Training/Workshop on

Tsunami Evacuation Maps, Plans, and Procedures and
the UNESCO-IOC Tsunami Ready Recognition Programme for the Indian Ocean Member States

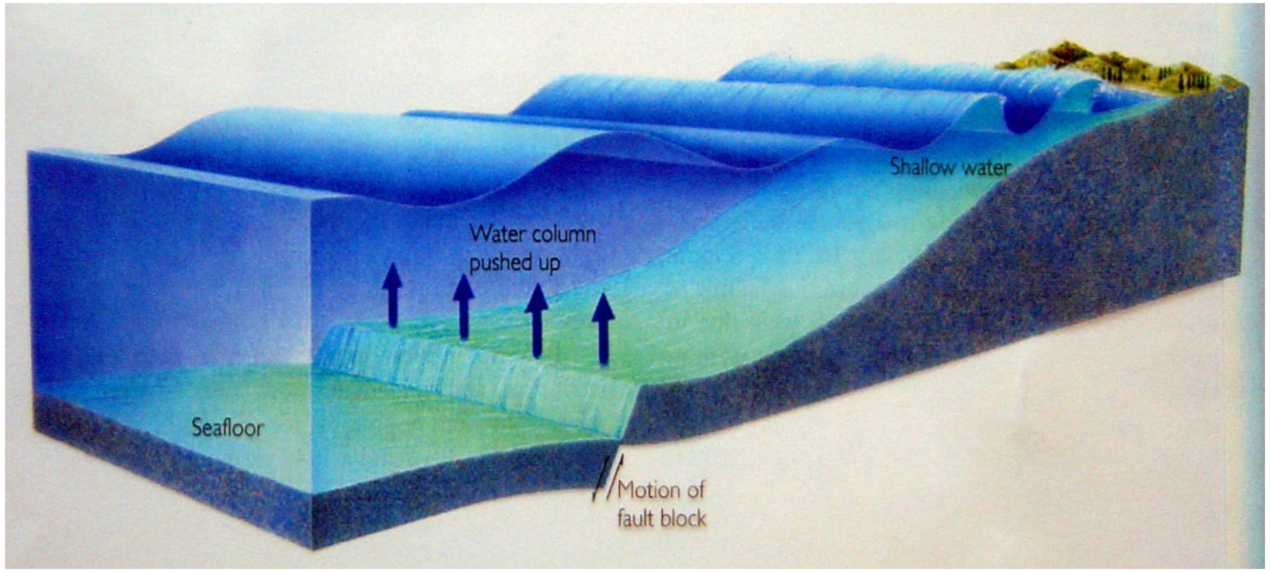
Hyderabad - India, 15-23 April 2025

Tsunami Inundation Modelling and MAP

TIMM #: Non-Seismic Sources generated Tsunamis

TEMPP 2025

What is Tsunami ?



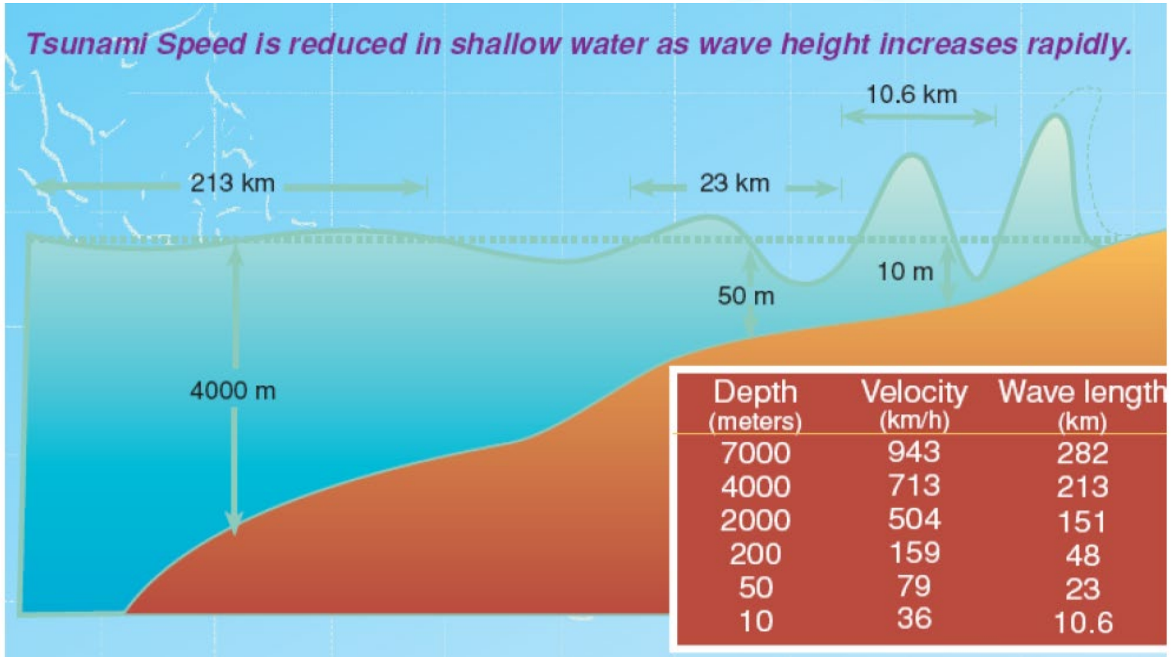
- "Tsunami" in Japanese means "harbor wave"
- A system of ocean gravity waves formed as a result of large-scale displacement of sea surface.
- Travel long distances without losing energy

Tsunami Characteristics

- Length and Time Period
  - Long wave length (of several 100 km)
  - Periods of a few minutes to about an hour
- Speed proportional to square root of water depth
  - 500 to 1000 km per hour in Deep Ocean
  - Grows to Tens of meters near shore About 30 km per hour near shore
- Height of Tsunami Wave
  - Less than a meter in the Deep Ocean
  - Grows to Tens of meters near shore

DEEP OCEAN tsunami has long wavelength, travels fast, small amplitude - doesn't affect ships

AS IT APPROACHES SHORE, it slows. Since energy is conserved, amplitude builds up - very damaging

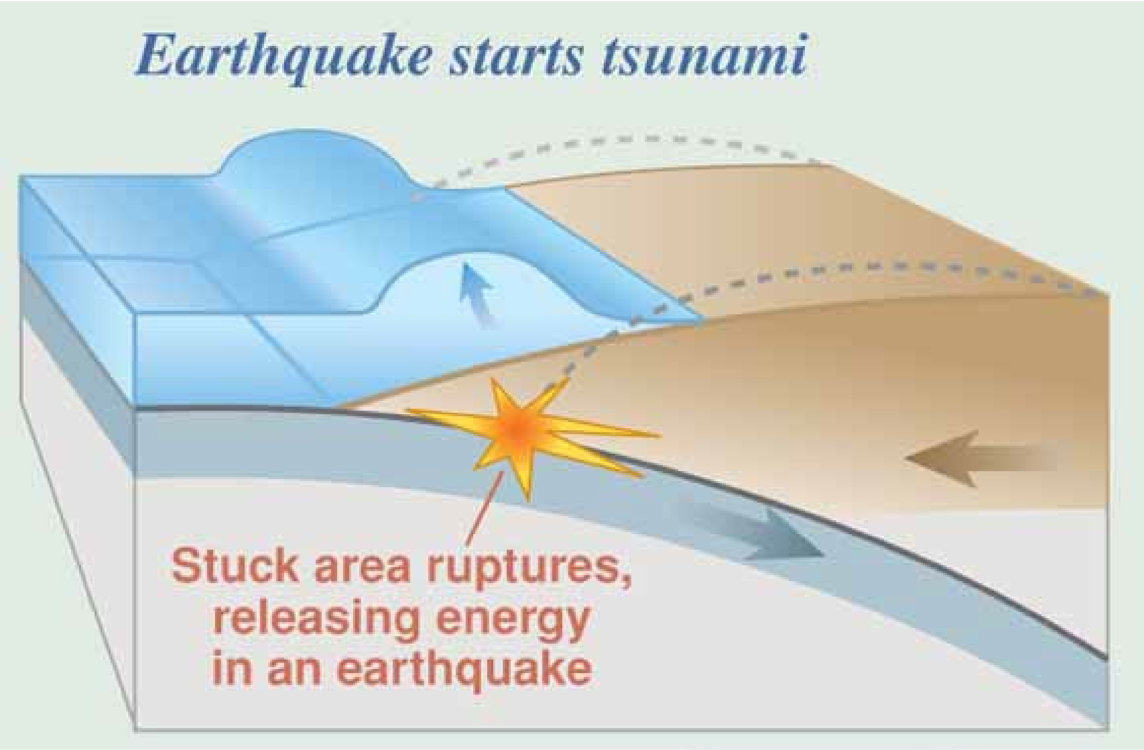


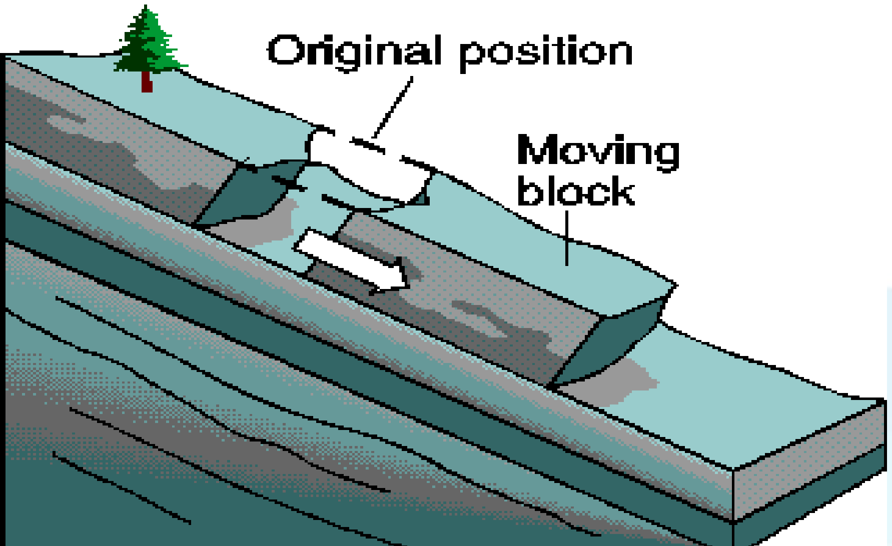
Depth (meters)	Velocity (km/h)	Wave length (km)
7000	943	282
4000	713	213
2000	504	151
200	159	48
50	79	23
10	36	10.6

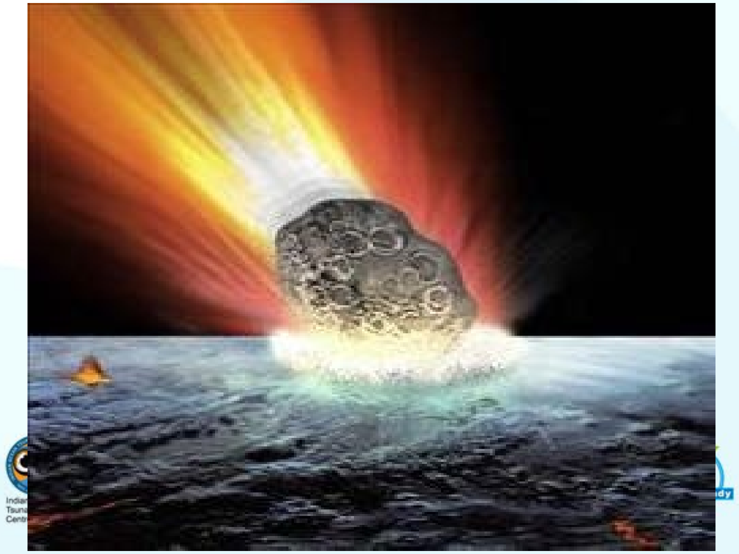
Causes of Tsunamis

Any impulse that causes <u>large scale displacement</u> of the sea surface.

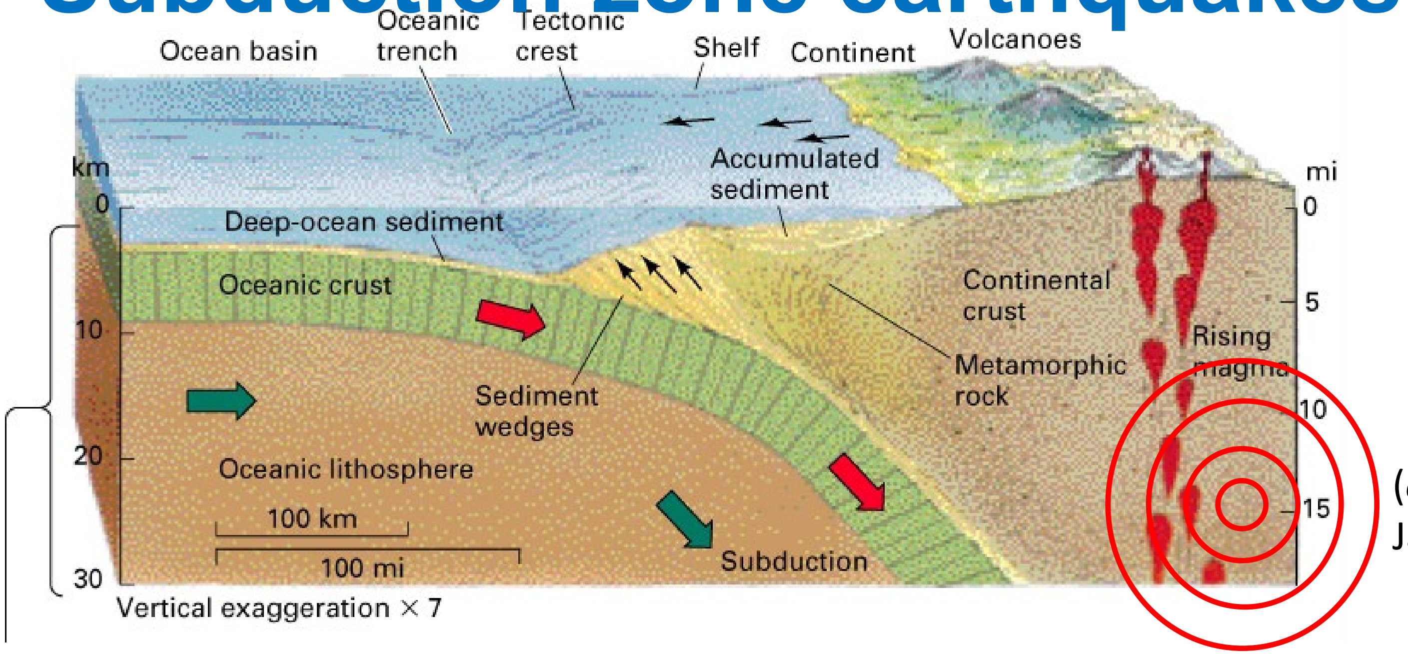
- **Earthquakes**
- **Landslide**
- **Volcanic eruptions**
- **Meteoroids Impact**

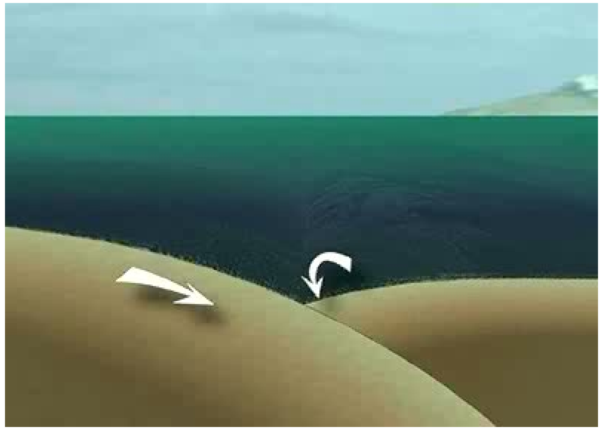




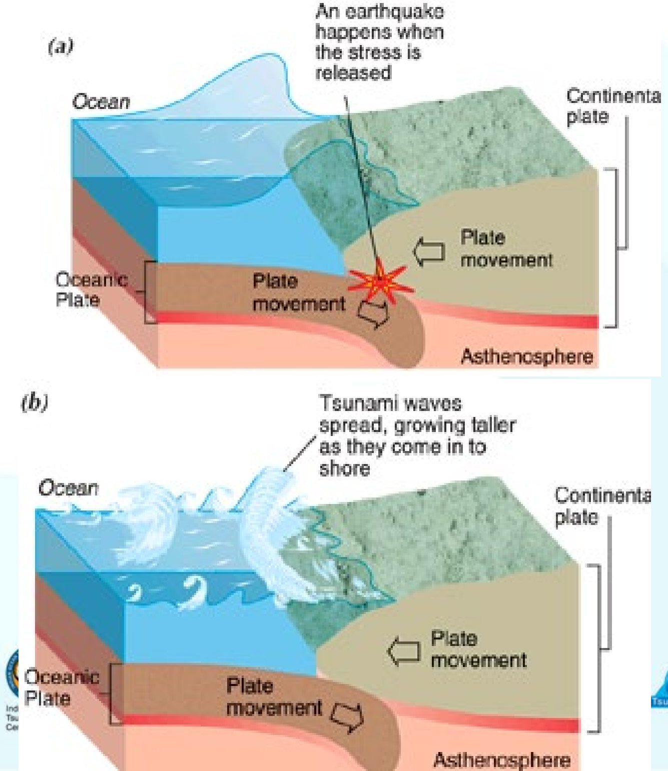


Subduction zone earthquakes





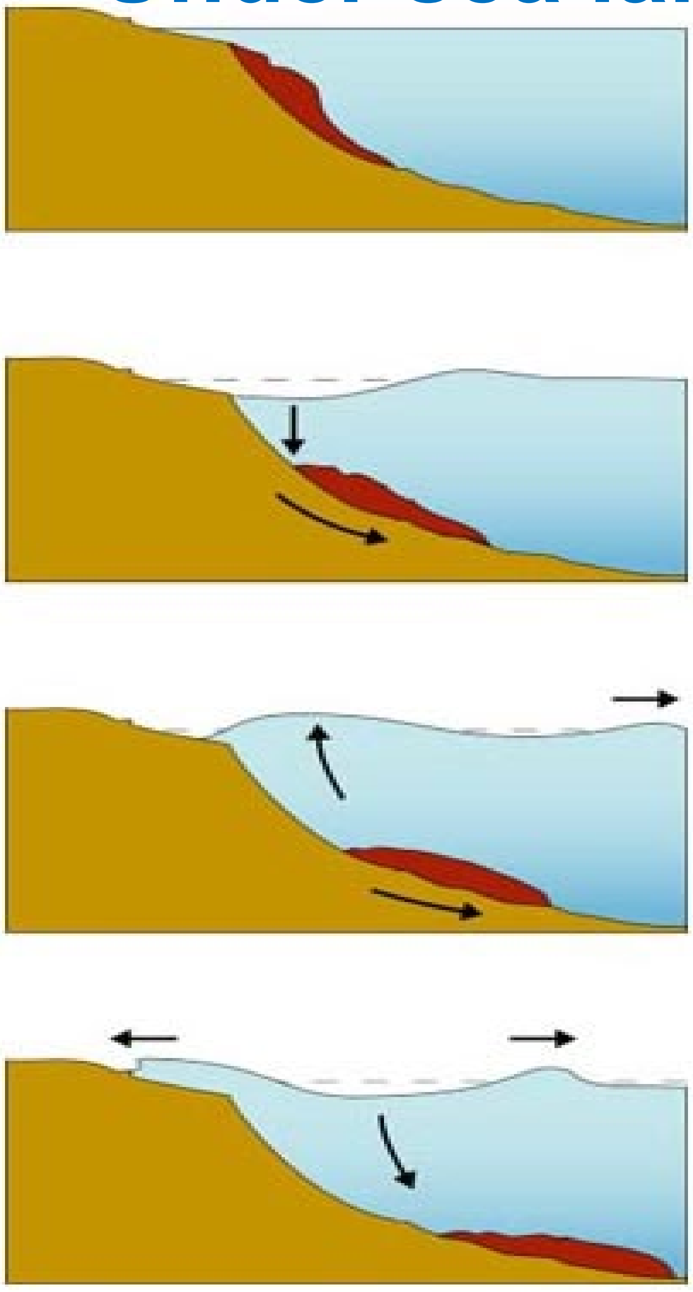
(*e.g.* Sumatra, 2004: >230,000 people killed; Japan, 2011: ~20,000 people killed)



- Oceanic crust collides with continental crust and is forced downward
- Compression forces build until rock fractures and an earthquake occurs
- **When an earthquake occurs, the energy travels outward in all directions.**

For the epicentre, the energy causes a sea wave to move away at great speed.

Under sea landslide or slump

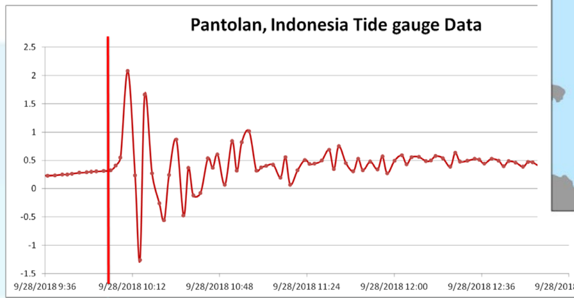


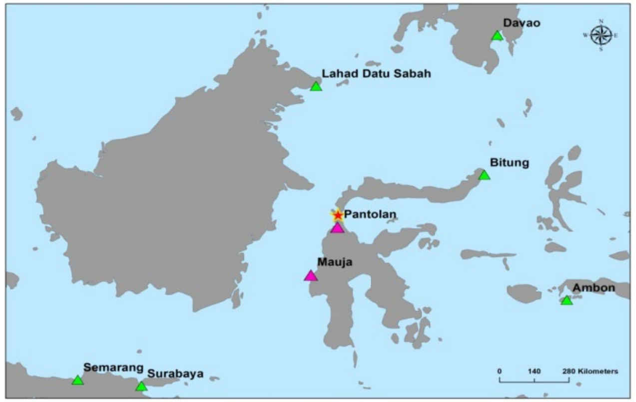
- Body of sediment slumps downward along a continental shelf
- Can be triggered by an earthquake
- Water drops at head of slump, rises at toe to create a wave
- Wave moves outward as a tsunami

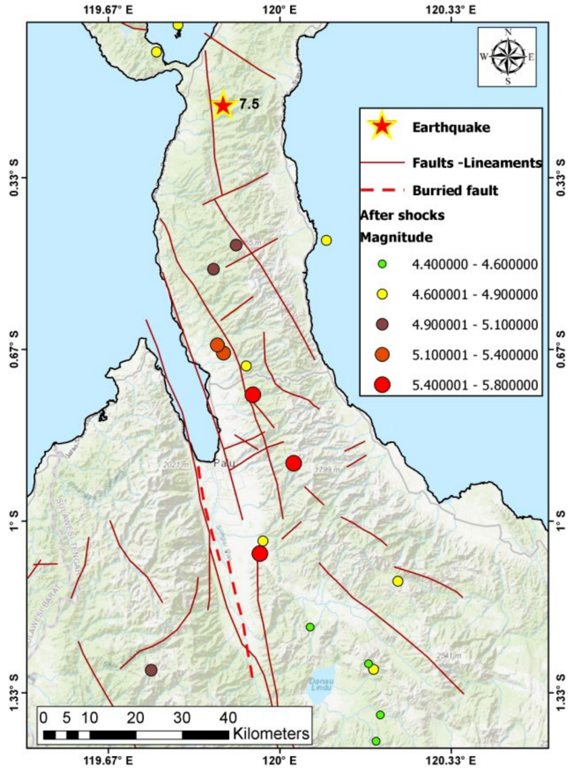
Mass Movement (*e.g.* Alaska, 1958: waves up to 518 m high formed in Lituya Bay).

Submarine Landslide:

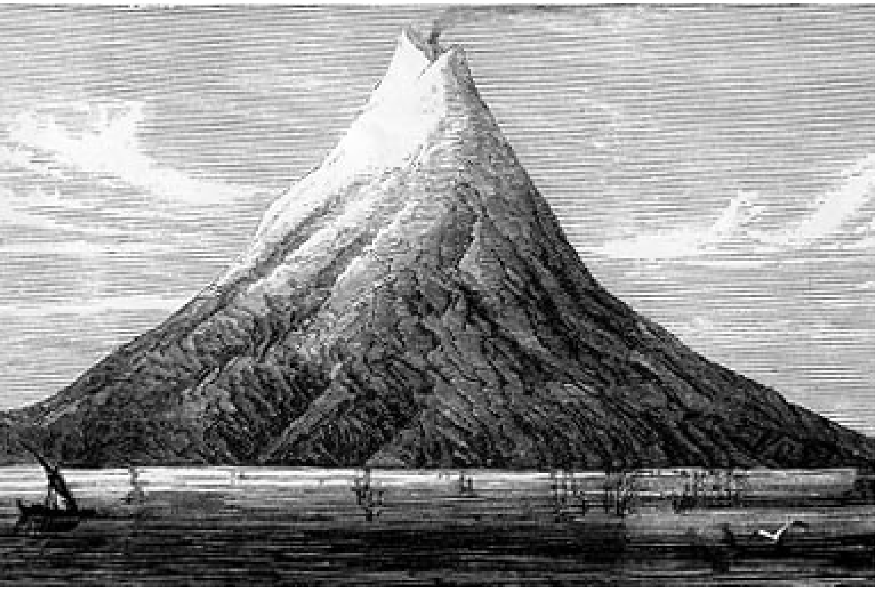
e.g. Palu, Indonesia Tsunami in 2018 killed more than 2000 people

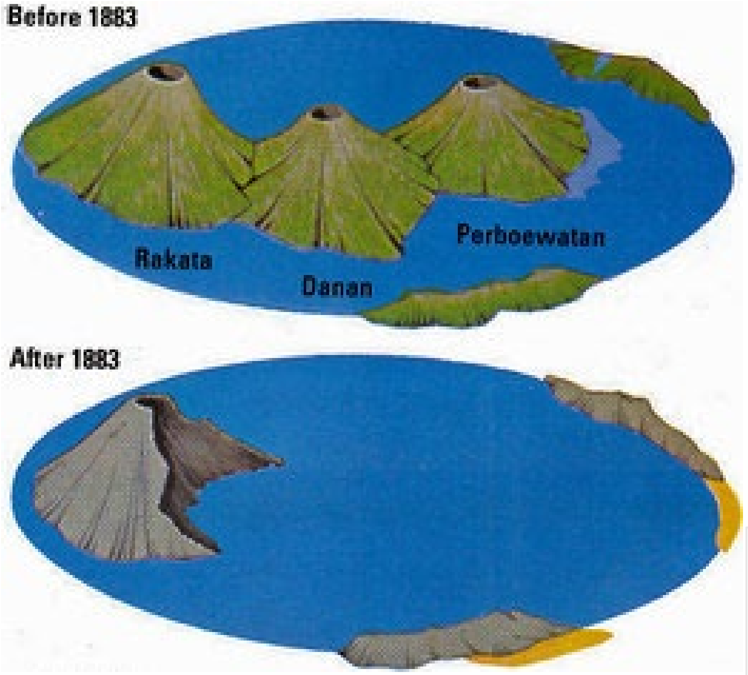






Volcanic Explosion

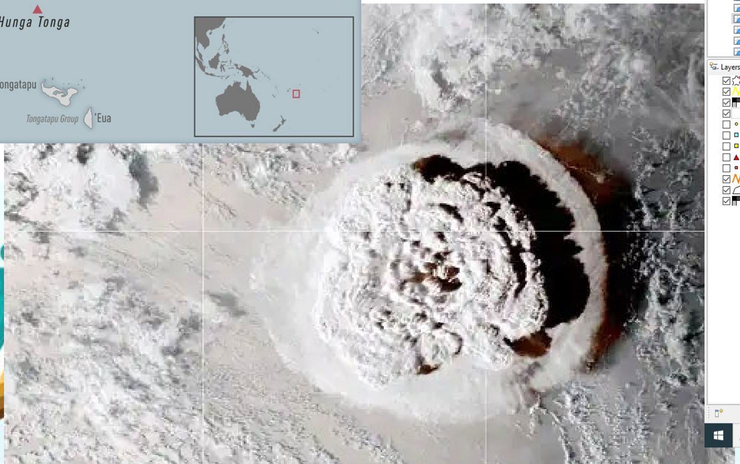


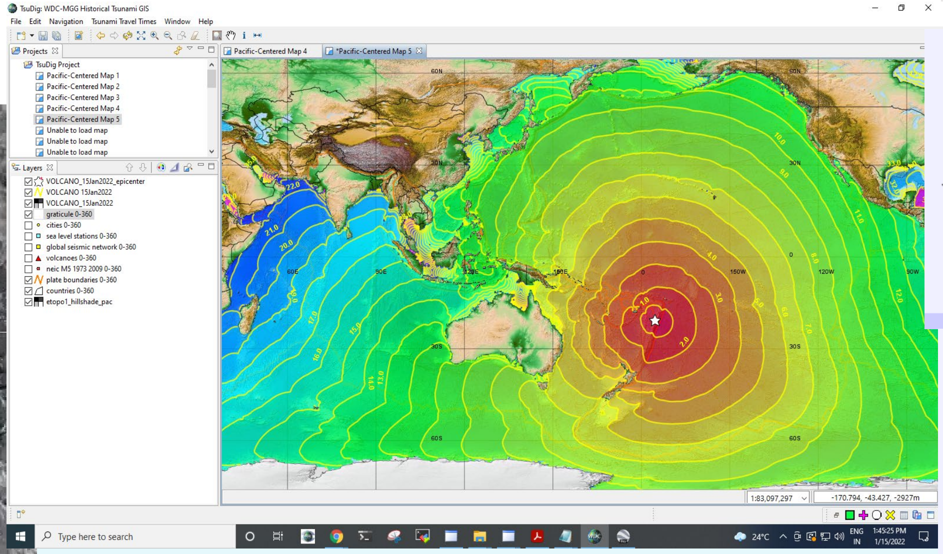


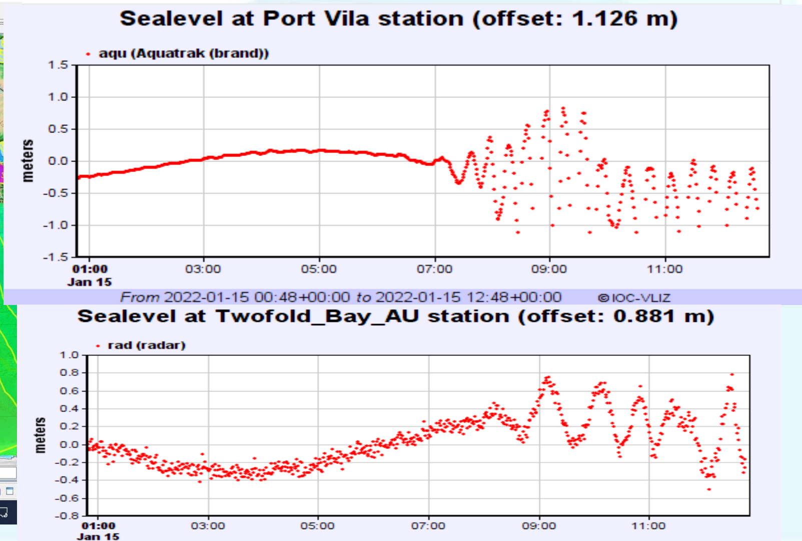
- The explosive eruption of Krakatau in August 1883 created a tsunami that claimed more than 36,000 lives

e.g. Anak Krakatau in 2018 killed more than 500 people

On 15 January 2022, underwater volcano in Tonga erupted, entire Pacific Ocean, sea level changes were observed



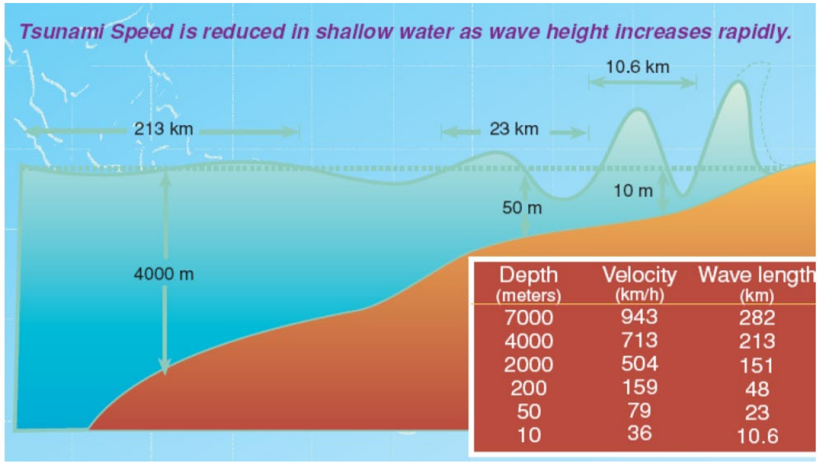


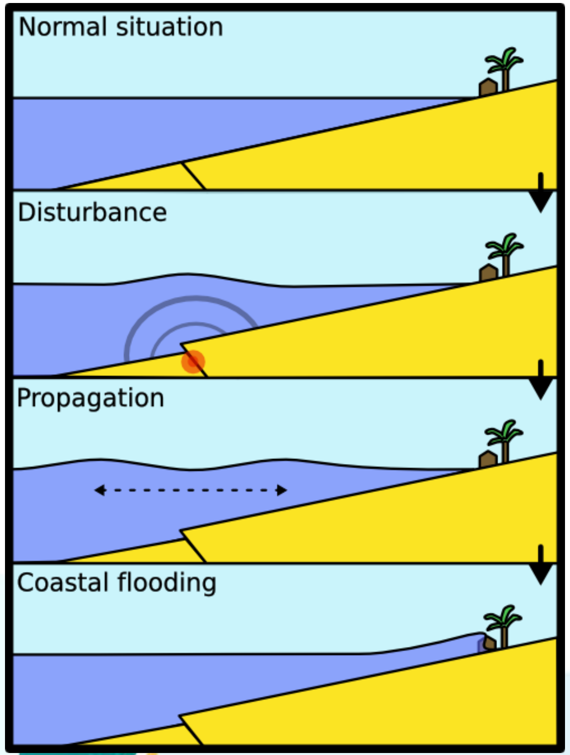


Tsunami Characteristics

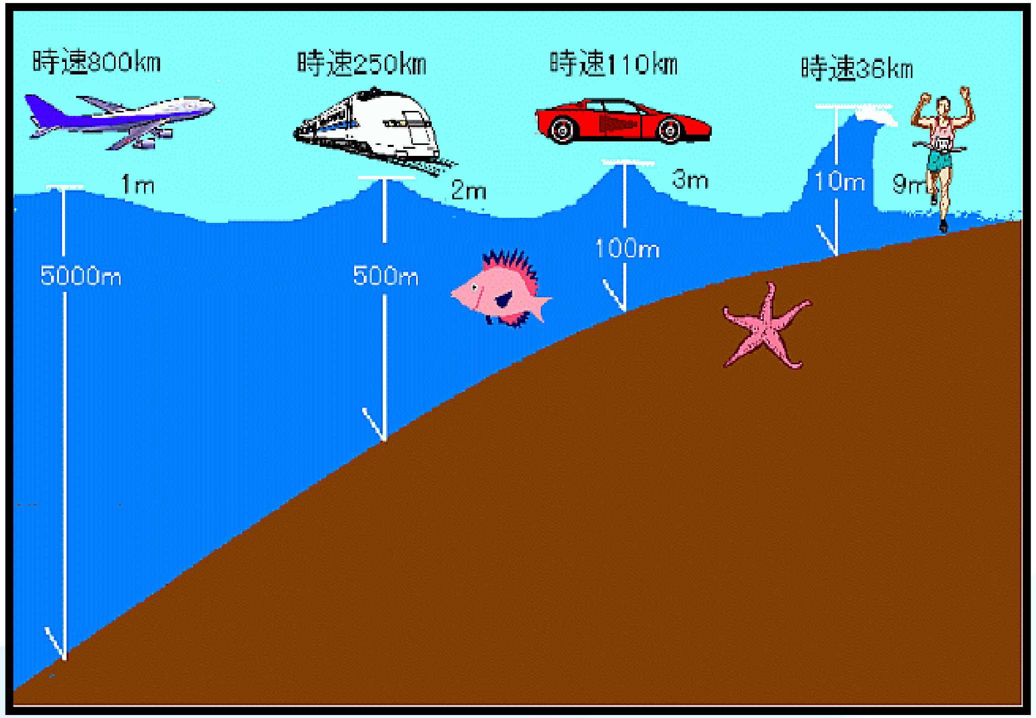
What happens during Tsunami?

Tsunami is a series of waves





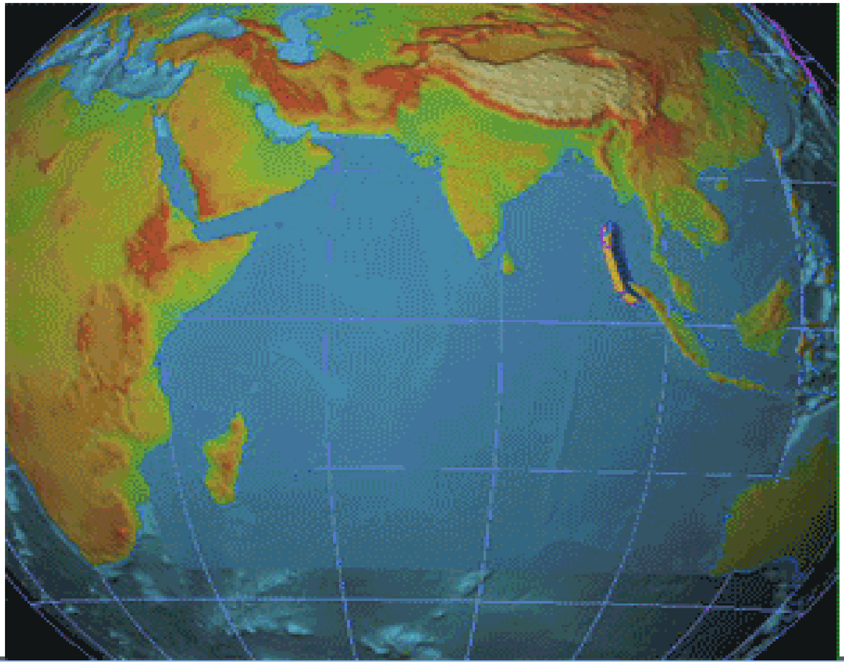
Generation



Propagation

Inundation

Boxing day Tsunami

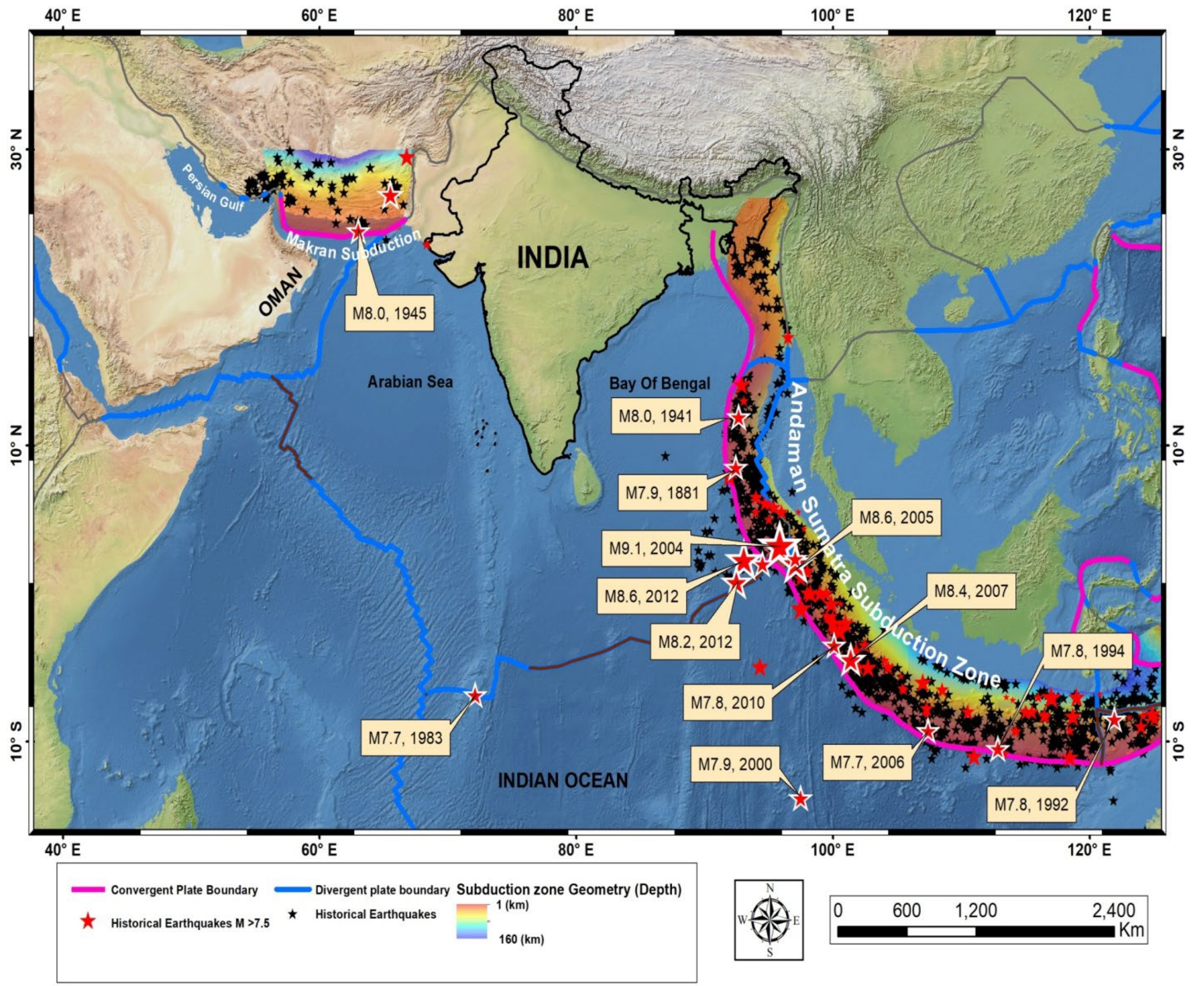


- The worst tsunami in recorded history on December 26, 2004
- Magnitude 9.3 (second strongest earthquake ever recorded on a seismograph)
- Lasted 10 minutes (longest lasting earthquake in history)
- 229,866 confirmed dead, which includes 42,883 missing and never accounted for
- More than $7 billion dollars damage

Reasons for huge loss.....

- Many nations in the Indian Ocean did not even recognize the word “tsunami”
- None had tsunami preparedness programs in place
- Absence of a Tsunami Early Warning System (TEWS) in India
- Ignorance of the natural signs of a tsunami led to inappropriate actions

Potential Tsunamigenic Source zones



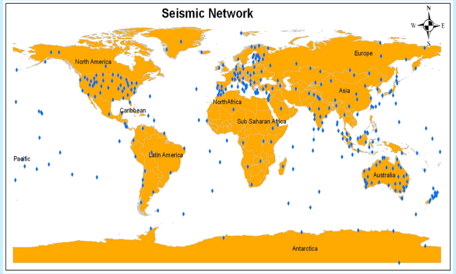
- **Tsunamis are primarily caused due to large undersea Earthquakes.**
- **For a tsunami to hit Indian coast, it is necessary that a tsunamigenic earthquake occurs and its magnitude should be larger than M 6.5**
- **Earthquakes with Slow Rupture Velocities are most efficient Tsunami Generators**
- **75% of earthquake energy is released in the circum-Pacific belt – 900 Tsunamis in 20th Century**
- **20% in the Alpine-Himalayan belt – 6 Tsunamis in 20th Century**
- **Historical Tsunami in India**

  12 Apr, 1762 (BoB EQ) – 1.8 M
  31 Dec, 1881 (Car Nicobar EQ)
  27 Aug, 1883 (Krakatoa) – 2 M
  26 Jun, 1941 (Andaman EQ)
  27 Nov, 1945 (Makran EQ) – 12 M
  26 Dec, 2004 (Sumatra EQ)

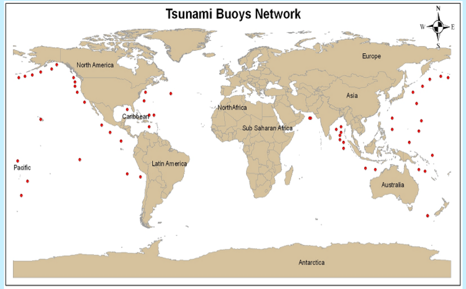
Tsunami Early Warning System

Detection → **Warnings** → **Dissemination**

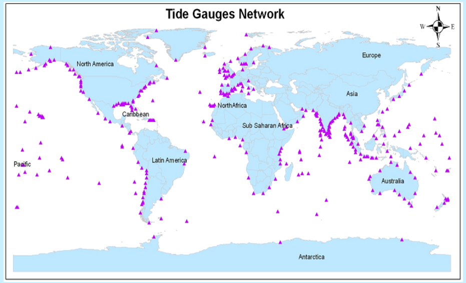
Participating Institutions
IMD, NIOT, NCCR, SOI,
NRSC, INCOIS
MHA, NDMA, Coastal States



Seismic Network



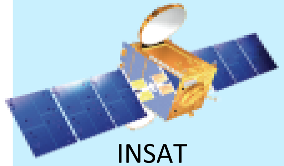
BPR Network



Tide gauge Network

Observation Networks

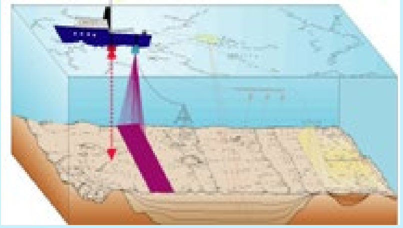

VSAT


INSAT

GPRS

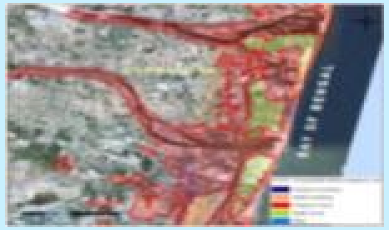

INMARSAT

Communications


Bathymetry


Tsunami Modelling


Topography


Costal Vulnerability

Modelling

COMMS Tests
Tsunami Drills
Trainings
Publicity Material


Capacity Building

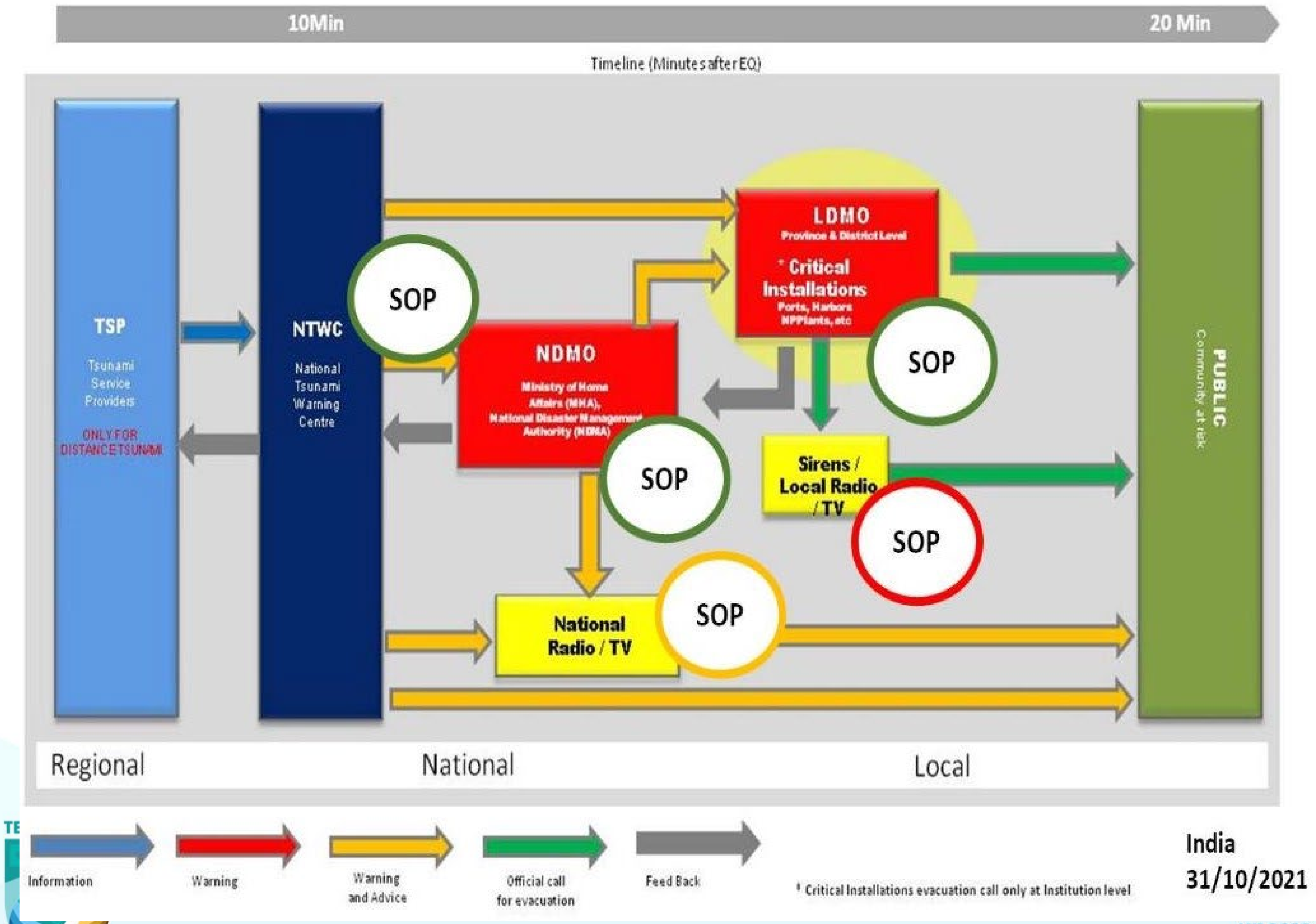

R & D

Paleo-tsunami
Modelling
GNSS Data Use

Last mile connectivity

TSUNAMI WARNINGS!!!

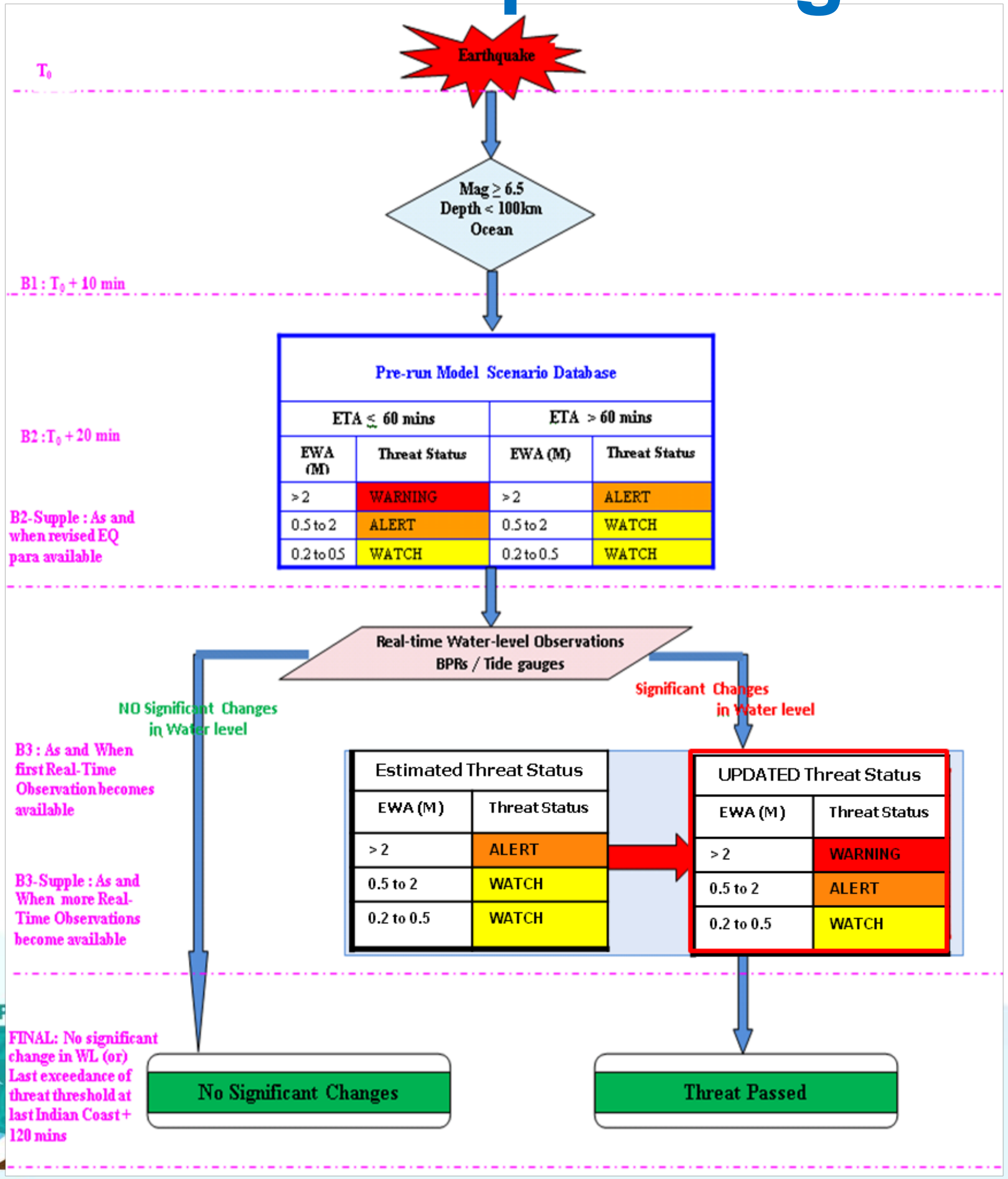
Tsunami Warning Chain - Integrated



National Warning Chain

- National Tsunami Warning Centres (**NTWCs**), Disaster Management Organisations (**DMOs** at national, provincial, and local level), and **Broadcast Media**
- **Standard Operating Procedures (SOPs)** underpin each link.
- SOPs prepared and tested at national, provincial and local level. Media SOP is being tested.
- **Routine 6-monthly communication tests** Jun and Dec every year (email, GTS, SMS, Fax)
- Test national tsunami warning chain and SOPs in Mock Drills
- Recent mock drill was in October 2023

Standard Operating Procedures - ITEWC



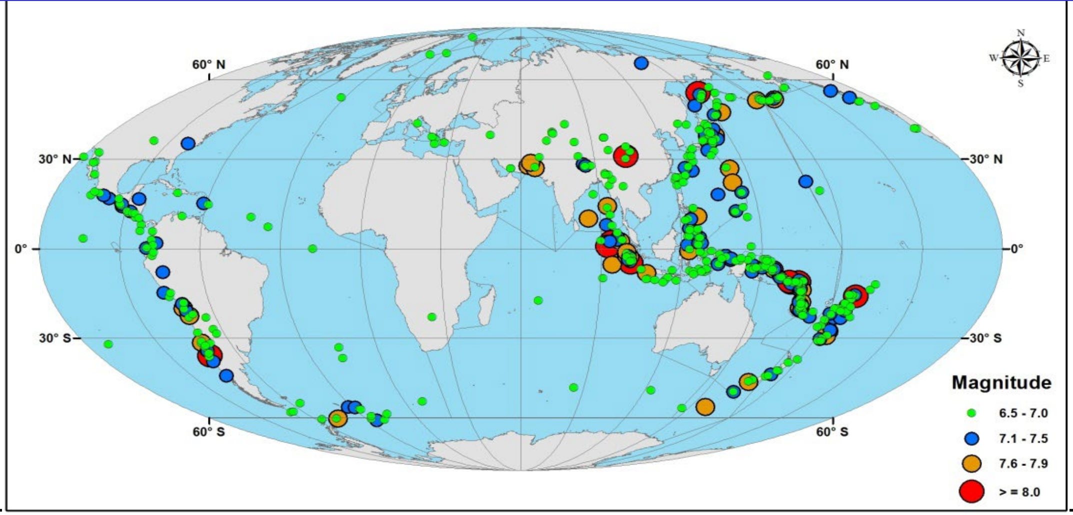
- The Indian Tsunami Early Warning Centre (ITEWC) **services** for an event **commence** whenever an earthquake is recorded with **M ≥ 6.5** within the Indian Ocean and **M ≥ 8.**0 outside of the Indian Ocean
- **Uniquely designed** SOP for generation of timely and accurate tsunami bulletins to handle both **near-sourc**e and **far-source** coastal regions
- Based on **proximity** of a coastal zone to the tsunamigenic earthquake source regions and Expected Wave Heights from Models
- **4 Threat Levels** corresponding to different public responses and mapped to **NDMA guidelines**

SOP – Public Response and Threat Levels in Bulletins

Threat Status	Action to be taken	Dissemination to	
WARNING	Public should be advised to move inland towards higher grounds. Vessels should move into deep Ocean	MoES, MHA, NDMA, NCMC, NDRF Battalions, SEOC, DEOC, Public, Media	WARNING
ALERT	Public should be advised to avoid beaches and low-lying coastal areas. Vessels should move into deep Ocean	MoES, MHA, NDMA, NCMC, NDRF Battalions, SEOC, DEOC, Public, Media	ALERT
WATCH	No immediate action is required	MoES, MHA, NDMA, NCMC, NDRF Battalions, SEOC, DEOC, Media	WATCH
THREAT PASSED	All clear determination to be made by the local authorities	MoES, MHA, NDMA, NCMC, NDRF Battalions, SEOC, DEOC, Public, Media	THREAT PASSED

Performance of ITEWC

ITEWC monitored 690 earthquakes (M>6.5) since its inception to till date

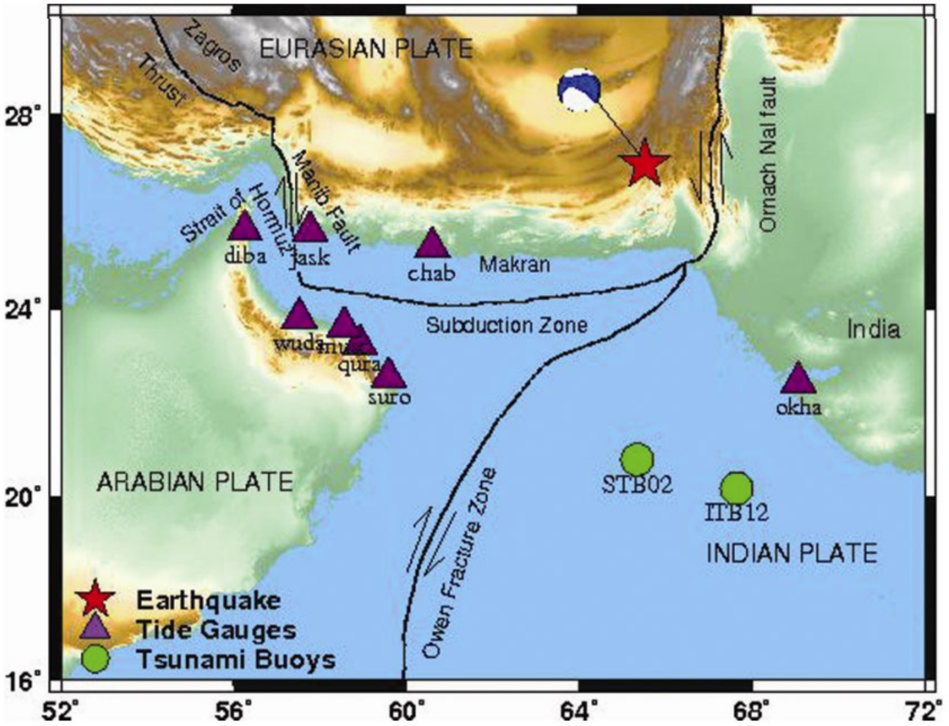


Region	No of Earthquake M≥6.5
Indian Ocean **(IO)**	102
Other than Indian Ocean (GO)	588

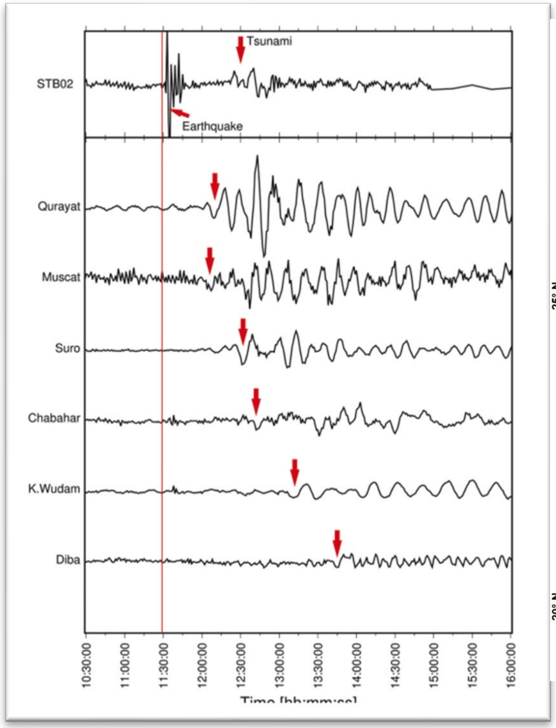
Parameter	Target (local/distant)	Achievement GO	Achievement IO
Elapse time from earthquake origin time to initial earthquake information issuance	10 min	10.0min	7.7 min
Probability of detection of Indian Ocean earthquakes with Mw ≥ 6.5	100%	100%	100%
Accuracy of hypocenter location (with respect to USGS final estimates)	Within 30 km	16.5 Km	14.8 Km
Accuracy of hypocentre depth (with respect to USGS final estimates)	Within 25 km	16.9 Km	13.8Km
Accuracy of earthquake Mw magnitude (with respect to USGS final estimates)	0.3	0.19	0.13

Non Seismic and Complex source Tsunamis

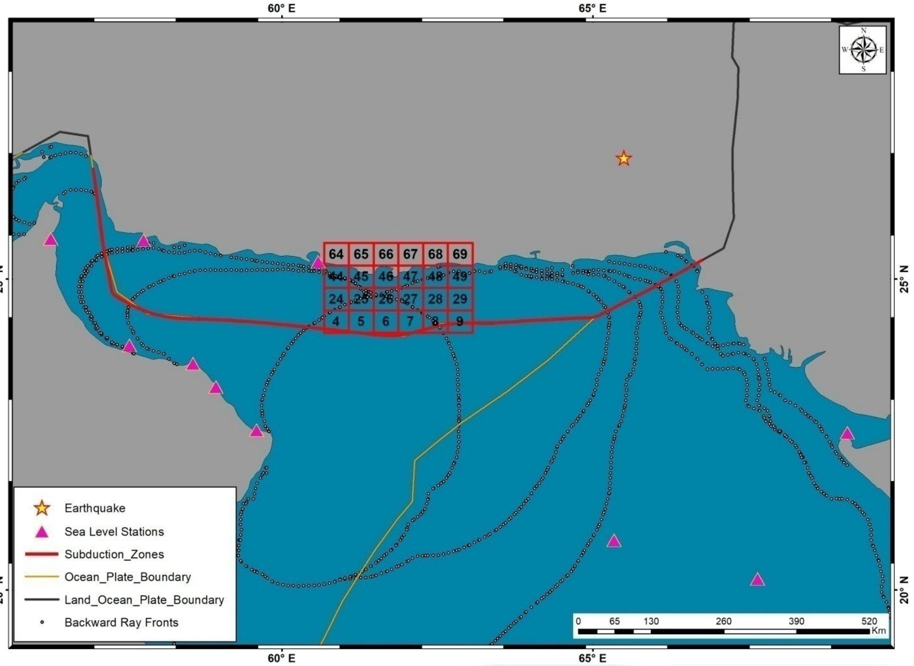
Case study Sep 24, 2013



Earthquake location on land part 200 kilometers away from the Makran coastline on 24 September 2013 (after Patanjali Kumar, et al., 2015)



Observations of 24 September 2013 tsunami recorded by various sea level gauges (after Patanjali Kumar, et al., 2015)

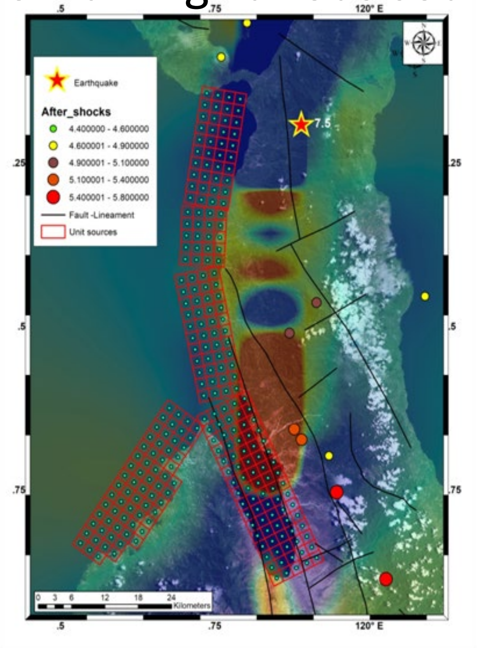


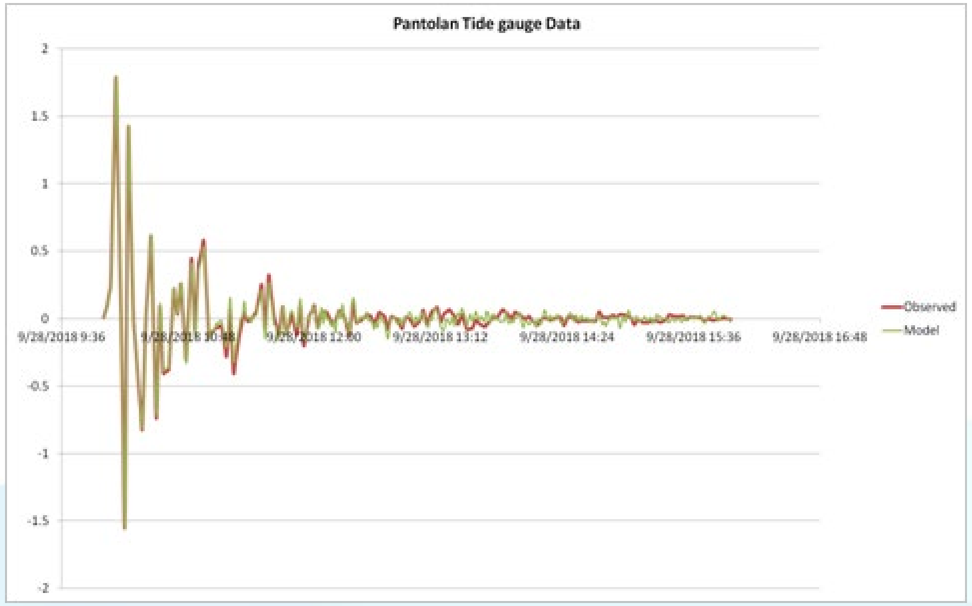
Backward ray tracing of 24 September 2013 tsunami source region (after Patanjali Kumar, et al., 2015)

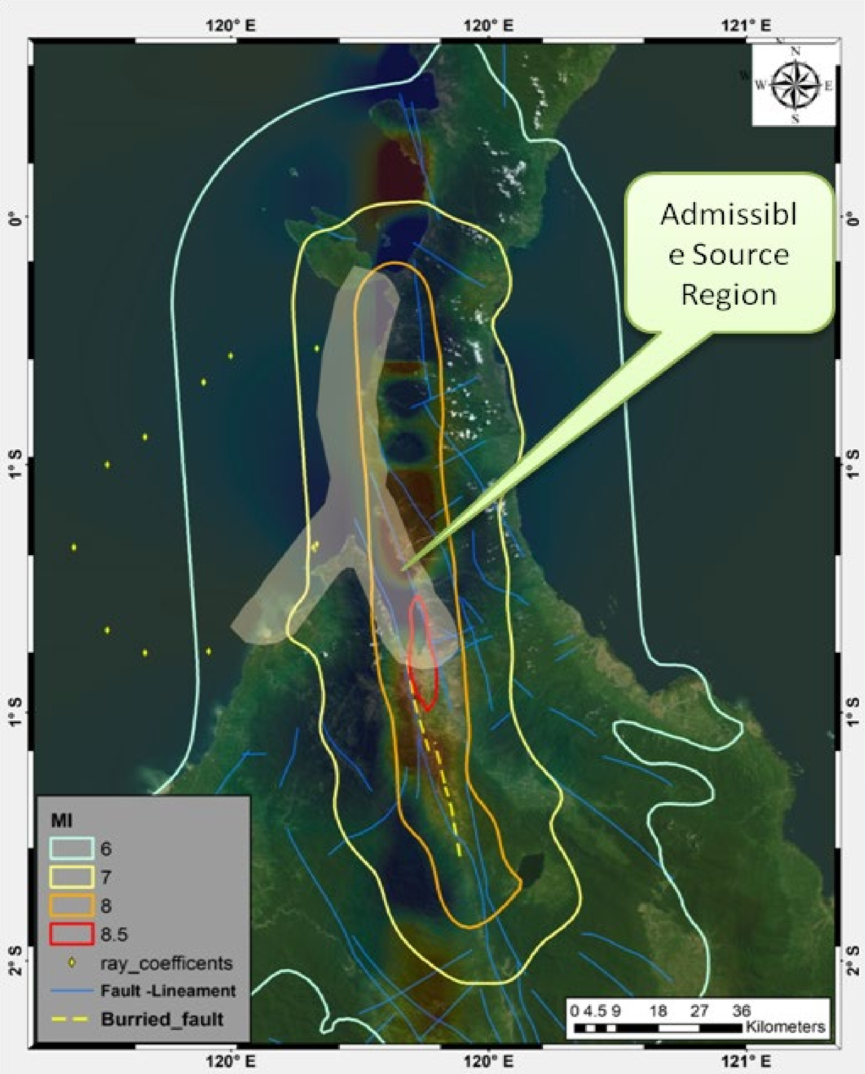
Non-Seismic and Complex source Tsunamis

Case study Sep 28, 2018

- Numerical Modelling of Tsunami triggered due to land based earthquake M7.5 on 28 September 2018
- Tsunami Propagation and greens function (small scale open ocean propagation scenarios) using ADCIRC
- Admissible source region of tsunamigenesis constrained from combining various source information







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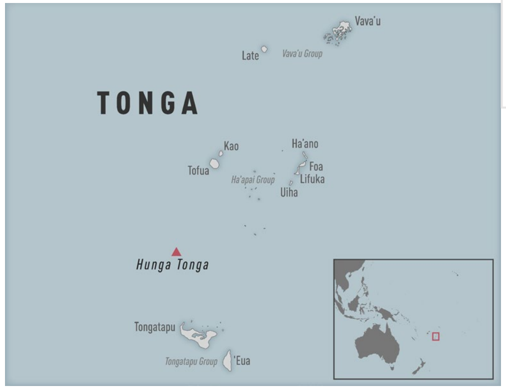
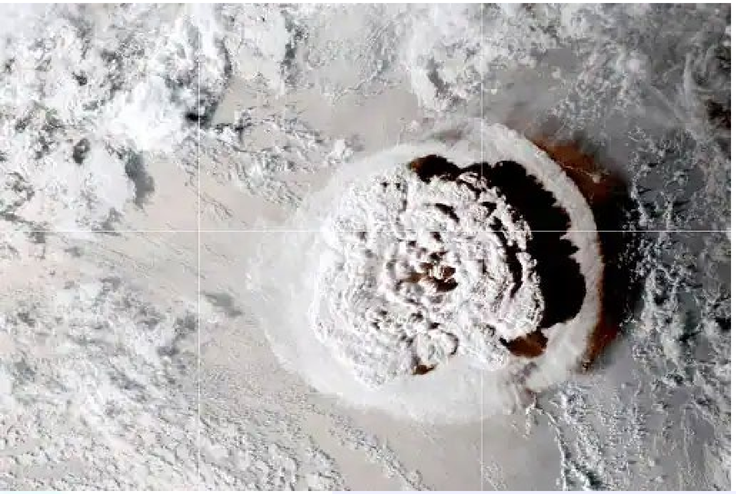
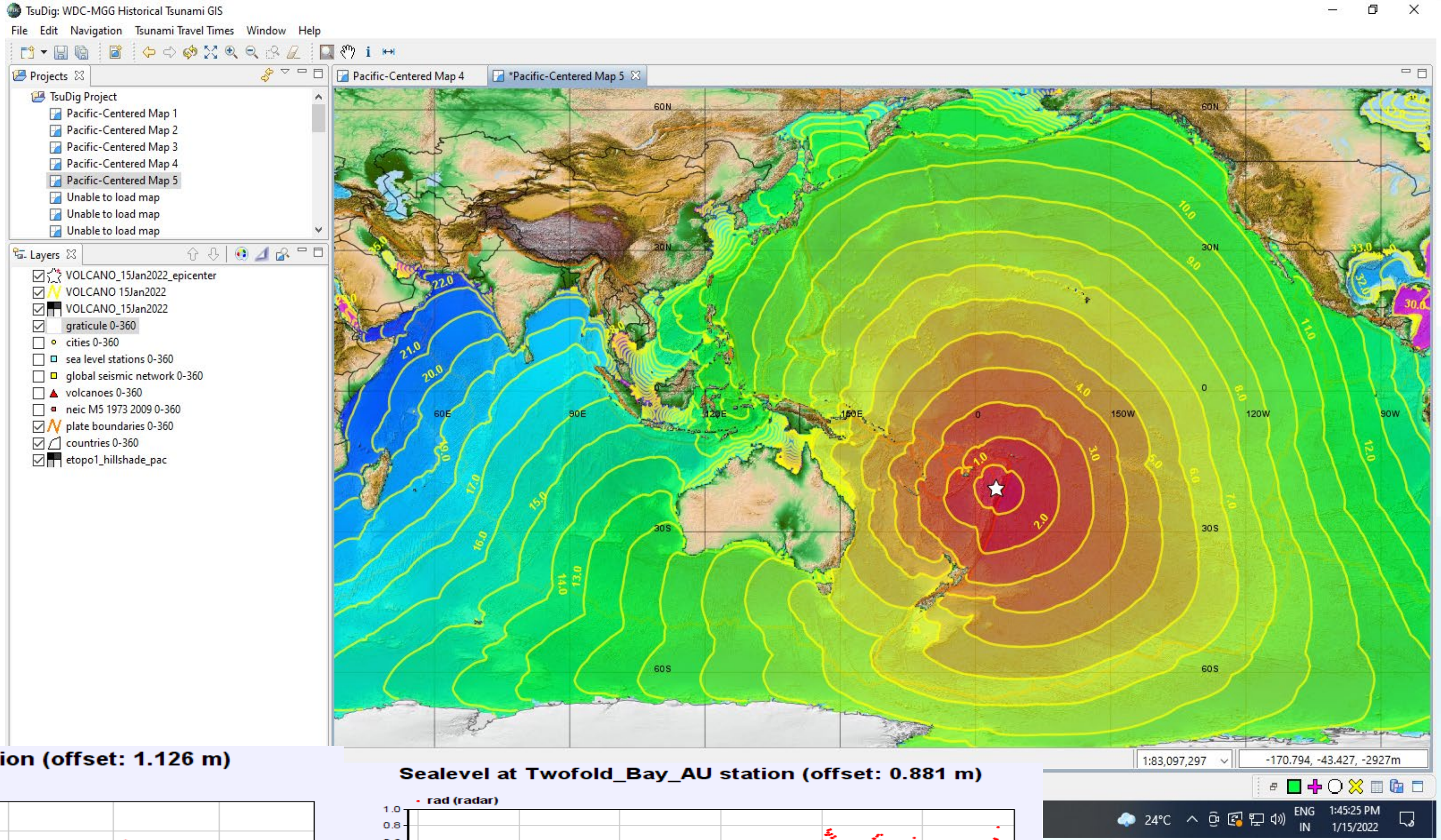
BMKG

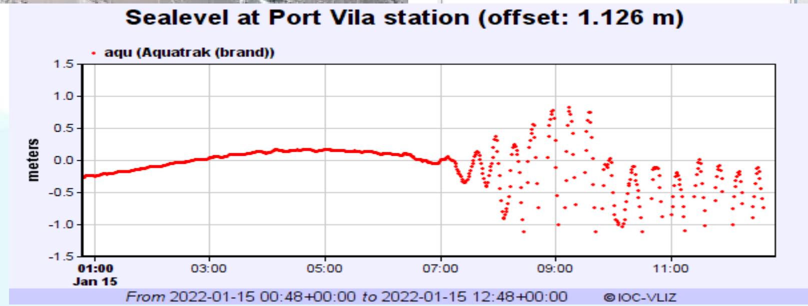
Non-Seismic and Complex source Tsunamis

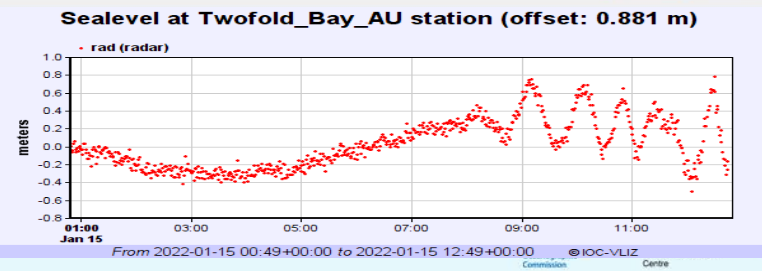
On 15 January 2022, underwater volcano in Tonga erupted, entire Pacific Ocean, sea level changes were observed



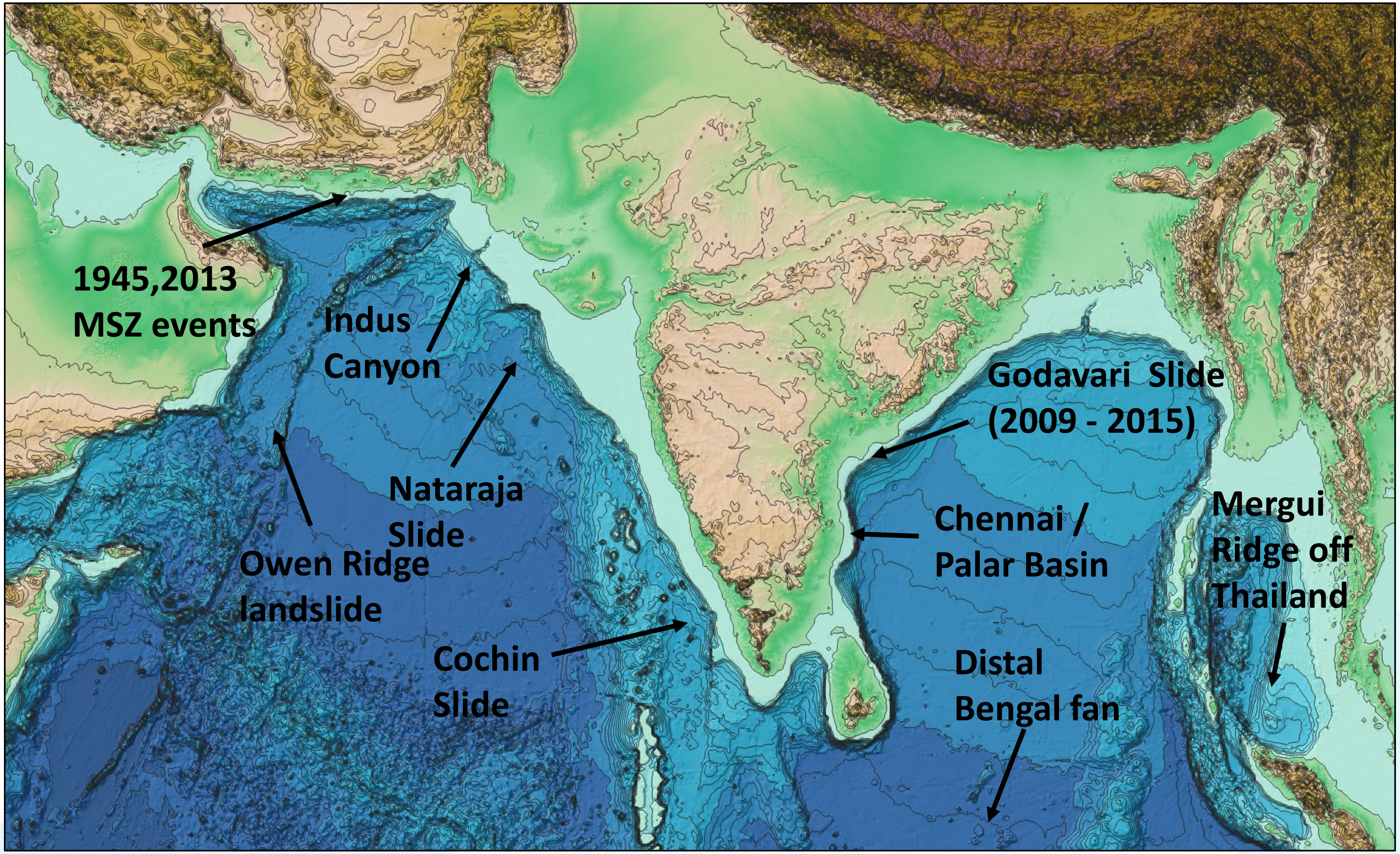






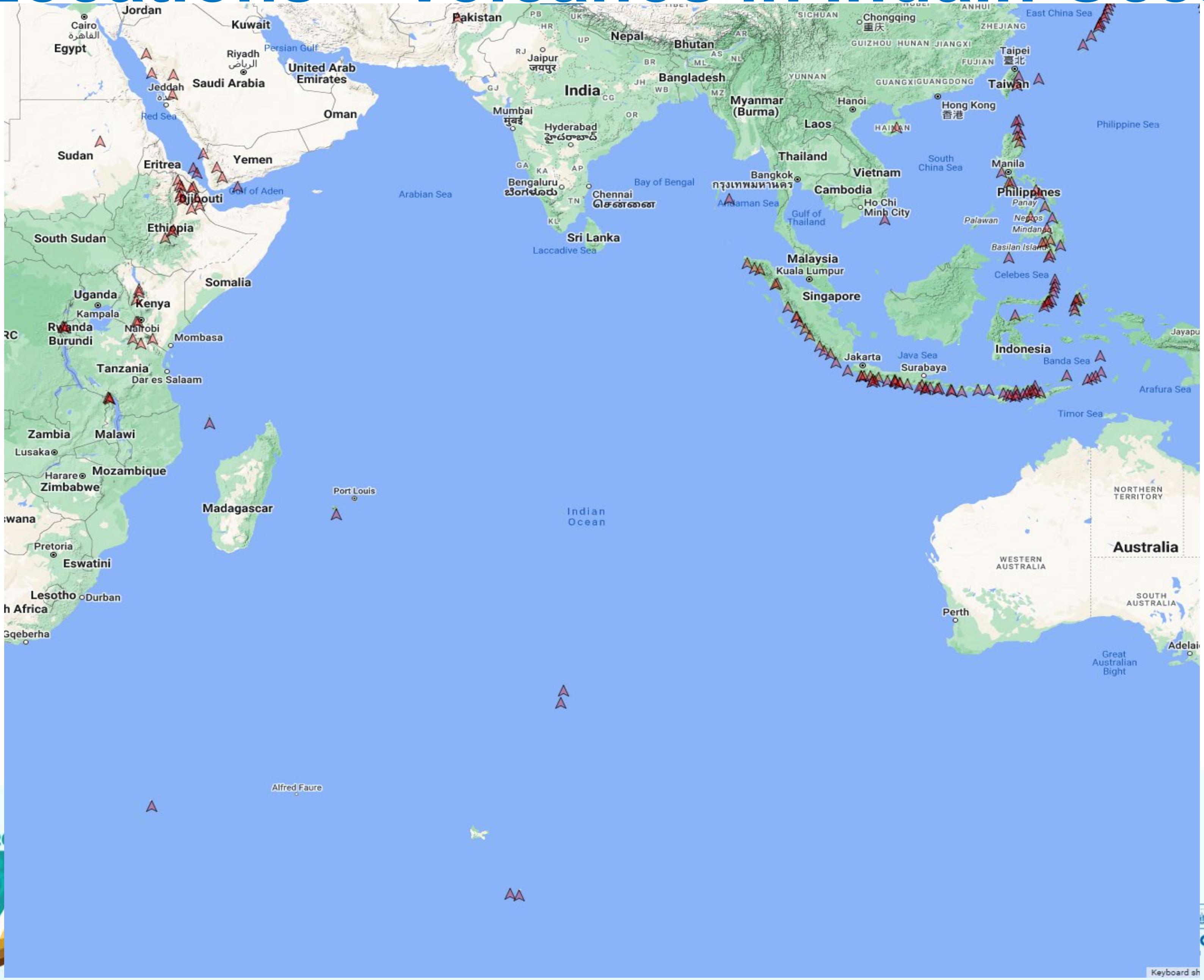


Locations – submarine landslides



Courtesy: PCTWIN Project: Naveen

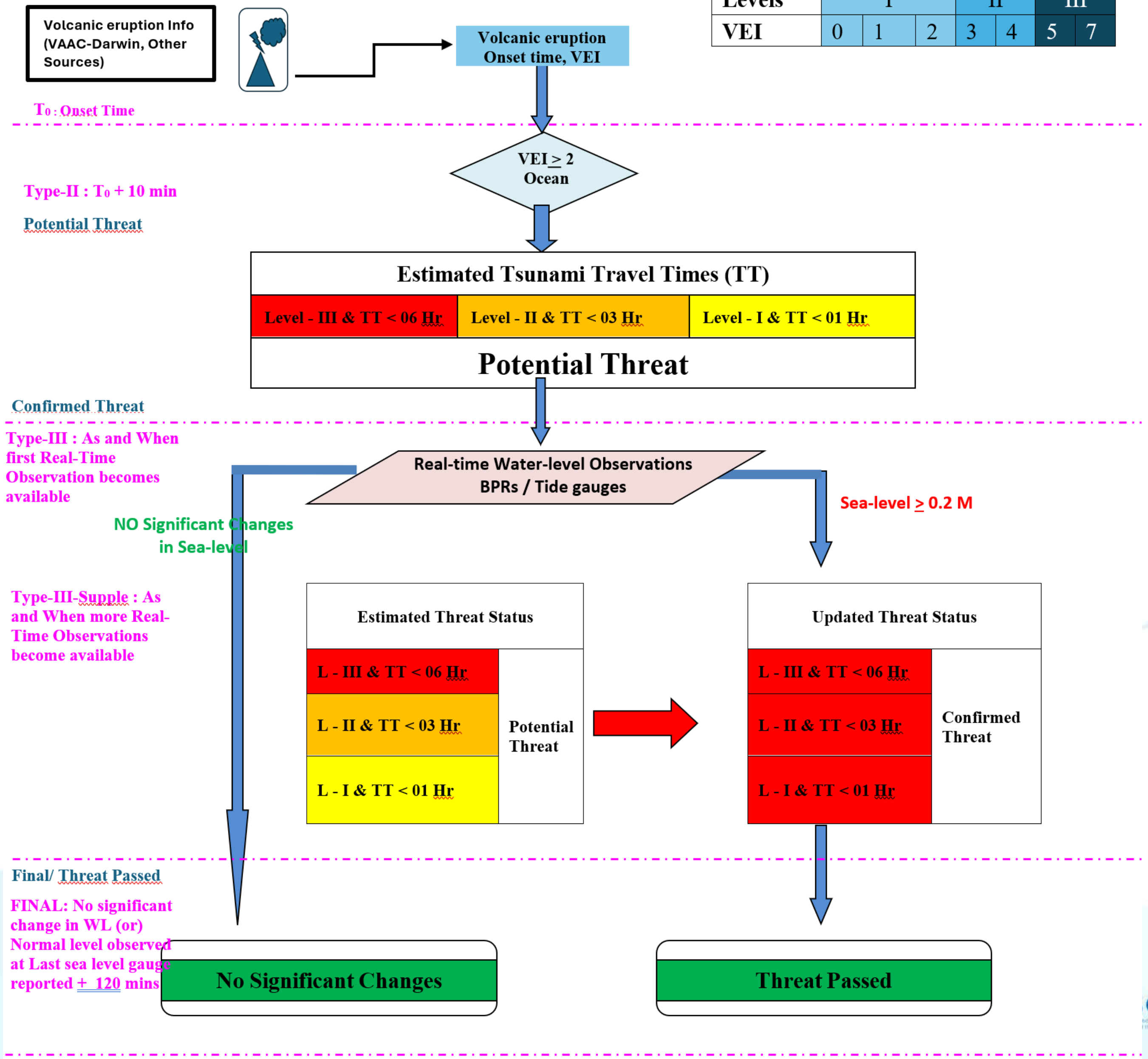
Locations – Volcanos in Indain Ocean



- About 1350 volcanoes are considered active in the past 12,000 years worldwide
- About 50–85 erupting volcanoes each year
- About 70 in the Indian Ocean

Standard Operating Procedure (SOP) for Tsunamis Generated by Volcanoes (TGV)

Levels	I			II		III	
VEI	0	1	2	3	4	5	7



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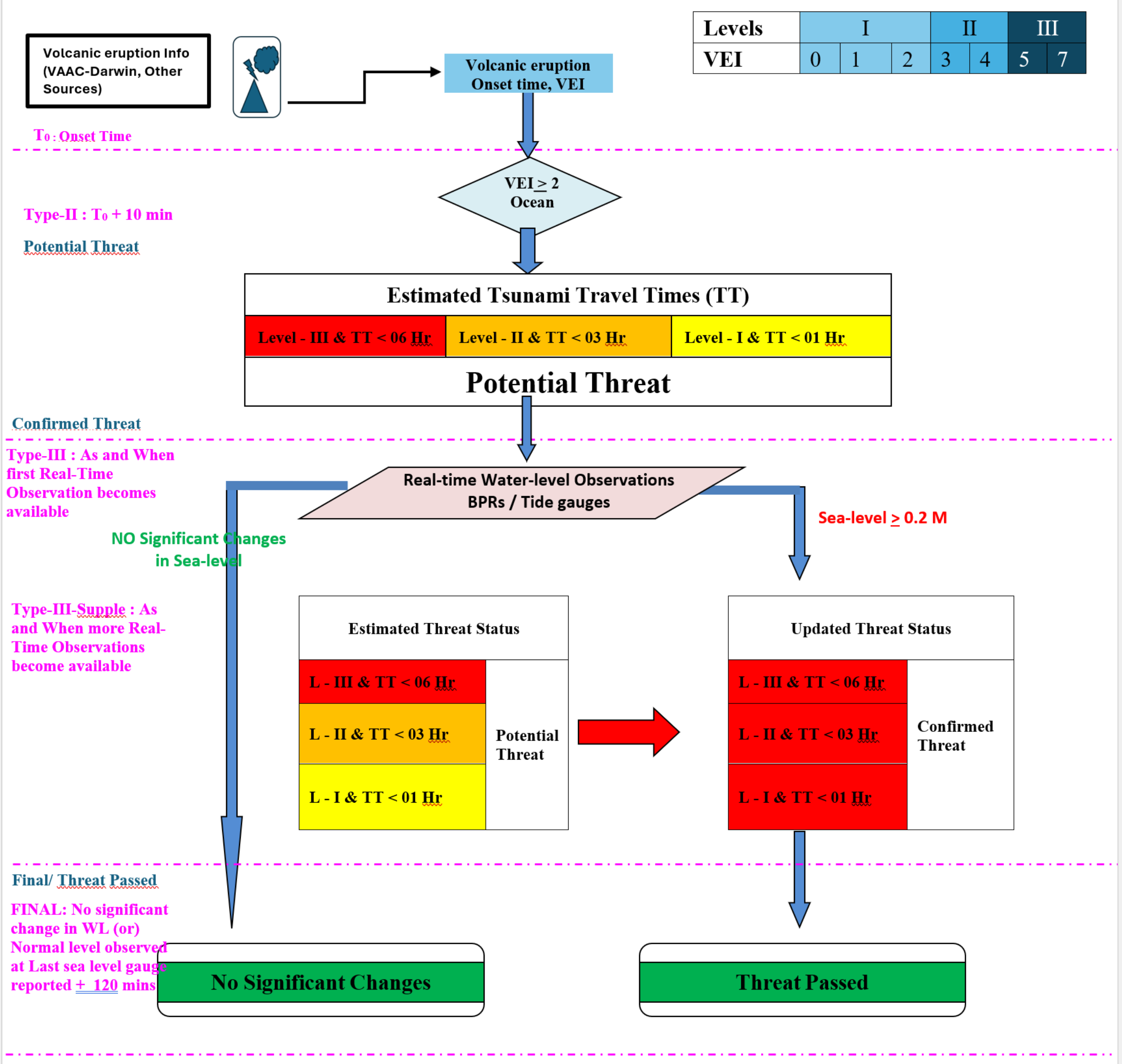
CAP INCOIS BMKG Tsunami Ready

Standard Operating Procedure (SOP) - National for Tsunamis Generated by Volcanoes (TGV)

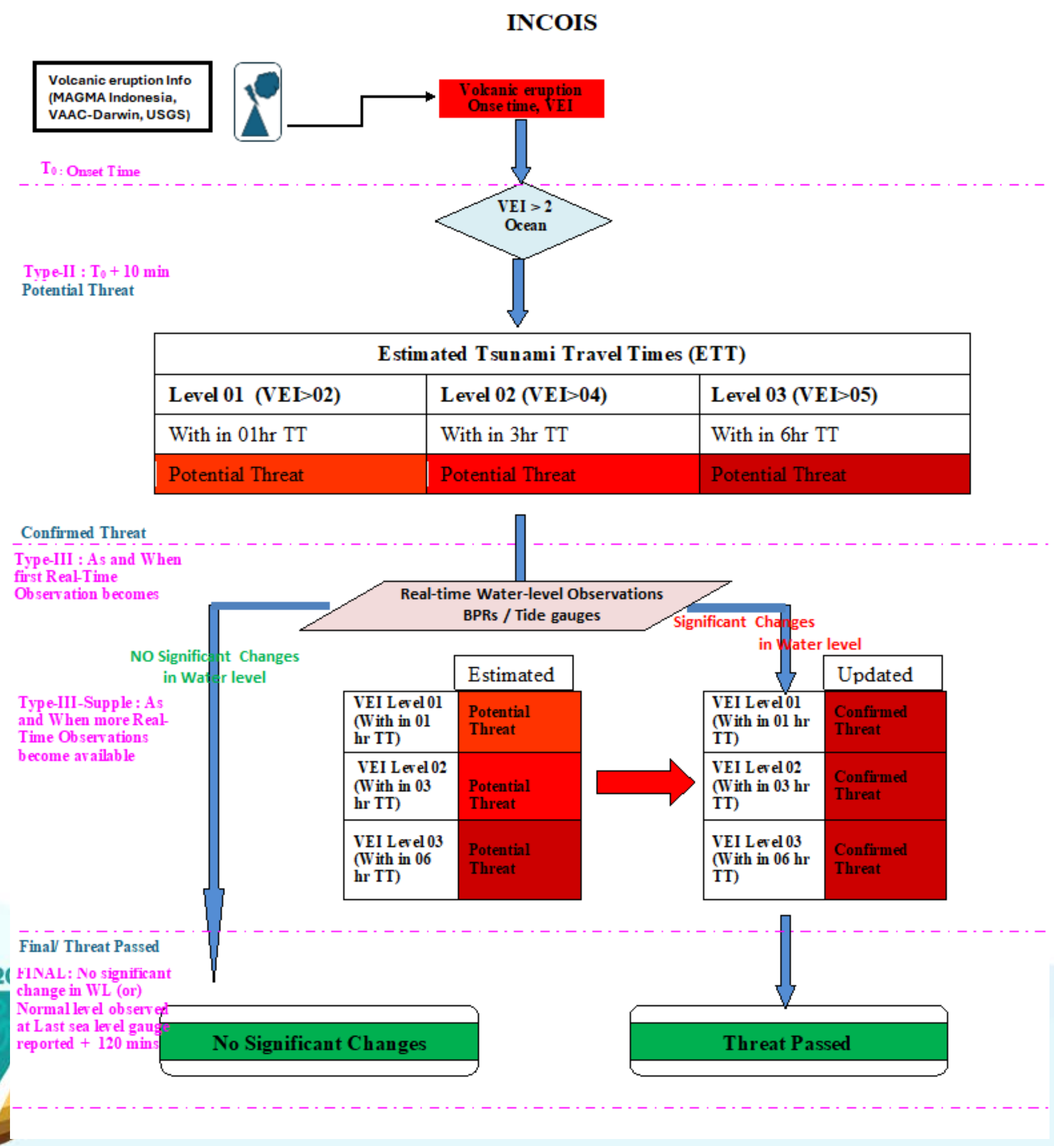


Standard Operating Procedure (SOP) for Tsunamis Generated by Volcanoes (TGV)

This National service will commence when there is an active volcano eruption with VEI ≥2

Potential tsunami threat estimated and issued bulletins

Standard Operating Procedure (SOP) - Regional for Tsunamis Generated by Volcanoes (TGV)



Standard Operating Procedure (SOP) for Tsunamis Generated by Volcanoes (TGV)

This Regional (TSP) service will commence when there is an active volcano eruption with VEI ≥2

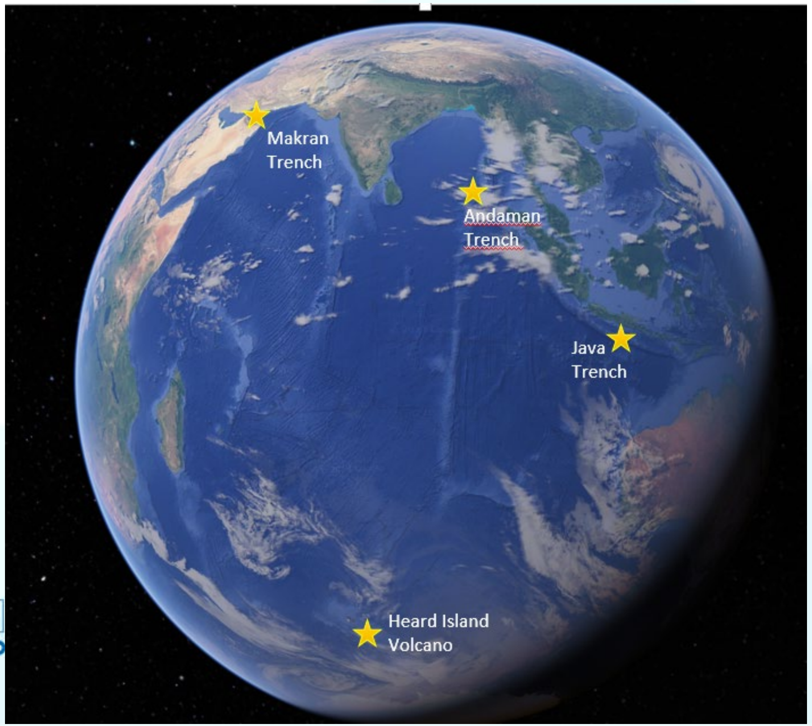
Potential tsunami threat estimated and issued bulletins

IOWave23 Exercise

IOWave23 Summary

- Exercise IOWave23 was successfully conducted on 4, 11, 18, and 25 October 2023.
- The 3 IOTWMS Tsunami Service Providers of Australia, India, and Indonesia issued tsunami bulletins in real-time.
- Exercise Indian Ocean Wave 2023 contained four earthquake scenarios with all scenarios run in real-time (Andaman Trench, Makran Trench, Heard Island and Java).
- At least 7 active Indian Ocean Member States involve Communities. At least 9 countries have procedures in place to ensure tsunami warnings including those with disabilities, all genders, elderly, and youth.
- 19 IOTWMS Member States completed the online survey: Australia, Bangladesh, France (Indian Ocean Territories), India, Indonesia, Iran, Madagascar, Maldives, Mauritius, Myanmar, Oman, Pakistan, Seychelles, Singapore, South Africa, Sri Lanka, Tanzania, Thailand, and United Arab Emirates – (Kenya, Malaysia, Mozambique, Timor Leste)

Scenario	1. Andaman Trench	2. Makran Trench	3. Heard Island Volcano	4. Java Trench
Date	4 October 2023 (Wednesday)	11 October 2023 (Wednesday)	18 October 2023 (Wednesday)	25 October 2023 (Wednesday)
Time	04:00 UTC	06:00 UTC	06:00 UTC	02:00 UTC
Magnitude	~M9	~M9	n/a	~M9
Depth	10 km	10 km	n/a	10 km
Latitude	7.20N	24.80N	53.10S	10.40S
Longitude	92.90E	58.20E	73.52E	112.80E
Location	Off west coast of Nicobar Islands, India	North-West Indian Ocean	Kerguelen Islands Region, Southern Ocean	South of Java, Indonesia



Sample Bulletins for VIT (TSP-Australia)

08:53 UTC 22 March 2024 Mag 6.6 Java Sea
16:16 UTC 03 March 2024 Mag 6.7 Macquarie Island Region
14:33 UTC 23 January 2024 Mag 6.5 Vanuatu Islands
22:12 UTC 18 January 2024 Mag 6.5 Tonga Islands
20:48 UTC 08 January 2024 Mag 6.8 Talaud Islands, Indonesia
07:10 UTC 01 January 2024 Mag 7.5 Near West Coast of Honshu, Japan
09:15 UTC 28 December 2023 Mag 6.5 Kuril Islands
12:56 UTC 07 December 2023 Mag 6.9 Vanuatu Islands
19:49 UTC 03 December 2023 Mag 6.8 Mindanao, Philippines
10:35 UTC 03 December 2023 Mag 6.6 Mindanao, Philippines
16:03 UTC 02 December 2023 Mag 6.6 Mindanao, Philippines
14:37 UTC 02 December 2023 Mag 7.5 Mindanao, Philippines
21:46 UTC 27 November 2023 Mag 6.5 Near North Coast of Papua New Guinea
09:05 UTC 24 November 2023 Mag 6.8 Mariana Islands
04:47 UTC 22 November 2023 Mag 6.6 Vanuatu Islands
08:14 UTC 17 November 2023 Mag 6.9 Mindanao, Philippines
13:02 UTC 08 November 2023 Mag 6.7 Banda Sea
04:54 UTC 08 November 2023 Mag 7.4 Tanimbar Islands Region, Indonesia
04:52 UTC 08 November 2023 Mag 7.1 Banda Sea
12:33 UTC 31 October 2023 Mag 6.6 Near Coast of Central Chile
11:10 UTC 31 October 2023 Mag 6.7 Fiji Islands Region
02:00 UTC 25 October 2023 Mag 9.1 SOUTH OF JAVA, INDONESIA *** TEST EVENT ***
04:00 UTC 18 October 2023 Mag N/A KERGUELEN ISLANDS REGION *** TEST EVENT ***
13.Final Bulletin 1730UTC 18 Oct 2023
12.Confirmed Threat Bulletin 1630UTC 18 Oct 2023
11.Confirmed Threat Bulletin 1532UTC 18 Oct 2023
10.Confirmed Threat Bulletin 1430UTC 18 Oct 2023
9.Confirmed Threat Bulletin 1330UTC 18 Oct 2023
8.Confirmed Threat Bulletin 1230UTC 18 Oct 2023
7.Confirmed Threat Bulletin 1130UTC 18 Oct 2023
6.Confirmed Threat Bulletin 1030UTC 18 Oct 2023
5.Confirmed Threat Bulletin 0930UTC 18 Oct 2023
4.Confirmed Threat Bulletin 0830UTC 18 Oct 2023
3.Confirmed Threat Bulletin 0730UTC 18 Oct 2023
2.Confirmed Threat Bulletin 0630UTC 18 Oct 2023
1.Potential Threat Bulletin 0605UTC 18 Oct 2023
11:35 UTC 16 October 2023 Mag 6.5 Andreanof Islands, Aleutian Islands
06:00 UTC 11 October 2023 Mag 8.9 GULF OF OMAN *** TEST EVENT ***
08:40 UTC 07 October 2023 Mag 7.0 Papua New Guinea Region
08:34 UTC 07 October 2023 Mag 6.8 Papua New Guinea Region
11:21 UTC 04 October 2023 Mag 6.5 Mindanao, Philippines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TEST TSUNAMI BULLETIN NUMBER 1 (TYPE-II THREAT ASSESSMENT BULLETIN)
IOTWMS TSUNAMI SERVICE PROVIDER AUSTRALIA (JATWC)
ISSUED AT 0605 UTC Wednesday 18 October 2023
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... POTENTIAL TSUNAMI THREAT IN THE INDIAN OCEAN ...

This bulletin applies to areas within and bordering the Indian Ocean. It is
issued in support of the UNESCO/IOC Indian Ocean Tsunami Warning and
Mitigation
System (IOTWMS).

1. TSUNAMI SOURCE INFORMATION
IOTWMS-TSP AUSTRALIA has detected a volcanic eruption at Heard Island with the
following details:

Date:         18 Oct 2023
Origin Time:  0400 UTC
Latitude:     53.10S
Longitude:    73.52E
Location:     KERGUELEN ISLANDS REGION

2. EVALUATION
An investigation is under way to determine if a tsunami has been
triggered. This TSP will monitor sea level gauges and report if any
tsunami wave activity has occurred.

Based on a tsunami travel time threat assessment, the zones listed
below are POTENTIALLY UNDER THREAT.

3. TSUNAMI THREAT FOR THE INDIAN OCEAN
For this event all locations within 8.00000 hours are considered
under Threat.

The list below shows the forecast arrival time of the first wave
predicted for the zone.

The list is grouped by country (alphabetic order) and ordered
according to the earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those
below, and the initial wave may not be the largest. A tsunami is a
series of waves and the time between successive waves can be five
minutes to one hour.

Dangerous conditions should be expected to continue for a minimum
of 10 hours after the predicted arrival time. As local
conditions can cause a wide variation in tsunami wave action,
CANCELLATION of national warnings and ALL CLEAR determination must be
made by national/state/local authorities.


AUSTRALIA
HEARD ISLAND AND MCDONALD ISLANDS  0400Z 18Oct2023
AURORA BANK                        0426Z 18Oct2023
LEEUWIN COAST                      1015Z 18Oct2023
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reg.bom.gov.au/tsunami/rtsp/

08:53 UTC 22 March 2024 Mag 6.6 Java Sea
16:16 UTC 03 March 2024 Mag 6.7 Macquarie Island Region
14:33 UTC 23 January 2024 Mag 6.5 Vanuatu Islands
22:12 UTC 18 January 2024 Mag 6.5 Tonga Islands
20:48 UTC 08 January 2024 Mag 6.8 Talaud Islands, Indonesia
07:10 UTC 01 January 2024 Mag 7.5 Near West Coast of Honshu, Japan
09:15 UTC 28 December 2023 Mag 6.5 Kuril Islands
12:56 UTC 07 December 2023 Mag 6.9 Vanuatu Islands
19:49 UTC 03 December 2023 Mag 6.8 Mindanao, Philippines
10:35 UTC 03 December 2023 Mag 6.6 Mindanao, Philippines
16:03 UTC 02 December 2023 Mag 6.6 Mindanao, Philippines
14:37 UTC 02 December 2023 Mag 7.5 Mindanao, Philippines
21:46 UTC 27 November 2023 Mag 6.5 Near North Coast of Papua New Guinea
09:05 UTC 24 November 2023 Mag 6.8 Mariana Islands
04:47 UTC 22 November 2023 Mag 6.6 Vanuatu Islands
08:14 UTC 17 November 2023 Mag 6.9 Mindanao, Philippines
13:02 UTC 08 November 2023 Mag 6.7 Banda Sea
04:54 UTC 08 November 2023 Mag 7.4 Tanimbar Islands Region, Indonesia
04:52 UTC 08 November 2023 Mag 7.1 Banda Sea
12:33 UTC 31 October 2023 Mag 6.6 Near Coast of Central Chile
11:10 UTC 31 October 2023 Mag 6.7 Fiji Islands Region
02:00 UTC 25 October 2023 Mag 9.1 SOUTH OF JAVA, INDONESIA *** TEST EVENT ***
04:00 UTC 18 October 2023 Mag N/A KERGUELEN ISLANDS REGION *** TEST EVENT ***
13.Final Bulletin 1730UTC 18 Oct 2023
12.Confirmed Threat Bulletin 1630UTC 18 Oct 2023
11.Confirmed Threat Bulletin 1532UTC 18 Oct 2023
10.Confirmed Threat Bulletin 1430UTC 18 Oct 2023
9.Confirmed Threat Bulletin 1330UTC 18 Oct 2023
8.Confirmed Threat Bulletin 1230UTC 18 Oct 2023
7.Confirmed Threat Bulletin 1130UTC 18 Oct 2023
6.Confirmed Threat Bulletin 1030UTC 18 Oct 2023
5.Confirmed Threat Bulletin 0930UTC 18 Oct 2023
4.Confirmed Threat Bulletin 0830UTC 18 Oct 2023
3.Confirmed Threat Bulletin 0730UTC 18 Oct 2023
2.Confirmed Threat Bulletin 0630UTC 18 Oct 2023
1.Potential Threat Bulletin 0605UTC 18 Oct 2023
11:35 UTC 16 October 2023 Mag 6.5 Andreanof Islands, Aleutian Islands
06:00 UTC 11 October 2023 Mag 8.9 GULF OF OMAN *** TEST EVENT ***
08:40 UTC 07 October 2023 Mag 7.0 Papua New Guinea Region
08:34 UTC 07 October 2023 Mag 6.8 Papua New Guinea Region
11:21 UTC 04 October 2023 Mag 6.5 Mindanao, Philippines
04:00 UTC 04 October 2023 Mag 9.0 NICOBAR ISLANDS, INDIA REGION *** TEST EVENT ***
11:03 UTC 12 September 2023 Mag 6.5 Philippine Islands Region
09:09 UTC 08 September 2023 Mag 6.6 South of Kermadec Islands
19:55 UTC 28 August 2023 Mag 7.0 Bali Sea
12:47 UTC 16 August 2023 Mag 6.5 Vanuatu Islands
12:44 UTC 26 July 2023 Mag 6.5 Vanuatu Islands
00:22 UTC 19 July 2023 Mag 6.5 Off Coast of Central America
06:48 UTC 16 July 2023 Mag 7.2 Alaska Peninsula


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TEST TSUNAMI BULLETIN NUMBER 4 (TYPE-III CONFIRMED THREAT BULLETIN)
IOTWMS TSUNAMI SERVICE PROVIDER AUSTRALIA (JATWC)
ISSUED AT 0830 UTC Wednesday 18 October 2023
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... CONFIRMED TSUNAMI THREAT IN THE INDIAN OCEAN...

This bulletin applies to areas within and bordering the Indian Ocean. It is
issued in support of the UNESCO/IOC Indian Ocean Tsunami Warning and
Mitigation
System (IOTWMS).

1. TSUNAMI SOURCE INFORMATION
IOTWMS-TSP AUSTRALIA has detected a volcanic eruption at Heard Island with
the
following details:

Date:         18 Oct 2023
Origin Time:  0400 UTC
Latitude:     53.10S
Longitude:    73.52E
Location:     KERGUELEN ISLANDS REGION

2. EVALUATION
Sea level observations have confirmed that a TSUNAMI WAS GENERATED.
Maximum wave amplitudes observed so far:

Kerguelen Is          FRANCE       49.50S  70.17E   3.58m    18 Oct 06:42
UTC
Marion Island         SOUTH AFRICA 46.90S  37.87E   2.52m    18 Oct 08:10
UTC

Based on a tsunami travel time threat assessment, the zones listed below are
POTENTIALLY UNDER THREAT.

3. TSUNAMI THREAT FOR THE INDIAN OCEAN
For this event all locations within 10.0000 hours are considered
under Threat.

The list below shows the forecast arrival time of the first wave
predicted for the zone.

The list is grouped by country (alphabetic order) and ordered
according to the earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those
below, and the initial wave may not be the largest. A tsunami is a
series of waves and the time between successive waves can be five
minutes to one hour.

Dangerous conditions should be expected to continue for a minimum
of 12 hours after the predicted arrival time. As local
conditions can cause a wide variation in tsunami wave action,
CANCELLATION of national warnings and ALL CLEAR determination must be
made by national/state/local authorities.


AUSTRALIA
HEARD ISLAND AND MCDONALD ISLANDS  0400Z 18Oct2023
AURORA BANK                        0426Z 18Oct2023
LEEUWIN COAST                      1015Z 18Oct2023
ALBANY COAST                       1024Z 18Oct2023
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Thank you