



National Seismic Monitoring & Tsunami Early Warning Center Karachi

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BY:

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Introduction

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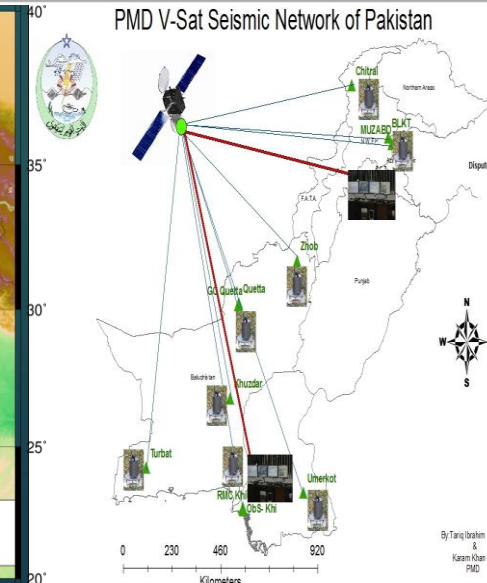
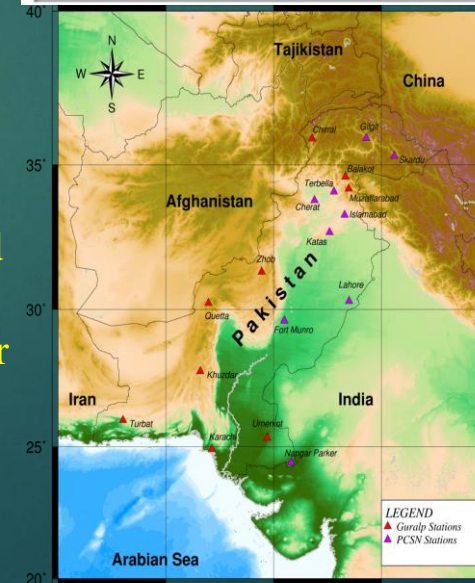
- ❑ Pakistan Meteorological Department is only responsible organization in our country for monitoring earthquake and Tsunami .
- ❑ The operational task of the department is to quickly estimates the earthquake source parameter, immediately disseminate the information to all stakeholders including media following the SOP.
- ❑ The center has been operational since 28th November, 2008 on round-the-clock basis
- ❑ Real-time
- ❑ 24 hours a day
- ❑ Seven days a week



National Seismic Monitoring & Tsunami Early Warning Center BB SEISMOMETER NETWORK

- After Indian Ocean Tsunami of 26th December, 2004 and Kashmir Earthquake of 8th October, 2005, keeping in view the potential Seismic risk and tsunami risk in MSZ along Pakistan coast.
- Pakistan Meteorological Department (PMD) has established a state-of-the art Seismic Monitoring and Tsunami Early Warning Centre at PMD Complex, Karachi (with a back center at Islamabad)
- In order to achieve the objectives NTWC uses more than 30 Broad band Stations (National Network) and More than 100 Global Seismographic networks data
- on real-time basis we monitor seismic activity and tsunami genic earthquakes in the country.

- Islamabad
- Skardu
- Lahore
- Katas
- Tarbella
- Cherat
- Gilgit
- Pattan
- Fortmunro
- Nagar Parker
- Turbat
- Khuzdar
- Quetta
- Zhob
- Chitral
- Muzaffarabad
- Balakot
- Bahawalnagar
- Umerkot
- Karachi

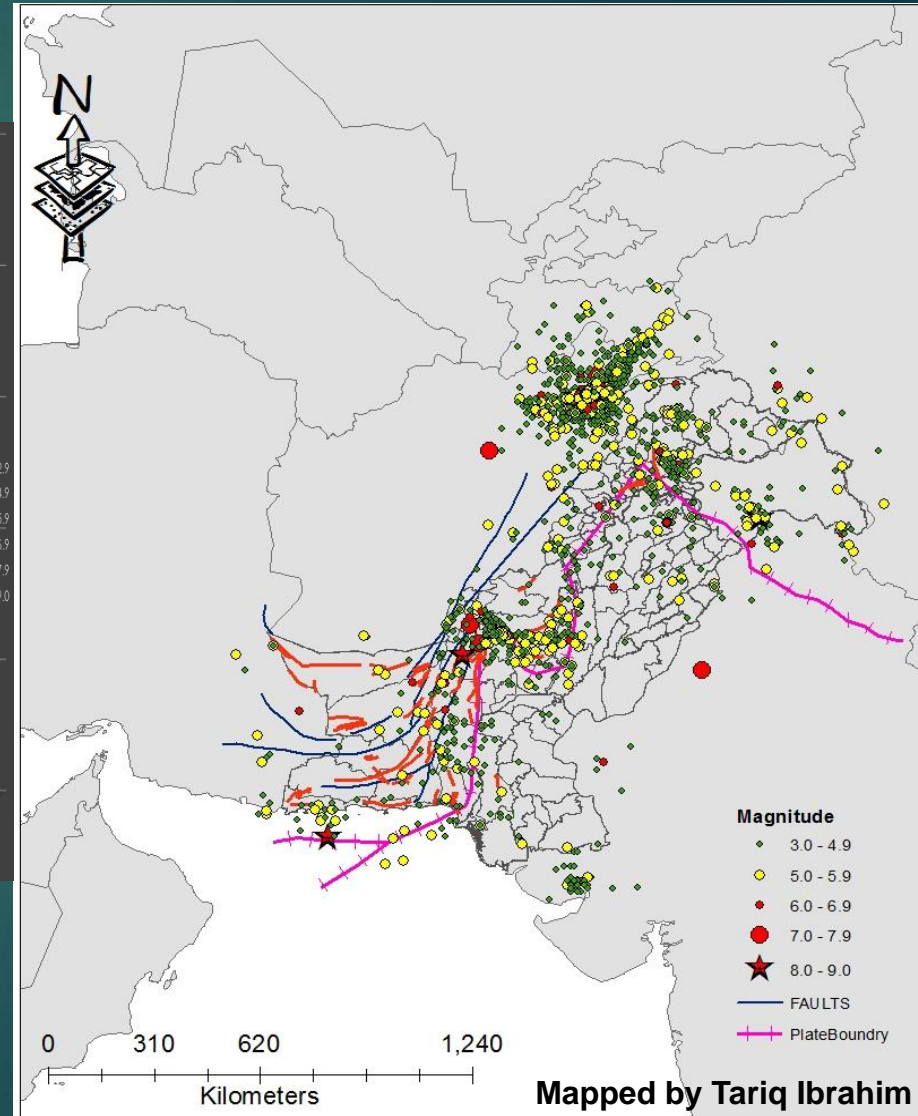
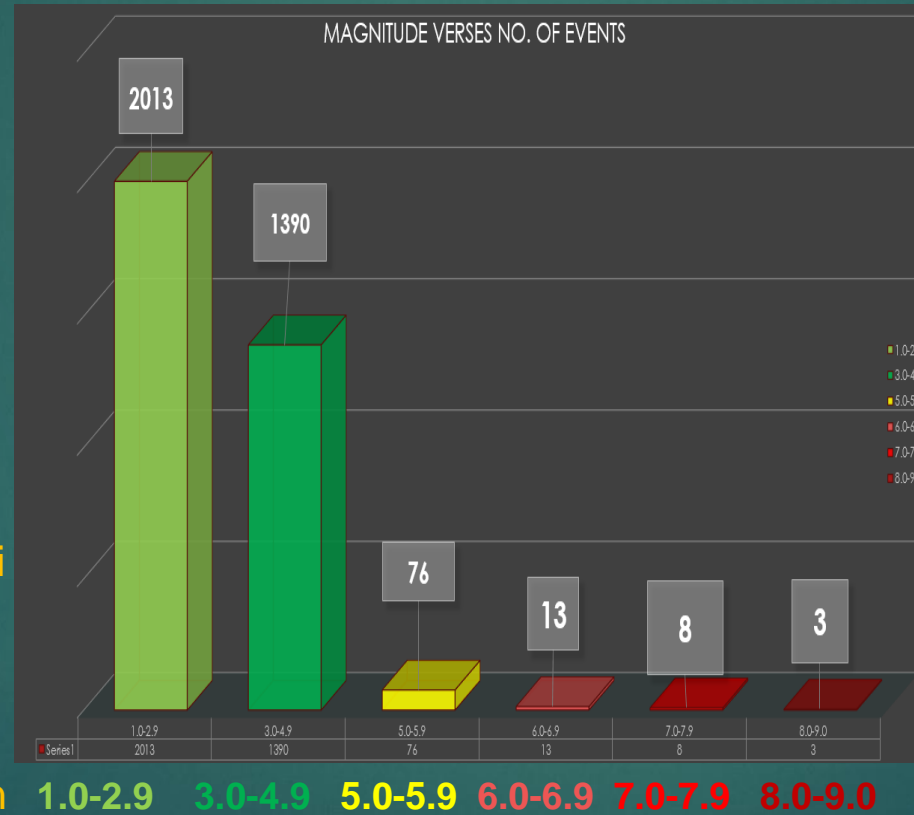


Historical Earthquakes In Pakistan

Pakistan has experienced many destructive earthquakes throughout its history.

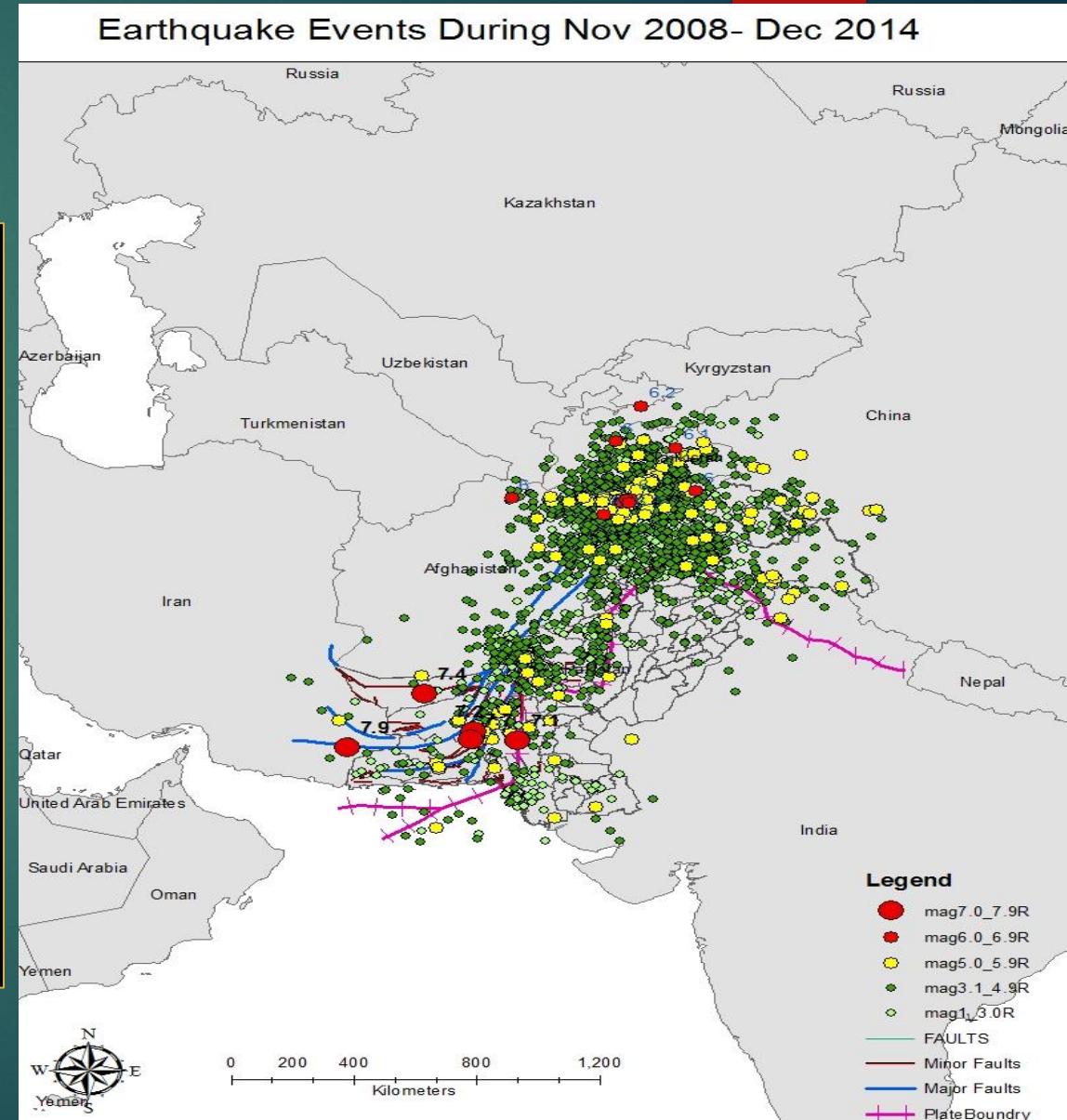
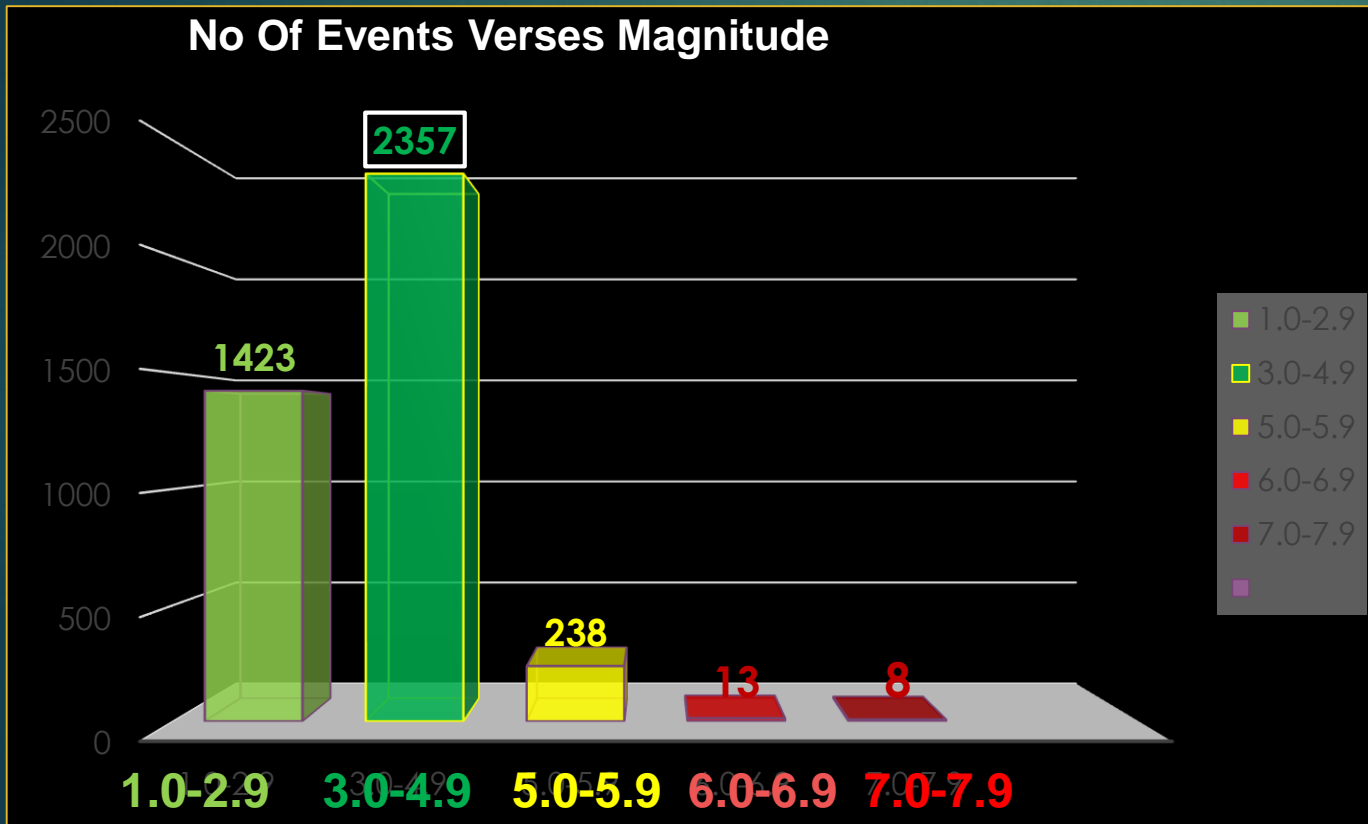
Earthquakes occurred between 1902 and 2008

- 1668 Shah Bandar Sindh
- 1827 Lahore
- 1889 Jhalawan, Balochistan
- 1909 Sibi, Balochistan
- 1935 Quetta, Balochistan
- 1945 Makran Earthquake & Tsunami
- 1974 Hunza- Hazara
- 2005 Muzaffarabad Kashmir
- 2008 Zariat Earthquake Balochistan
- 2013 Awaran District, Balochistan



Earthquakes In Pakistan

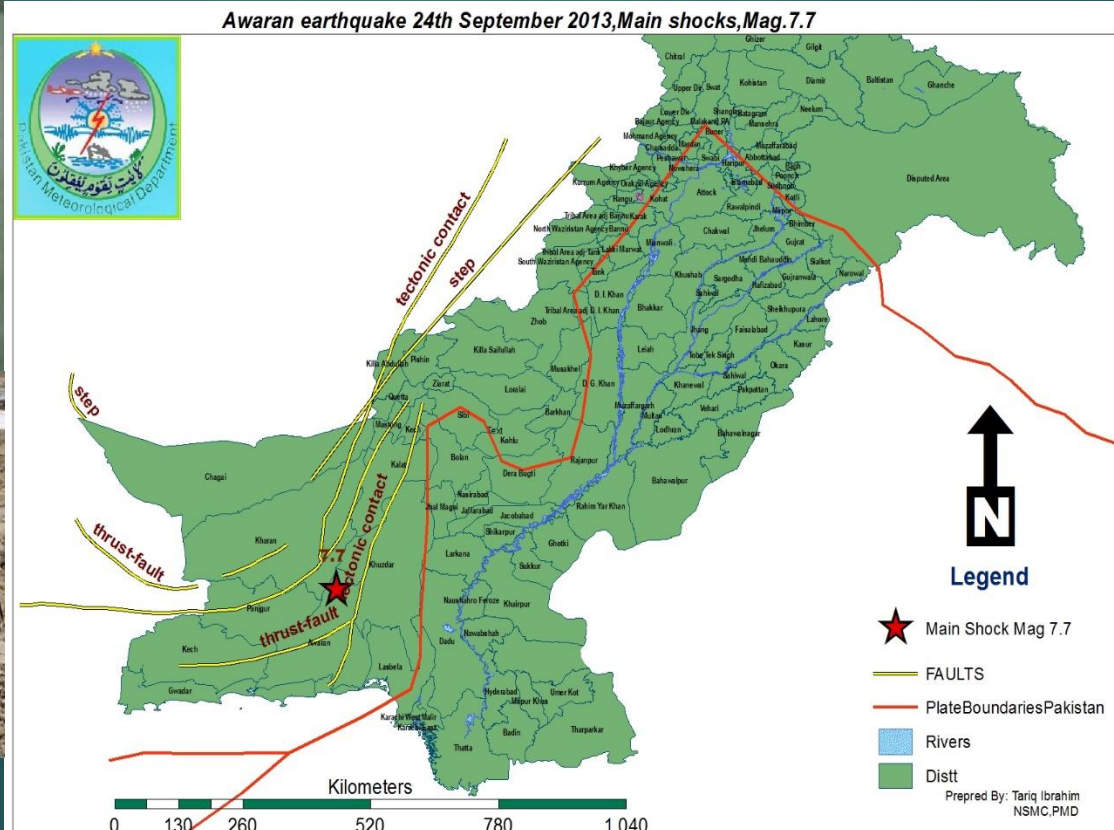
if we look into 6 Six years earthquakes, total no. of earthquake are 4039 (Four thousands and thirty nine)



24th September 2013, Awaran Earthquake Mag. 7.7 Mw



Earthquake Island was appear (small island Having size of 1 sqkm) near off coast of port city of Gwadar, Pakistan.



Non Seismic Source-- in 2018 china Geological Survey and NIO of Pakistan conducted survey and found 12 volcanos in Makran Continental region



Koh-i-Sultan, (Mountain of the king) is a volcano located in District chaghai Balochistan



The mud volcano that emerged offshore in Hingol, Balochistan



several mud volcanoes that rise from the desert landscape of southern Pakistan, along the coast of the Arabian Sea

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Chander Gup Volcano

9

youtube.com/watch?v=MESHosto9kl

Urbanization under... Urbanization under... UNOSAT New Tab Extensive Flooding i... MODIS Web Image of the Day Lake Manchar is Ov... EO Explorer EO Explorer

YouTube PK Search

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00:00:00
0 bytes / 13.1GB

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C:\Users\tt\Documents\Bandicam

bandicam 2023-05-29 15-12-41-862.mp4	33.4MB
bandicam 2023-05-29 15-03-02-203.mp4	19.4MB
bandicam 2023-05-23 13-08-54-407.mp4	585.7MB
bandicam 2023-05-19 15-02-45-138.mp4	1,001MB
bandicam 2023-04-19 15-24-40-276.mp4	745.1MB
bandicam 2023-04-19 15-23-36-713.mp4	12.2MB
bandicam 2023-04-19 15-09-23-311.mp4	363.4MB
bandicam 2023-04-06 14-20-44-306.mp4	618.7MB
bandicam 2023-04-06 13-49-57-978.mp4	274.7MB
bandicam 2023-04-06 12-59-33-881.mp4	697.7MB

1360x768, 23.355fps, H264 | 00:00:25 | 6.4Mbps

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BANDICUT

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How to Take a Screenshot on Windows

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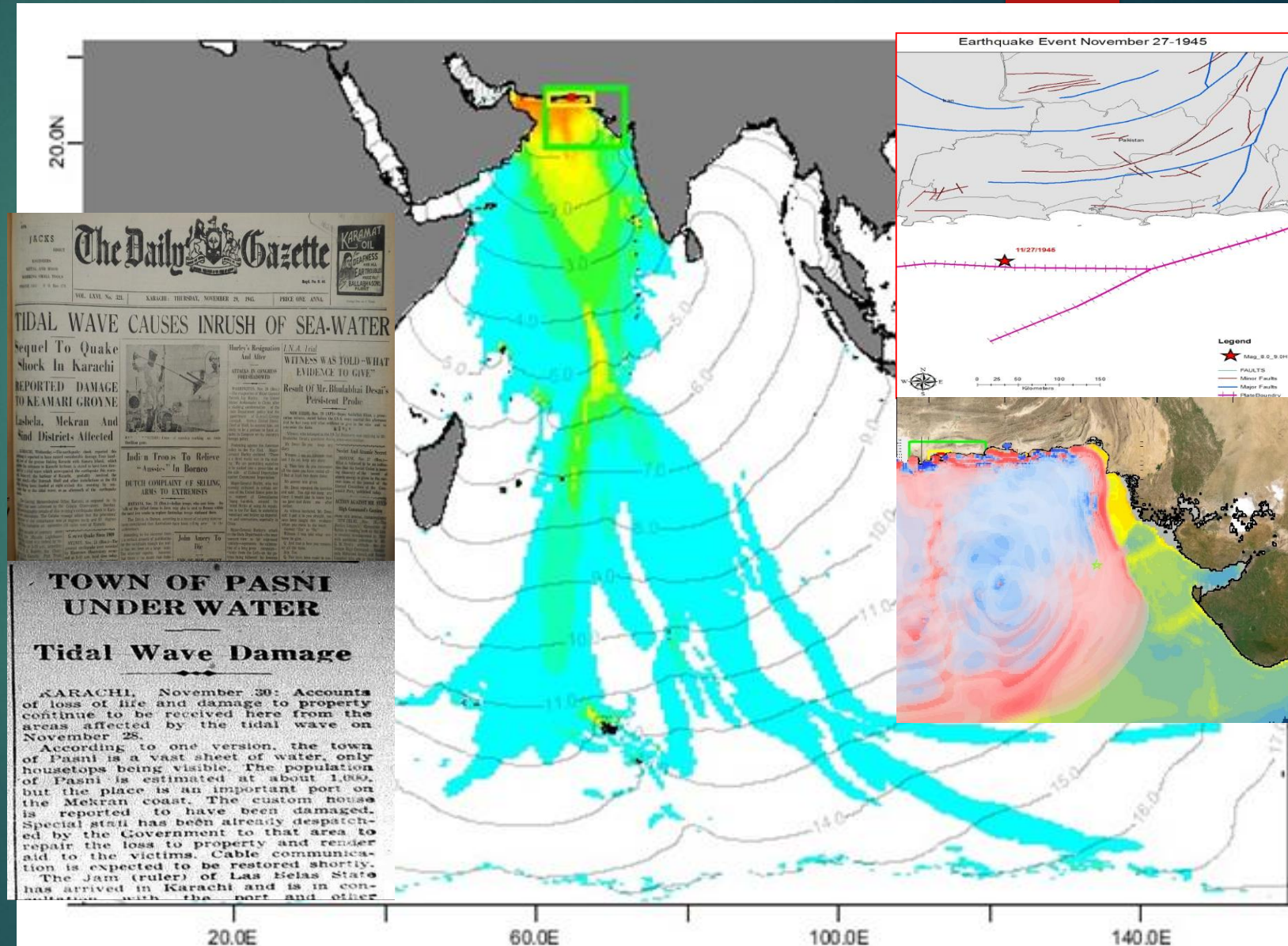
2.8K

Share

183K views 1 year ago

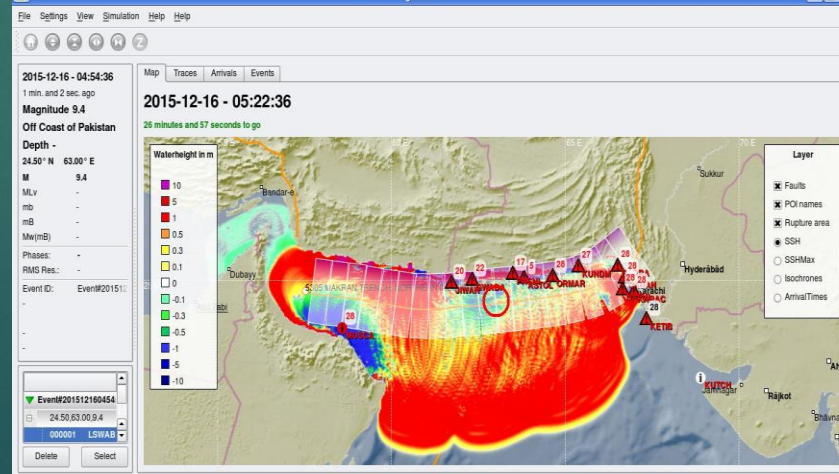
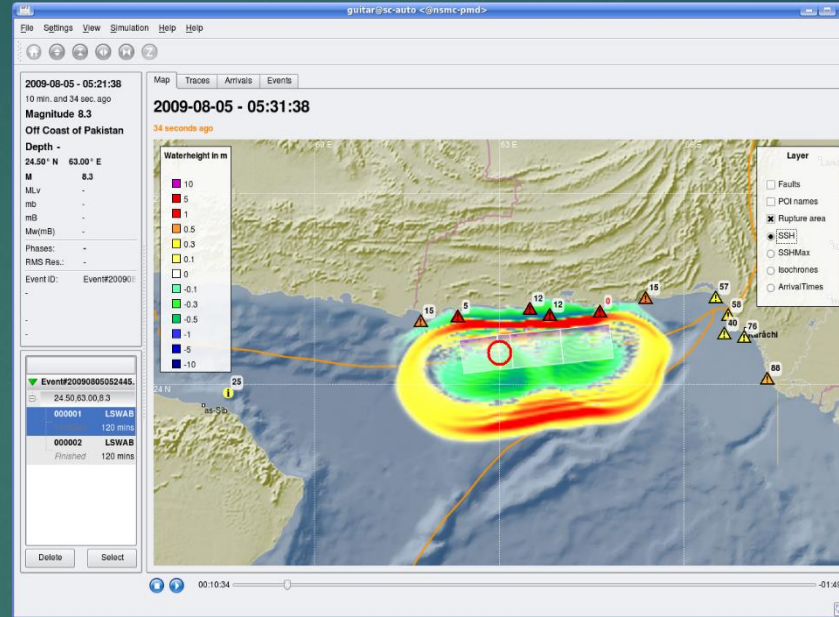
Tsunami Potential of MSZ and its possible threat to the coastal areas of Pakistan

- Makran Subduction zone has potential to generate future tsunami in the Arabian Sea and Indian Ocean.
- Earthquake of 28th November 1945, with Magnitude of 8.7 epicenter Near Pasni at 24.5 N 63.0 E in Arabian Sea, generated a destructive tsunami in Indian Ocean.
- More than 4,000 people were killed along the Coast of Pakistan and neighboring countries like Iran, India and Oman by tsunami and earthquake.



TSUNAMI DECISION SUPPORT SOFTWARE (Real Time Modeling)

Tsunami Decision Support Software GUITAR has been installed, which is linked with Earthquake Analysis Software and can calculate estimated Tsunami Arrival Times and wave heights at any point of interest.



Ocean-Wide Tsunami Watch Bulletin (shallow, undersea earthquake)

Tsunami bulletin number: Event#20151216043046.503734.3
Agency ID PMD
Issued at 2015-12-16 04:33:09

This bulletin is for all areas of the Indian Ocean
...An Indian Ocean -wide tsunami watch is in effect...

A tsunami watch is in effect for
INDIA, OMAN, PAKISTAN
For other areas of the Indian Ocean region, this message is an advisory only.

An earthquake has occurred with these preliminary parameters

Origin Time 2015-12-16 04:30:41
Coordinates 24.50 N 63.00 E
Location Off Coast of Pakistan
Magnitude 8.0

Evaluation

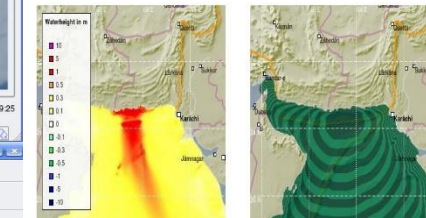
Earthquakes of this size have the potential to generate a widespread destructive tsunami that can affect coastlines across the entire Indian Ocean.

However - it is not known that a tsunami was generated. This watch is based only on the earthquake evaluation. Authorities in the region should take appropriate action in response to the possibility of a widespread destructive tsunami.

Due to only limited sea level data from the region it is not possible for this centre to rapidly confirm nor evaluate the strength of a tsunami if one has been generated.

Simulation results

Estimated maximum sealevel surface height and initial tsunami wave arrival times. Actual arrival times may differ and the initial wave may not be the largest. The time between successive tsunami waves can be five minutes to one hour.



Maximum Sealevel Surface Height

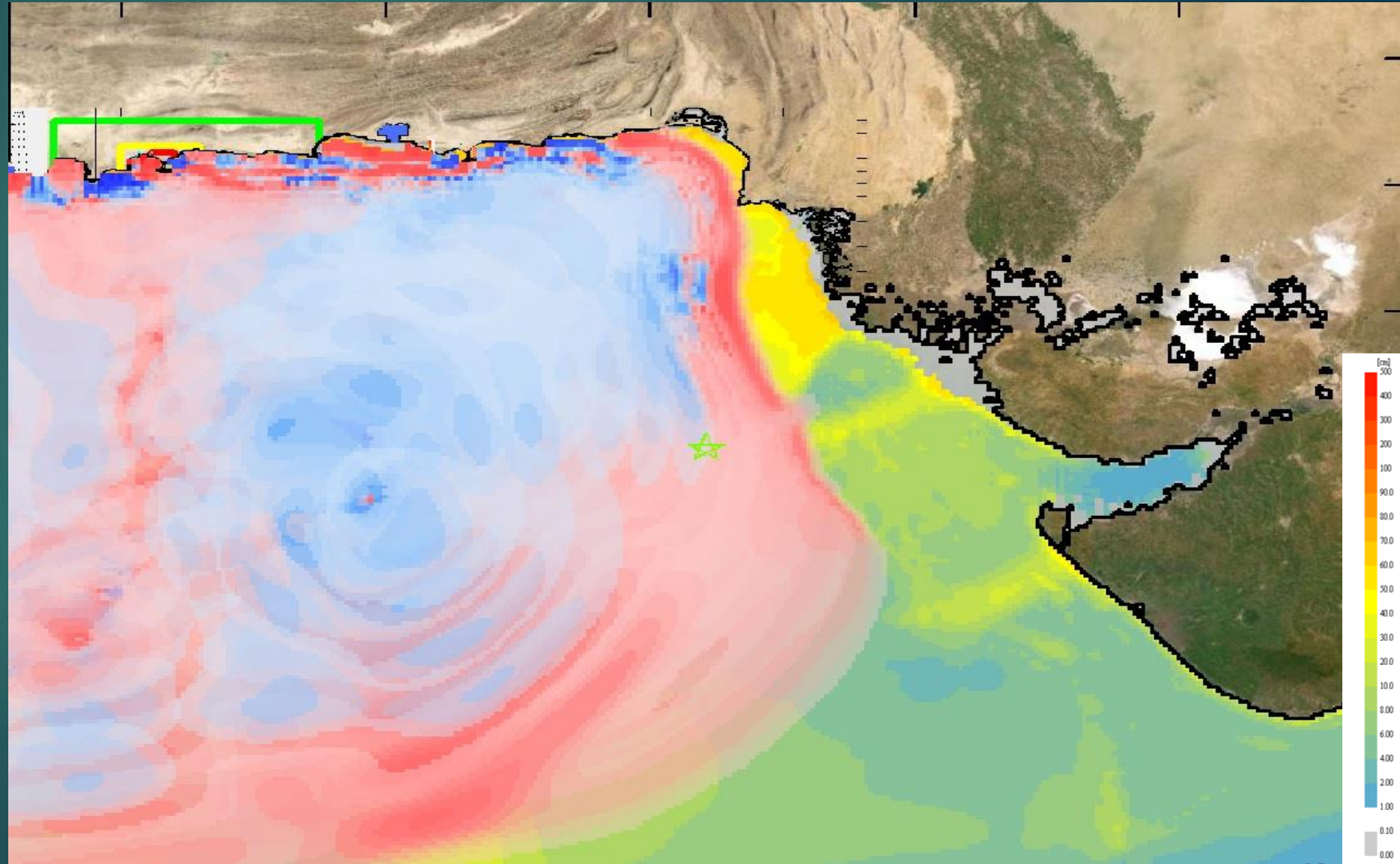
Arrival Times (interval=5 min)

POI	Country	Type	TA	ASSH	TM	MSSH	Runup
GWADA	PAKISTAN	W	2015-12-16 04:47:55	0.1 m	2015-12-16 04:52:10	1.5 m	major tsunami
ORMAR	PAKISTAN	W	2015-12-16 04:52:25	0.0 m	2015-12-16 06:40:55	0.7 m	major tsunami
PASNI	PAKISTAN	W	2015-12-16 04:55:10	0.0 m	2015-12-16 05:01:25	0.9 m	major tsunami
ASTOL	PAKISTAN	W	2015-12-16 04:55:25	0.0 m	2015-12-16 05:01:25	0.9 m	major tsunami
JIWAN	PAKISTAN	W	2015-12-16 04:55:40	0.0 m	2015-12-16 06:44:40	1.0 m	major tsunami
MUSCA	OMAN	FP	2015-12-16 05:05:10	0.0 m	2015-12-16 06:46:10	0.1 m	tsunami
KUNDM	PAKISTAN	W	2015-12-16 05:08:10	0.0 m	2015-12-16 06:38:10	0.3 m	tsunami
NATHI	PAKISTAN	W	2015-12-16 05:35:10	0.0 m	2015-12-16 05:43:55	0.1 m	minor tsunami
BARRA	PAKISTAN	W	2015-12-16 05:51:55	0.0 m	2015-12-16 06:00:40	0.1 m	minor tsunami
GADAN	PAKISTAN	W	2015-12-16 05:52:55	0.0 m	2015-12-16 06:05:40	0.1 m	minor tsunami
KARAC	PAKISTAN	W	2015-12-16 06:11:40	0.0 m	2015-12-16 06:52:10	0.0 m	no tsunami
DUQM	OMAN	FP	2015-12-16 06:18:40	0.0 m	2015-12-16 07:00:55	0.1 m	tsunami
KETIB	PAKISTAN	W	2015-12-16 06:20:55	0.0 m	2015-12-16 06:33:40	0.2 m	minor tsunami
SALAL	OMAN	FP	2015-12-16 06:43:25	0.0 m	2015-12-16 06:51:10	0.0 m	no tsunami
KUTCH	INDIA	FP	2015-12-16 07:00:40	0.0 m	2015-12-16 07:00:55	0.0 m	no tsunami

This will be the only bulletin issued by the PMD for this event unless additional information becomes available.

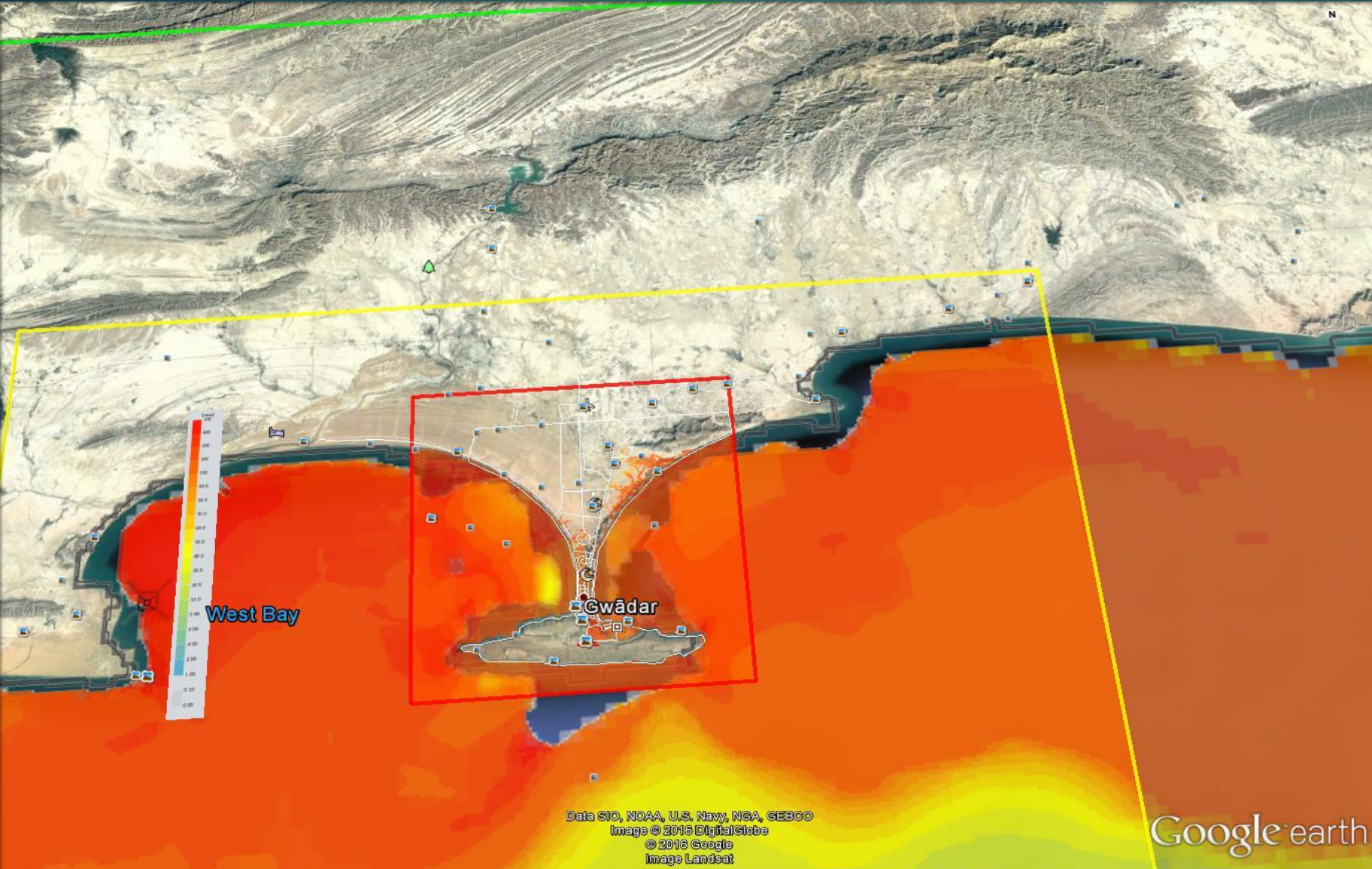
TSUNAMI Inundation at Pakistan Coast

GEBCO's current gridded bathymetric dataset are used to find out run up of water and inundation area



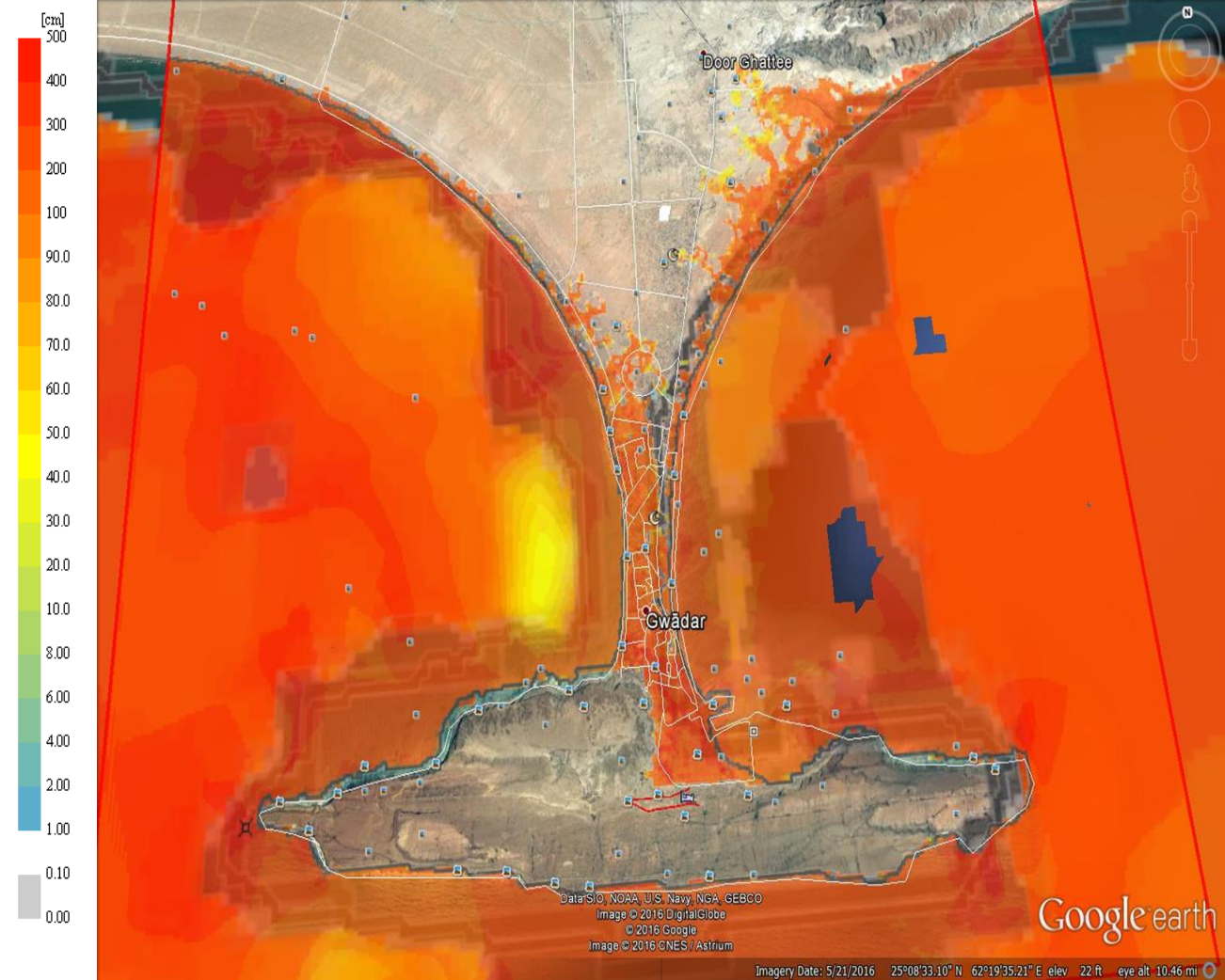
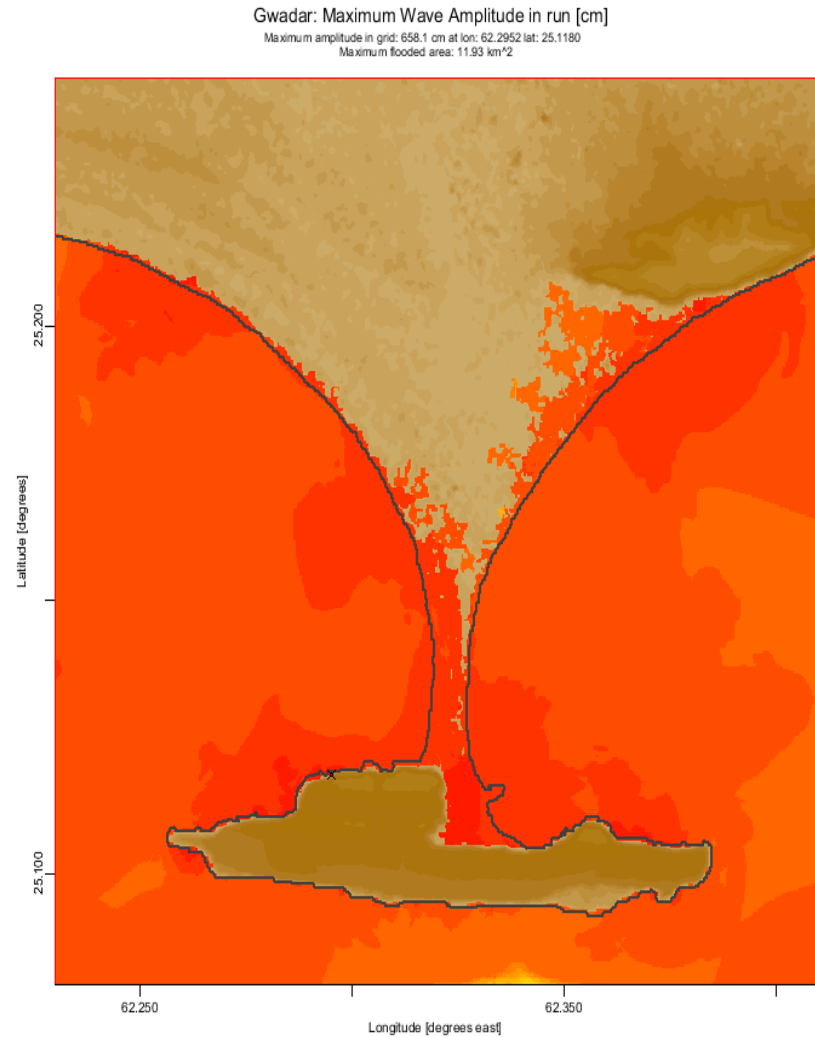
TSUNAMI Inundation at Gwadar

GEBCO's current gridded bathymetric dataset to find out run up of water and inundation



Tsunami Inundation for Gawdar City (11.93sqkm)

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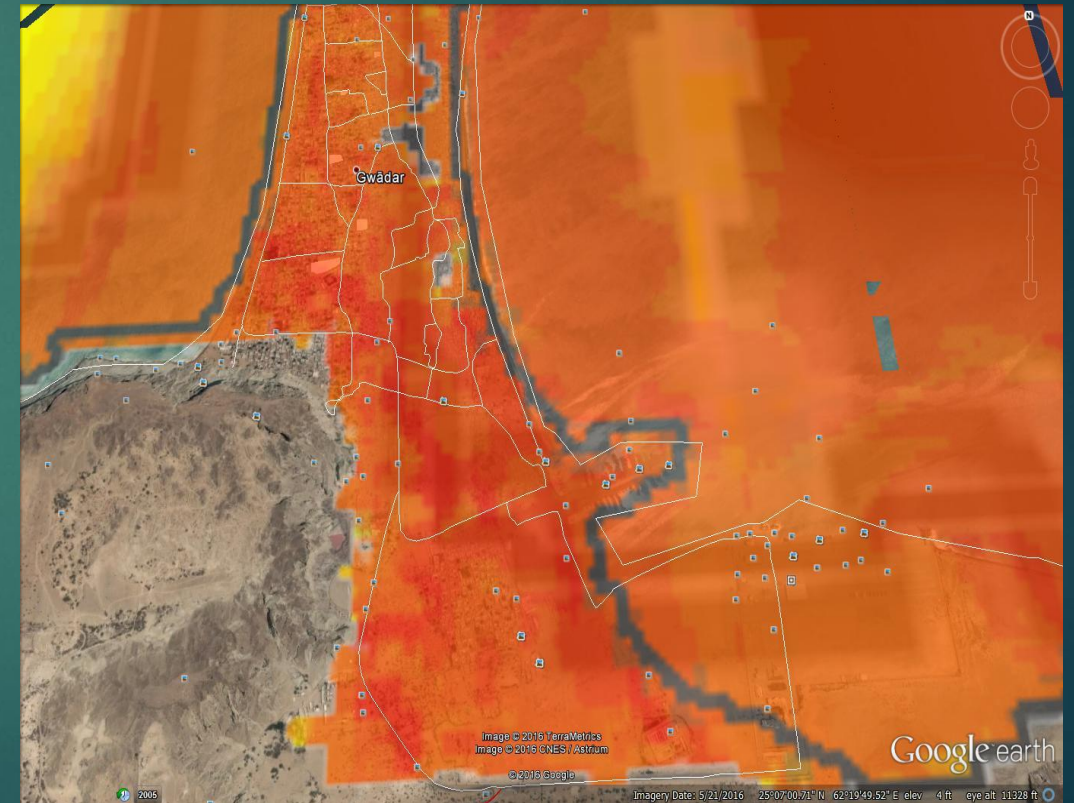


TSUNAMI Inundation at Gwadar

Before Tsunami



After Tsunami

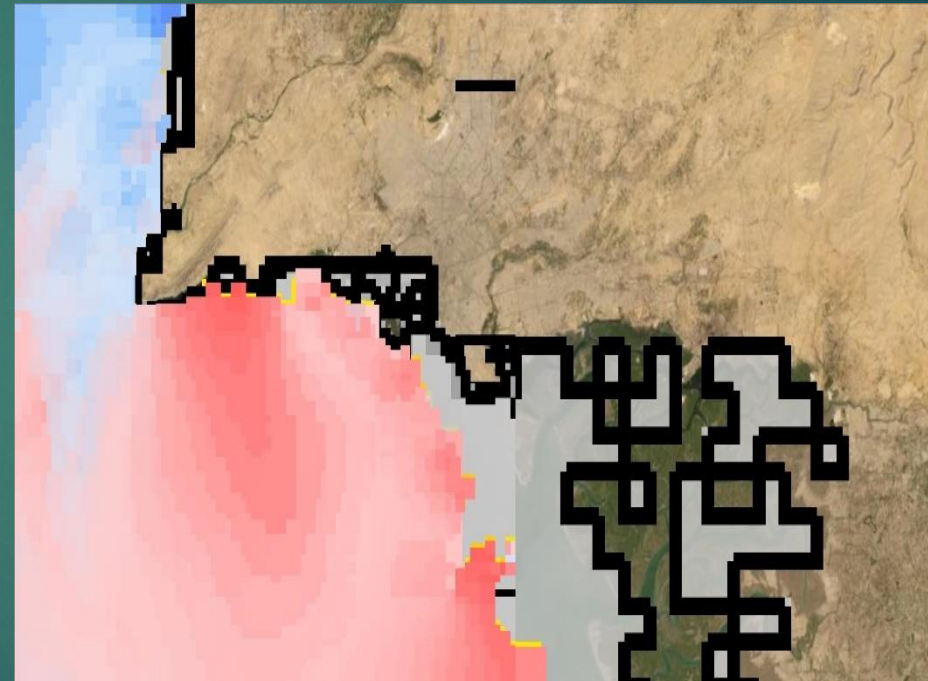


TSUNAMI Inundation at Karachi

Before Tsunami



After Tsunami



Japan Meteorological Agency (JMA) for Indian Ocean.

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❑ NTWC also receives tsunami advisories issued by the International Tsunami Warning Centers like

❑ Pacific Tsunami Warning Centre (PTWC)

❑ TSP India, Australia, Indonesia

❑ Japan Meteorological Agency (JMA) for Indian Ocean.

The screenshot displays the 'eLink MCI Server Application 2.0a' window. The title bar includes 'File', 'Connection', 'System Logs', 'Arrange Data', and 'Exit'. The main content area is titled 'Meteorological Data Communication and Plotting System' and shows a message received from the Pacific Tsunami Warning Center (PTWC) on 2009-07-06 at 18:15:12. The message is a tsunami bulletin for the Indian Ocean, issued at 0350Z on 29 April 2009. The bulletin provides preliminary parameters for an earthquake that occurred in the South-East Arabian Sea, with a magnitude of 8.5. It also includes an evaluation stating that a destructive widespread tsunami threat exists based on historical data, and that there is a possibility of a wide spread tsunami that could affect the coasts located fifteen hundred kilometers away from the earthquake epicenter.

Connection Date :2009-07-06 Message Time :18:15:1206-07-2009 18-15-12
WEIO23 PHEB 061233
TIBIOX
TSUNAMI BULLETIN NUMBER 001
PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS
ISSUED AT 0350Z 29 APRIL 2009

THIS BULLETIN IS FOR ALL AREAS OF THE INDIAN OCEAN.
... TSUNAMI INFORMATION BULLETIN ...

THIS MESSAGE IS FOR INFORMATION AND TEST PURPOSE ONLY ONLY.

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0350Z 29 APRIL 2009
COORDINATES - 11.2 NORTH 65.1 EAST
LOCATION - SOUTH-EAST ARABIAN SEA
MAGNITUDE - 8.5

EVALUATION

A DESTRUCTIVE WIDESPREAD TSUNAMI THREAT EXIST BASED ON HISTORICAL EARTHQUAKE AND TSUNAMI DATA.

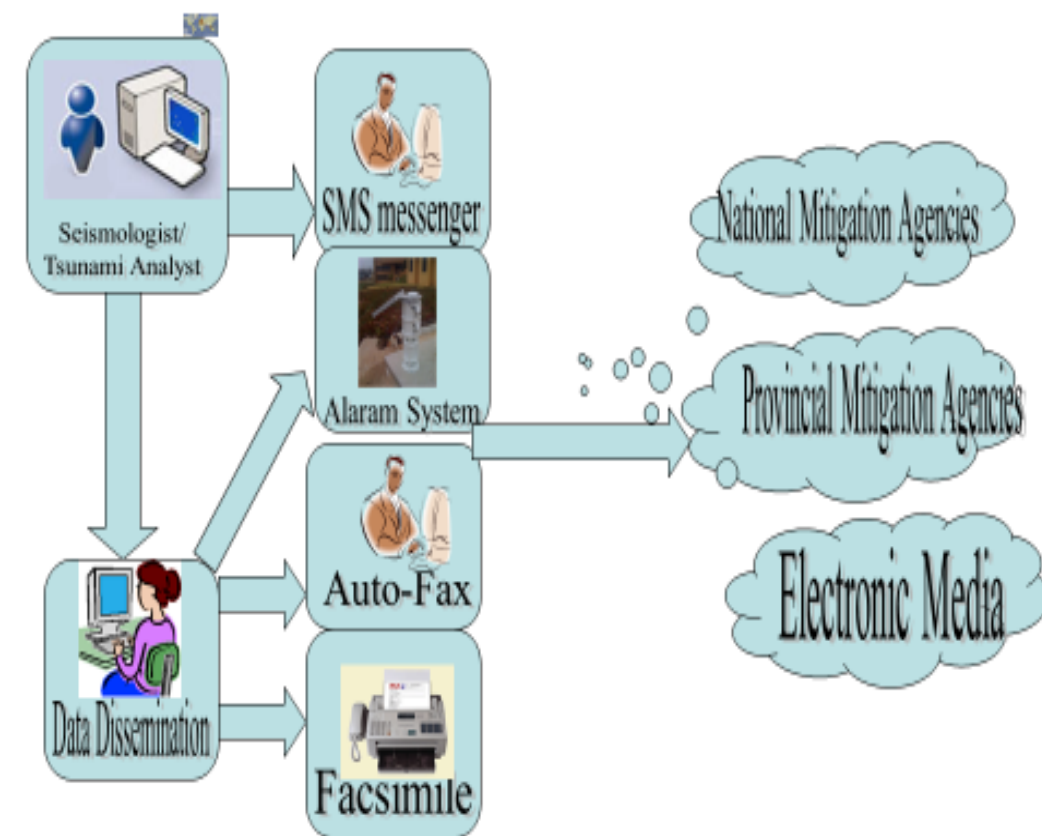
THERE IS A POSSIBILITY OF A WIDE SPREAD TSUNAMI THAT COULD AFFECT THE COASTS LOCATED FIFTEEN HUNDRED KILOMETERS AWAY FROM THE EARTHQUAKE EPICENTER. AUTHORITIES IN THE REGION NEAR THE EPICENTER SHOULD BE

Sunday 14/03/2010, 09:25:54 GMT Status: Stop IP: 192.168.0.241 Port: 0

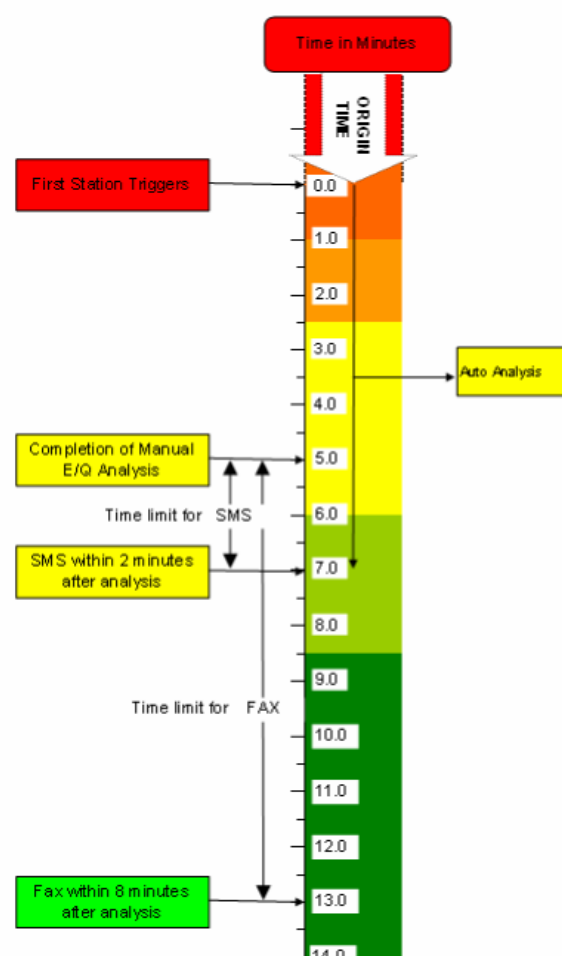
COMPONENTS OF TSUNAMI EARLY WARNING

- ❑ Acquisition/Monitoring of Data
- ❑ Analysis of Data/Decision Making either EQ has potential to Generate Tsunami
- ❑ Dissemination of information Through SMS, Fax, and Triggng Sirens

Dissemination (TSUNAMI/EARTHQUAKE)



TIME LINE FOR EARTHQUAKE PROCESSING AND DISSEMINATION OF TSUNAMI BULLETIN (FOR MAKHRAN SUBDUCTION ZONE)



SMS FORMAT FOR ARABIAN SEA

EARTHQUAKE MAGNITUDE RANGE	DESCRIPTION OF MESSAGE
4.5-6.4	Earthquake Parameters
6.5-7.0	E/Q M 6.3 in Arabian Sea dt 06-12-2009 at 15:55 PST. A small possibility of tsunami threat for Pak. Coast. PMD
7.1-7.5	E/Q M 7.5 in Arabian Sea dt 06-12-2009 at 11:24 PST. Local Tsunami may generate. Threat to Pak. Coast. PMD.
7.6-8.0	E/Q M 8.0 in Arabian sea dt 06-12-2009 at 09:53 PST. Widespread Tsunami may generate. Inland destruction possible along Pak. Coast. PMD.
Greater than 8.0	E/Q M 8.5 in Arabian sea dt 06-12-2009 at 18:35PST. Destructive tsunami with severe inland damages possible along Pak. Coast. PMD.



Tsunami Warning Bulletins

(SEVERE TSUNAMI THREAT)

TSUNAMI BULLETIN-01

Issued at 11:05:00 PST

Tsunami Warning

National Tsunami Warning Centre (NTWC), Karachi of Pakistan Meteorological Department has recorded an Earthquake with the following preliminary seismological parameters:

Origin time 08-09-2019 at 11:00:00 PST

Magnitude: 8.7

Depth: 10 Km

Latitude: 24.80°N

Longitude: 62.20°E

Location: Off Coast of Pakistan

EVALUATION:

. Based on the historical data, earthquakes of this size may cause wide-spread inland damages and Destructive Tsunami generation in the Arabian Sea and along coastline of Pakistan. However, it is not known that a tsunami has been generated. This bulletin is based only on the earthquake evaluation. Monitoring of Sea Level Gauges is under way to determine if a tsunami has been triggered. **People in coastal areas of Balochistan especially Jiwani, Gwadar, Pasni, Ormara and neighborhood are STRONGLY ADVISED TO EVACUATE IMMEDIATELY** to higher grounds or go far inland. **People in coastal areas of Sindh are advised to standby for evacuation.** Boats and Ships at sea are advised to stay in the deeper parts of the sea until the threat is over. If there is sufficient time, boats and ships in harbors and bays are advised to go to the deeper parts of the sea until the threat is over.

UPDATES

Additional bulletins will be issued by NTWC, Karachi for this event as more information becomes available.

Sd/=
Duty Seismologist

(SEVERE TSUNAMI THREAT)

TSUNAMI BULLETIN-02

Issued at 11:10:00 PST

Tsunami Warning

National Tsunami Warning Centre (NTWC) of Pakistan Meteorological Department has recorded an Earthquake with the following preliminary seismological parameters:

Origin time: 08-09-2019 at 11:00:00 PST

Magnitude: 9.0 (Revised)

Depth: 10 Km

Latitude: 24.80°N

Longitude: 62.20°E

Location: Off Coast of Pakistan

EVALUATION: It has not been confirmed whether Tsunami has been generated or not. Based on the historical data, earthquakes of this size may cause wide-spread inland damages and Destructive Tsunami generation in the Arabian Sea and along coastline of Pakistan. However, it is not known that a tsunami has been generated. This bulletin is based only on the earthquake evaluation. Monitoring of Sea Level Gauges is under way to determine if a tsunami has been triggered. **People in coastal areas of Balochistan especially Jiwani, Gwadar, Pasni, Ormara and neighborhood are STRONGLY ADVISED TO EVACUATE IMMEDIATELY** to higher grounds or go far inland. **People in coastal areas of Sindh are advised to standby for evacuation.** Boats and ships at sea are advised to stay in the deeper parts of the sea until the threat is over. If there is sufficient time, boats and ships in harbors and bays are advised to go to the deeper parts of the sea until the threat is over.

SIMULATION RESULTS:

According to pre-run scenarios estimated initial tsunami wave arrival times and amplitude of the maximum tsunami wave, at the various locations are given below. However, actual wave arrival times and maximum amplitude 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.

CITY NAME	ARRIVAL TIME (PST)	WAVES HEIGHT (meters)
JIWANI	1115PST 08 Sep 2019	12.5 m
GAWADAR	1115PST 08 Sep 2019	12.0 m
PASNI	1115PST 08 Sep 2019	13.6 m
ORMARA	1115PST 08 Sep 2019	12.8 m
BAGAR	1115PST 08 Sep 2019	12.0 m
KUNDMALIR	1130PST 08 Sep 2019	07.3 m
ASTOL	1115PST 08 Sep 2019	08.2 m
WINDER	1145PST 08 Sep 2019	11.0 m
GADANI	1147PST 08 Sep 2019	05.2 m
KARACHI	1155PST 08 Sep 2019	04.1 m
KETIBANDAR	1205PST 08 Sep 2019	04.1 m
THATTA	1209PST 08 Sep 2019	03.7 m
BADIN	1230PST 08 Sep 2019	03.5 m

UPDATES

Additional bulletins will be issued by NTWC, Karachi for this event as more information becomes available.

Sd/=
Duty Seismologist

(Confirmed Tsunami Threat)

TSUNAMI BULLETIN-03

Issued at 11:30:00 PST

Tsunami Warning

National Tsunami Warning Centre (NTWC) of Pakistan Meteorological Department has recorded an Earthquake with the following preliminary seismological parameters:

Origin time: 08-09-2019 at 11:00:00 PST

Magnitude: 9.0 (Revised)

Depth: 10 Km

Latitude: 24.80°N

Longitude: 62.20°E

Location: Off Coast of Pakistan

Pak.Met.Dept

OBSERVATION OF TSUNAMI ACTIVITY:

Sea level observations confirmed that a **destructive tsunami has been generated**. All the People at coastal areas of Pakistan are advised to **evacuate immediately to higher grounds or go far inland**.

Arrival times and wave heights, as observed at Tidegauges locations, are given below;

Gwadar	25.6N 57.8E	1125 PST 08 Sep 2019	13.5m
Ormara	25.3N 60.6E	1127 PST 08 Sep 2019	12.8m

UPDATES

Additional bulletins will be issued by NTWC, Karachi for this event as more information becomes available

Sd/=
Duty Seismologist

Tsunami Warning-All Clear - Cancellation

TSUNAMI BULLETIN-04

Issued at 16:00:00 PST

National Tsunami Warning Centre (NTWC) of Pakistan Meteorological Department has recorded an Earthquake with the following preliminary seismological parameters:

Origin time: 08-09-2019 at 11:00:00 PST

Magnitude: 9.0 (Revised)

Depth: 10 Km

Latitude: 24.80° N

Longitude: 62.20° E

Location: Off Coast of Pakistan

Evaluation:

The sea level readings indicate that the threat is over for most of the area. Therefore, the Tsunami warning, issued by this centre, is now cancelled. For any affected area, where no major waves have occurred for at least 2 hours, after the estimated arrival time or damaging waves have not occurred for 2 hours, the local authority may assume that the threat has passed.

Action regarding the "**all clear**", decision must be made by **local authorities**.

Sd/=
Duty Seismologist

Project title: Earthquake and Tsunami Preparedness (CCAM)

- Improvement of Tsunami Warning Dissemination System
- Up-gradation of new version of Seiscomp3 software, as the existing one was installed in 2008.
- Reliable Software for Tsunami Modeling and Inundation
- Established 4 New Broad Band Seismometers (Umerkot, Karachi, Gwadar, Quetta)
- Supported in latest IT Equipments
- Installation of New Tsunami Sirens along Coast
 - Ibrahim Hyderi
 - Hawks Bay
 - Rehari Gooth
 - Gwadar
 - Pasni.
- Conduct Tsunami drills to vulnerable coastal community



Tsunami Sirens along the Karachi coast

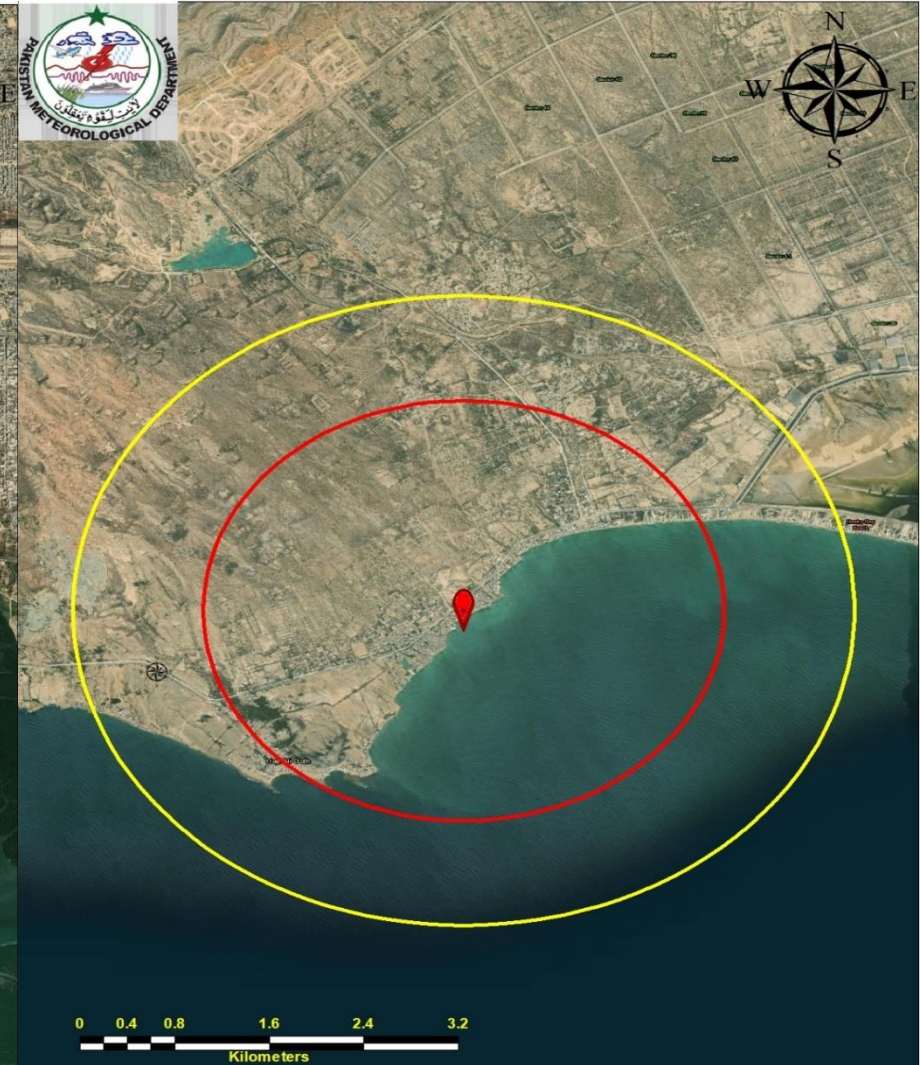
Ibrahim Hyderi Sirens 2-3km Range



Rehari Goth Karachi 2-3km Range



Hawks Bay 2-3km Range



Source: Sif, Muzaf, Qandry, Bardakur © cartographia, ORESMMap 0.0, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Sif, HEPD, Qandry, © OpenStreetMap contributors, and the GIS User Community

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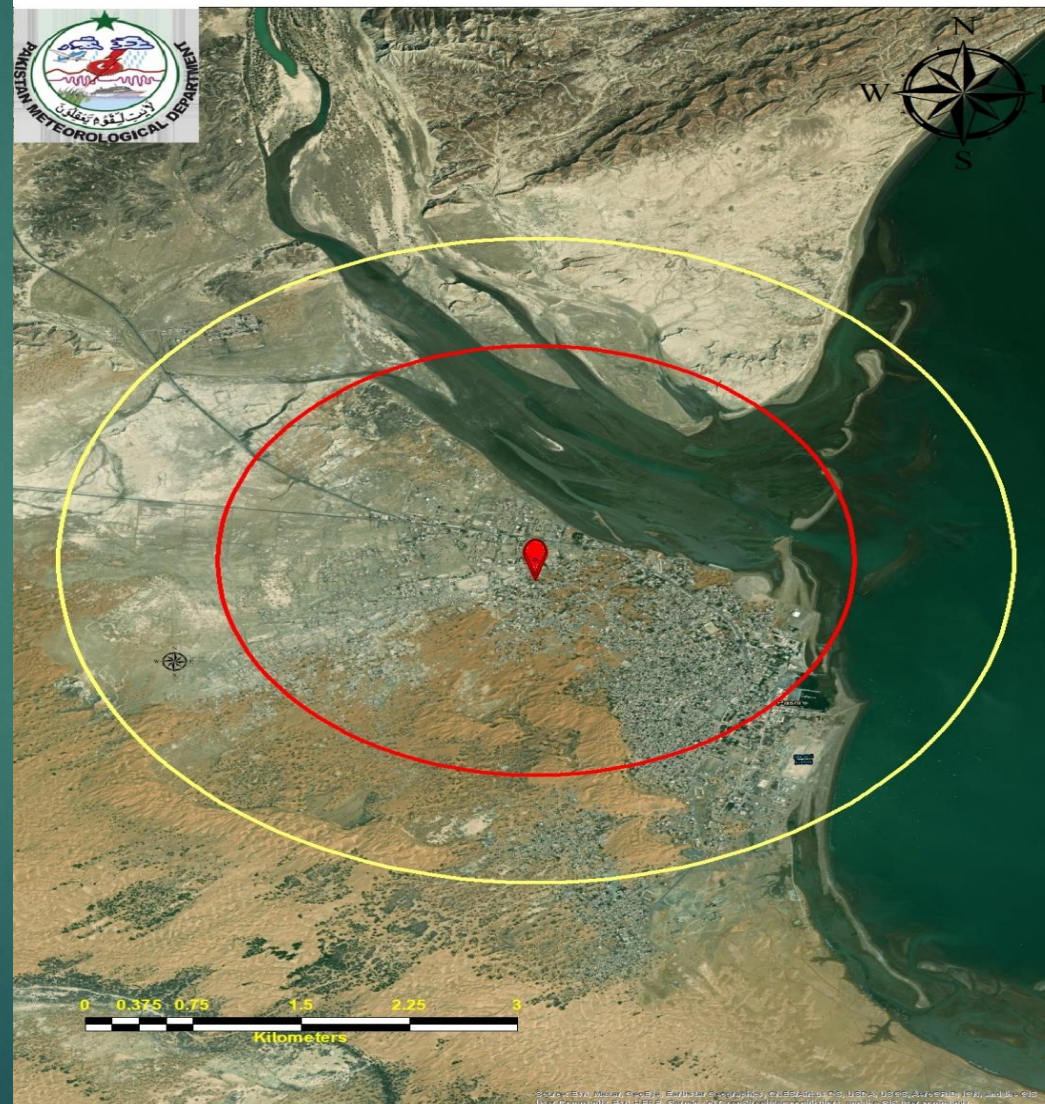
Tsunami Sirens along the Gwadar & Pasni

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Gwadar Sirens 2-3km Range




Pasni 2-3km Range



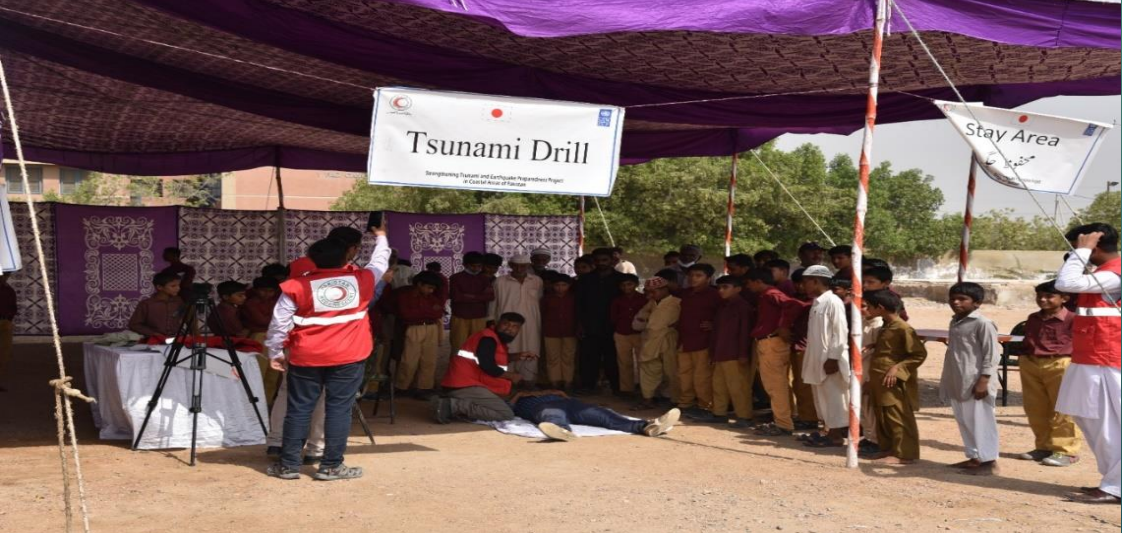
Tsunami drills at Karachi Rehri Goth & Soomar Goth



Pakistan Meteorological Department
National Tsunami Warning Centre
Tsunami Drill



Improving the Lives of Coastal Communities Through Tsunami & Earthquake Preparedness And Awareness



Tsunami drills

25



Thanks For Patience

