

## **Earthquake and Tsunami off Indonesian coast 26 December 2004**

A powerful earthquake occurred on the 26 December 2004 at 00 hr 58 UTC with magnitude 9.0 on the Richter Scale near Latitude  $03.3^{\circ}$  North,  $95.8^{\circ}$  East. The epicentre lay 42 kilometers north of Baza Nazerah, Simuelue Island, Indonesia at a depth of about 10km below the ocean. This is considered as one of the greatest earthquake since 1964 when such a phenomenon took place in Alaska. Large amplitude earthquakes were recorded in the Sumatra region in 1833 and 1861 (8.8 and 8.5 in Richter Scale respectively).

### Some effects of the disaster

The effects were widely felt along the east coasts of India, Sri Lanka, Bangladesh, Indonesia, Thailand, Maldives islands, Malaysia and caused damage to nearby islands in the Bay of Bengal. Although it struck Australia, East Africa, Somalia, and Seychelles, the Tsunamis (waves) generated caused less harm over these countries.

Tremors (aftershocks) were felt in some parts of India, Sri Lanka, Thailand, Nicobar Island and other neighbouring countries, after the main shock. Signals have been recorded by tide gauges from different parts of the world as far as the West coast of Alaska Station and Chile on 27 December morning and California amongst others.

In Sri Lanka the press reported 30 – 40 feet high waves. A train overturned near Colombo killing many passengers. Coasts and tourists resorts suffered a lot due to immense waves breaking up to 300 meters inland. Many boats were damaged or sunk. Minor waves were also reported from Maharashtra near Ratnagiri (West Indian coasts) due to shoaling effects.

Effects and disaster caused are well known with maximum number of death in Indonesia. Banda Aceh was badly affected.

### Tsunami

'Tsu' means Port, "nami" means long ocean wave in Japanese language.

Tsunamis originate as a consequence of seismic disturbances in the ocean generating a large amount of Potential energy which is transmitted through the water medium and propagates in all directions. In deep oceans, these waves have small amplitudes but travel at an average speed of about 700 kmph and their wave lengths may be of the order of 150km. High and furious waves are generated when they break ashore or over reefs hence, inundation occurs.

### Action taken by the Mauritius Meteorological Services

- After having confirmed information from International Media and Rodrigues, the Meteorological Services informed through radio immediately that the population in Rodrigues must not venture at sea and evacuate low level coastal areas.
- In Mauritius some hotels/restaurants were flooded and some members of the public lost their belongings near Pereybère. Many hotels on the coasts were contacted and tourists and local residents as well were asked to evacuate beaches and lagoons. The Police Information Room and Coast Guard Posts were also contacted.
- Information was immediately sent through all electronic media available to be broadcast soonest.
- The Chief Fisheries Officer was called at the Meteorological Services, who helped by informing Fisheries Posts to evacuate people from the lagoons.
- Just before noon, private radios, did broadcast messages informing the population on the situation.
- The Mauritius Broadcasting Corporation (MBC) could be contacted only at 12 45 hours and the Meteorological Office could intervene live on the air at 1300 hours.
- A written bulletin in French was sent to MBC at 13.20 hours followed by an English version at 1400 hours.
- At 15 30 hours, after careful assessment of the situation, the Director went on the air to inform the public that the worse was over and activities may be resumed on coastal areas.

- Special Communiqués at 1600 hours for Mauritius and at 16 15 hours for Rodrigues were also issued.

## **Observations and Measurements**

### **Wave Rider Buoy**

- Observations from the wave rider buoy situated off Blue Bay Coast in the open sea indicated that wave height reached 2.15 meters only around midnight on the 26 December and maximum wave height was recorded on 27 December at 05 00 hours local time with a peak of 2.48 meters. Afternoon waves (on the sea surface) were only about 1.5 meters high (Tsunamis usually travel in the deep ocean surface).

It is to be noted that information from isolated places such as Cap Malheureux, Poste Lafayette, Le Morne, Grand Bay and some coastal hotels indicated that waves could have reached 3 – 4 meters. Sea water penetrated inland as well during the early afternoon.

### **-Tide gauge data/information**

- Free oscillations of water fluctuations observed from tide gauge records at Port Louis were analysed. It showed that there were remarkable deviations of the seiches during the passage of the Tsunami in the afternoon of 26 December 2004.
- The tidal record showed that abnormal seiches were observed as from midday 26 January 2005 up to the next morning and these variations were highest between noon to late afternoon.
- Rodrigues tide gauge also showed such variations at the beginning but unfortunately went out of order just after the first fluctuations.
- Reports received from Rodrigues on the 26 December 2004 informed that water was being pumped from some areas around 11 o'clock in the forenoon.
- A diver indicated that while diving at sea he suddenly read a depth of 9 meters on his manometer when he was initially at a depth of 4 meters, confirming that water had piled up on top of him.
- Boats were damaged in the high seas and at Port Mathurin water accumulated and receded several times.

### **Speed of travel**

- Average time for the Tsunami to reach the Rodriguan Coast was about 6 hours. Thus average speed of travel from epicentre was about 683 kmph.
- Average speed of travel between Rodrigues and Mauritius was estimated to be about 500 kmph.

### **Conclusions**

- It is unfortunate that no data was received from actual observations in the Indian Ocean. Ships and other scientific institutions did not inform the Meteorological Office of such an event either.
- The effects of such an earthquake near the Republic of Mauritius would have been quite disastrous.
- No institution in Mauritius performs seismic/volcanic/oceanographic observations and forecasts so far.
- Time limitations, lack of facilities for evacuation purposes makes this event almost unpredictable.
- National warning systems on Tsunamis need an observing network and monitoring system.

### **Recommendations**

- A Natural Disaster Management Strategy has to be put in place for the prevention of such calamities.
- The United Nations, The World Meteorological Organisation, The Joint Commission for Oceanography and Marine Meteorology, The International Oceanographic Commission must collaborate for expertise and experience with the advanced warning system of the Pacific region.
- Availability of extra budgetary support is required to face the challenge.