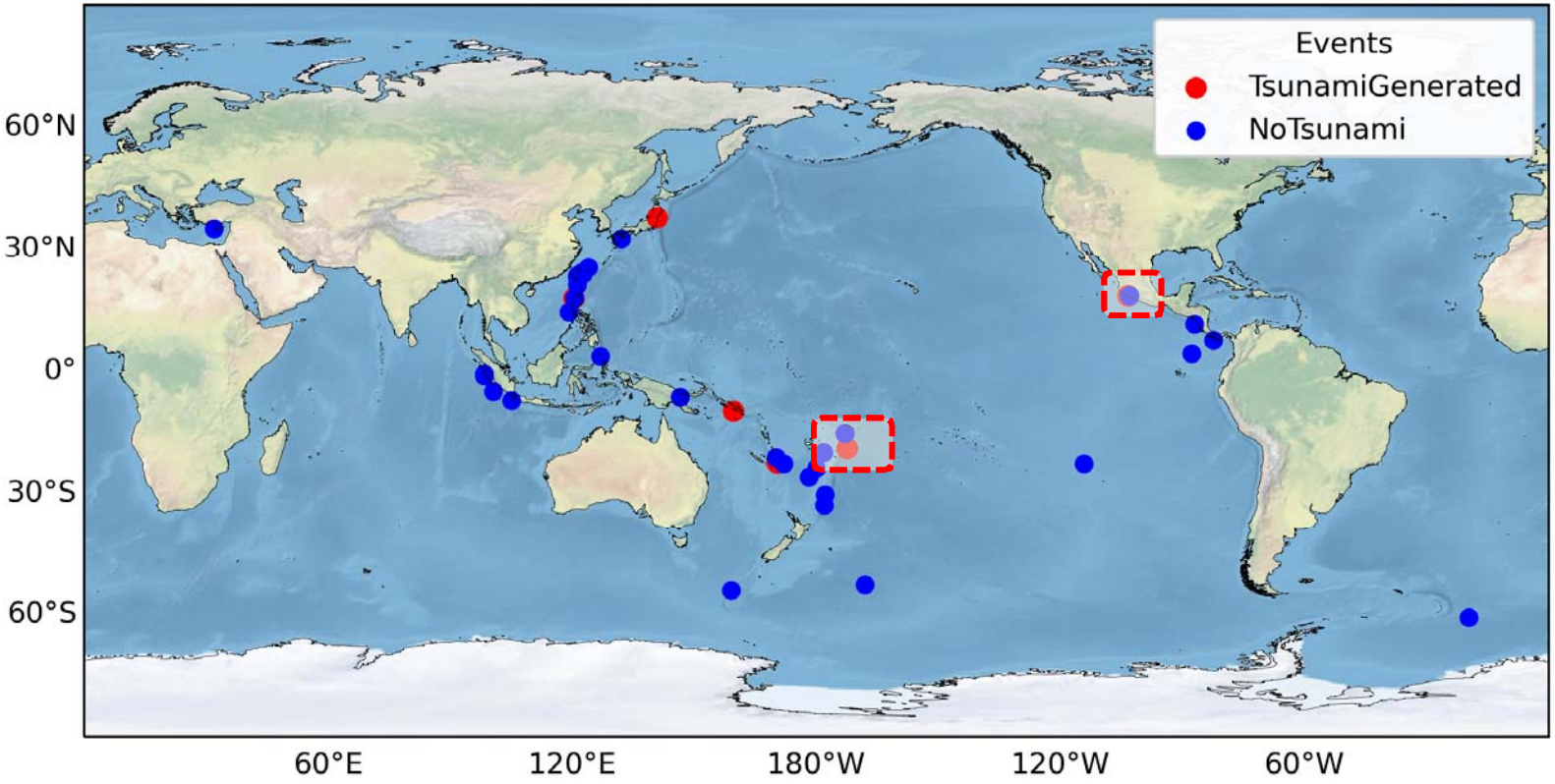
## Independent development




**Smart Tsunami Information Processing System(STIPS): A fully independent developed tsunami warning and decision support system based on Python language is in operation for domestic tsunami service, and SCSTWS.**

# 2.5 Issue Performance in 2022

- Responded to 46 major Earthquakes
- Issued 92 tsunami information bulletins
- Average latency is 9.0 **mins** for the first message, **not including Tanga Tsunami**



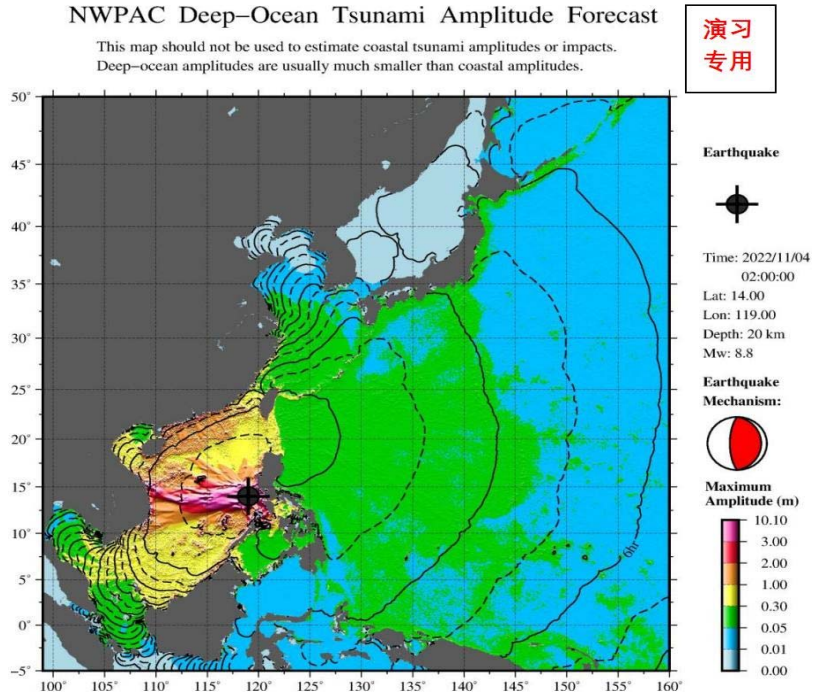
# 2.6 Domestic Tsunami Desk-top Exercise, 2022

## World Tsunami Awareness Day

Hypothesis Source: Earthquake with *M*w8.8 in Manila trench

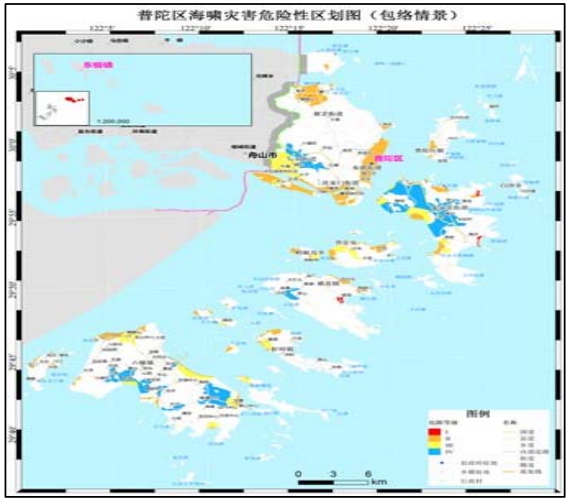
Warning: Catastrophic impact in Hainan, Guangdong, Guangxi and Fujian

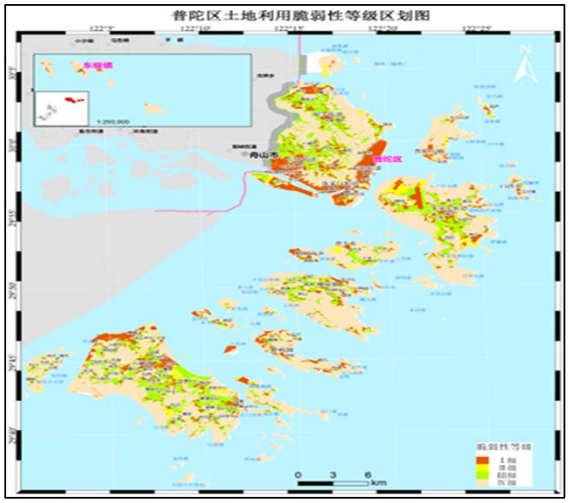
Dissemination: Received Effectively in 10 minutes

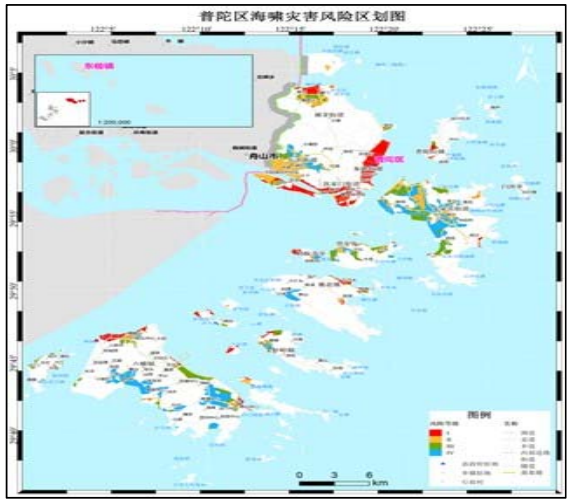


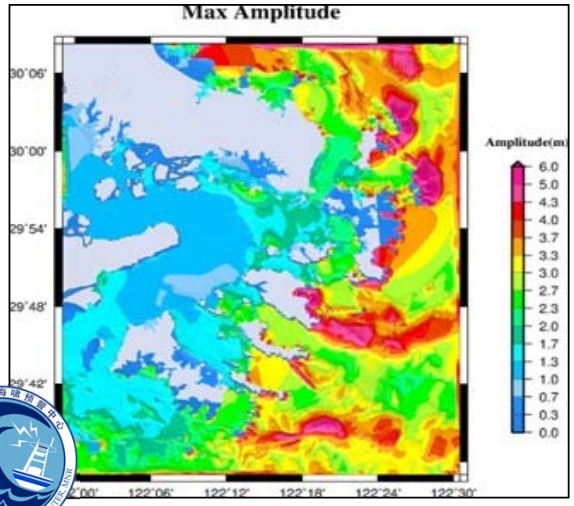
# 3. Tsunami Mitigation and Publicity

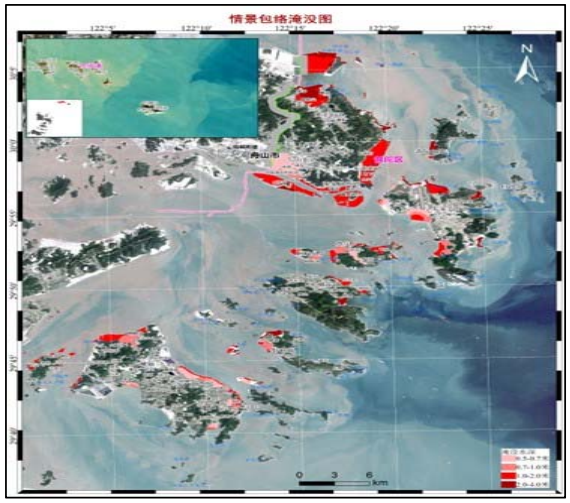
# 3.1 Tsunami Risk Identification and Assessment



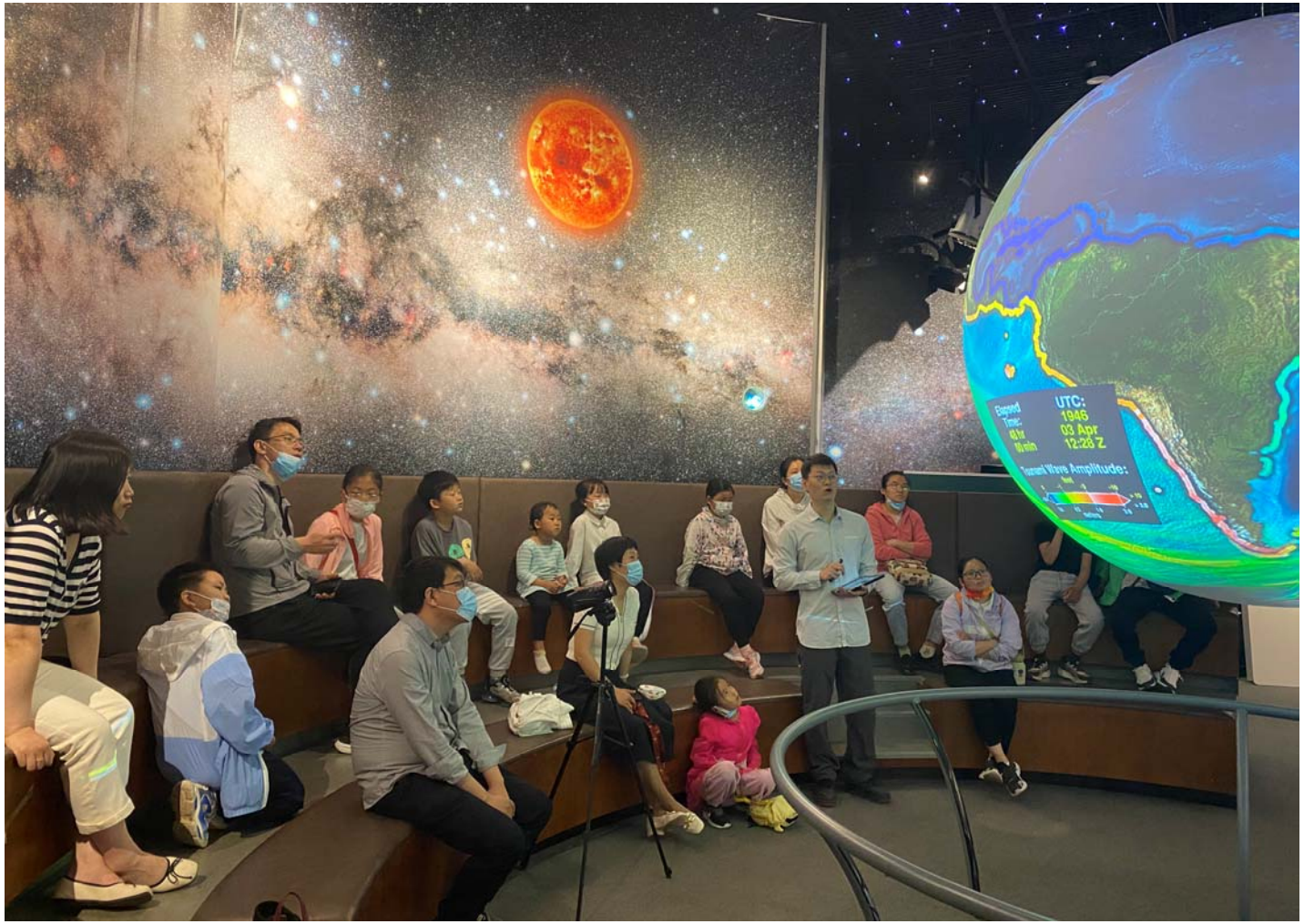

# 3.2 Earth Day, 22 April


Lessons in the National Maritime Museum, Tianjin, 22 April 2023

# 3.3 National Disaster Prevention and Mitigation Day


Live webcast of publicity on tsunami hazard, Beijing, 12 May 2023

# 3.4 Tsunami Science Popularization




Polularization Activities in Beijing Science Center, May, 2023

# 4. Internatonal Communication and coordination

# 4.1 International communication

**The NMEFC-BMKG International Conference on Non-seismic Tsunamis and Complex Tsunamis (online), 14 July, 2022**

# 4.2 International communication

**International Symposium on Applied Technologies for Earthquake and Tsunami Monitoring, Early Warning and Disaster Mitigation in the South China Sea Region (online), 20 December, 2022**

# 4.3 International coordination

Thirtieth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Nuku' alofa, Kingdom of Tonga, 11–15 September 2023


# *Thank You!*

**National Marine Environmental Forecasting Center**
**National Tsunami Warning Center**
**Ministry of Natural Resources, P. R. China**