Earthquake and Sea-Level Monitoring

Updates on Monitoring Network Development
Seismotectonic Setting
Philippine National Programs

Communities have achieved resilience to volcanic eruptions, earthquakes, tsunamis and other related hazards

Enhanced safety of communities from volcanic eruptions, earthquakes and tsunamis

Strategic Objectives:

1. Provide highly accurate and timely warning & information
2. Develop cost-effective monitoring & warning system
3. Accurately predict and simulate geologic phenomena

Programs (Strategic Initiatives):

1. National Earthquake Monitoring and Information (NEMI)
2. National Tsunami Monitoring and Early Warning (NTMEW)
Philippine Seismic Network

• Ninety-six (96) station network
  • Seismic stations
  • Volcano observatories

• Ongoing Network Development Activities
  • Target (2017): 96 stations
  • Target (2022): 115 stations
  • Acquisition of earthquake monitoring & communication equipment
  • Inauguration of Davao Cluster Center
  • Continued capacity enhancement of technical staff
Strong-motion Broadband Stations

Basco, Batanes (June 22-29, 2012)
San Manuel, Pangasinan (Sept 02-08, 2012)

Lubang Island (Dec 14-19, 2010)
Virac, Catanduanes (Nov 14-20, 2010)

El Nido, Palawan (Dec 03-09, 2011)
Borongan, Eastern Samar (Nov 20-25, 2011)

Bataraza, Palawan (Nov 29-Dec 04, 2010)
Guimarases Island, Guimaras (Dec 06-11, 2010)

Pagadian, Zamboanga del Sur (Nov 22-27, 2010)
Mati, Davao Oriental (Nov 12-18, 2011)

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Hydra v1.47

- Software for automatic real-time processing of earthquake events
SEISCOMP3 Data Acquisition and Real-time Processing System

- SeedLink Server for Data Sharing
- Used by member countries
Sea-Level monitoring Stations

- **Philippine Project (DOST-GIA Project)** – 10 sites
- **JICA-GAPDR** - 19 commissioned sites
- **JICA-JST** – 5 sites
Sea-level Monitoring Stations

Tsunami Detection Station

Data Transmission Station
Mass Alerting System Using Tsunami Siren (ASTI-DOST)
**Expanding circles shows the location of the latest events**

- Data access can be set to get data from NEIC or PHIVOLCS seismic systems (HYDRA or SEISCOMP3)
- Earthquake magnitude range (> 0, >4.5 and > 6.5) can be set for alerting, auto SMS and Emailing
Tide Tool Application

- Developed and supported by US NOAA NWS PTWC
- With graphical user interfaces to continuously monitor sea level data streams
PHIVOLCS Data Receiving Center
Tsunami Advisory and Warning Services

“Right Information to the Right People at the Right Time in order to make the Right Decisions”
Tsuni Information Classification

- **Tsunami Advisory: No tsunami threat**
  - For information purposes

- **Tsunami Advisory: Sea-level monitoring**
  - Tsunami potential
  - Sea-level monitoring ongoing
  - Be ready to evacuate

- **Tsunami Advisory: Sea-level disturbance**
  - Estimated tsunami wave height is less than one meter
  - Stay away from the beach

- **Tsunami Warning**
  - Estimated tsunami wave height is one-meter or higher
  - Immediate evacuation and implement tsunami safety procedures

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EARTHQUAKE

No Potential for tsunami

Seismic Data Analysis

Advisory 0

Long Lead time

Advisory 1

High Potential for tsunami

A tsunami was confirmed by Sea Level Data

Advisory 2

Very short Lead time

Warning 3

Life Threatening

Non Life Threatening

ALERT CANCELLATION

ALERT CANCELLATION
Communication Scheme for Trans-Pacific Tsunami Earthquake

PTWC NWPTAC

NAMRIA

Mass Texting Companies

Office of the President

PAGASA

NDRRMC

PHIVOLCS

OCD

OCD RC RDRRMC

LGUs DRRMC

PUBLIC

Radio Broadcasts TV broadcasts

Siren Public Address System

GTS FAX PHONE

FAX PHONE

FAX EMAIL Phone

FAX PHONE

FAX PHONE SSB Radios

FAX PHONE SSB Radios

FAX PHONE

FAX PHONE
Tsunami Information Products

- Earthquake Information
- Tsunami Advisory and Warning
- Tsunami Updates
- Threat Cancellation

- Fax, Website, email
- SMS, Cell broadcast system
- Social media (e.g. Twitter, Facebook)
- Radio and Television
Decision Support Tools

- **SWIFT System**

- **Earthquake mechanism**
Decision Support Tools

- Tsunami Scenario Database (33,000 scenarios)
  - Computed arrival time of tsunami wave and maximum wave height at forecast points
M7.2 Davao Occidental Earthquake

Date:
April 29, 2017

Time:
04:23 AM

Coordinates:
5.02°N, 125.24°E

Depth:
57 km

Magnitude:
Mw 7.2

Location:
53 km S 30° W of Sarangani (Davao Occidental)

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2017/04/28 20:23 Davao Occidental, Philippines

<table>
<thead>
<tr>
<th>Date (UTC)</th>
<th>Longitude</th>
<th>Latitude</th>
<th>Depth (km)</th>
<th>Mw</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017/04/28 20:23</td>
<td>125.0 E</td>
<td>5.4 N</td>
<td>20</td>
<td>6.9</td>
<td>Manual (Rapid solution)</td>
</tr>
</tbody>
</table>

SWIFT Centroid Moment Tensor Solution:

- Moment magnitude ($M_w$) = 6.9
- Seismic moment ($M_0$) = $2.62 \times 10^{19}$ Nm

(Lon, Lat, Depth) = (125.00°E, 5.40°N, 20 km)

(Strike 1, Dip 1, Rake 1) = (305°, 31°, 59°)

(Strike 2, Dip 2, Rake 2) = (160°, 64°, 107°)
Sea-level Monitoring

Sea Level Disturbance were observed at 2023Z at Sarangani Sea Level Station

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1. “Towards a Tsunami-resilient nation”
Offshore Active Faults Mapping

- 10 KHz transducer
- 3.5 KHz transducer
- Sensor unit
Knowledge of Risks
Education, Awareness, Preparedness Campaigns

Educational materials, seminars, drills, press conferences, media programs
Teacher Training

Lecture on Tsunami and Tsunami Hazards
Lecture on Historical Earthquakes and Tsunami in Masbate

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Community-based Tsunami Preparedness Activities

- hazard assessments
- preparation of evacuation maps
- installation of tsunami signage
- coastal village education campaigns
- tsunami drills

Familiarization with Hazard and Evacuation Maps

Tsunami Signage

Tsunami Drill
World Tsunami Day

- 05 November 2017
- Tsunami Awareness Activities in Zambales, a province facing the Manila Trench in the West Philippine Sea

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