CTBTO PREPARATORY COMMISSION | preparatory commission for the comprehensive nuclear-test-ban treaty organization

CTBTO Spectrum

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Who we are

The Comprehensive Nuclear-Test-Ban Treaty bans all nuclear weapon test explosions. It opened for signature in New York on 24 September 1996 and enjoys worldwide support.

The CTBTO Preparatory Commission was established to carry out the necessary arrangements for the implementation of the Treaty and to prepare for the first session of the Conference of the State Parties to the Treaty after its entry into force. It consists of all States Signatories and the Provisional Technical Secretariat.

Inside this issue

Establishment of an effective tsunami early warning system

By Masahiro Yamamoto, Director, Earthquake and Tsunami Observations Division, Japan Meteorological Agency

On 26 December 2004, a tsunami, triggered by a large earthquake off the coast of Sumatra, Indonesia, killed more than three hundred thousand people in the coastal areas of the Indian Ocean region. The fast-moving water of the tsunami devastated everything in its path, including homes, hotel complexes, trees, boats and cars.

The Sumatra earthquake was registered within minutes at waveform monitoring stations of the International Monitoring System (IMS) throughout the world, and was included in the first automatic event list released by the International Data Centre (IDC) to subscribing States Signatories about two hours after the data were recorded. The Reviewed Event Bulletins, which contain the review results by IDC analysts and are normally issued within ten days, included for 26 and 27 December 1054 aftershocks (figure 1).

Tsunami is a Japanese word meaning 'harbour wave'. Tsunamis are usually small in deep waters, but become large and cause damage when they approach coasts or harbours. A characteristic of tsunamis is that their destructive impact can occur far away from the area of origin. Therefore, real-time seismic and sea level data monitored in the region are an essential component of a system that issues timely tsunami warnings. Although the networks of many institutions registered the

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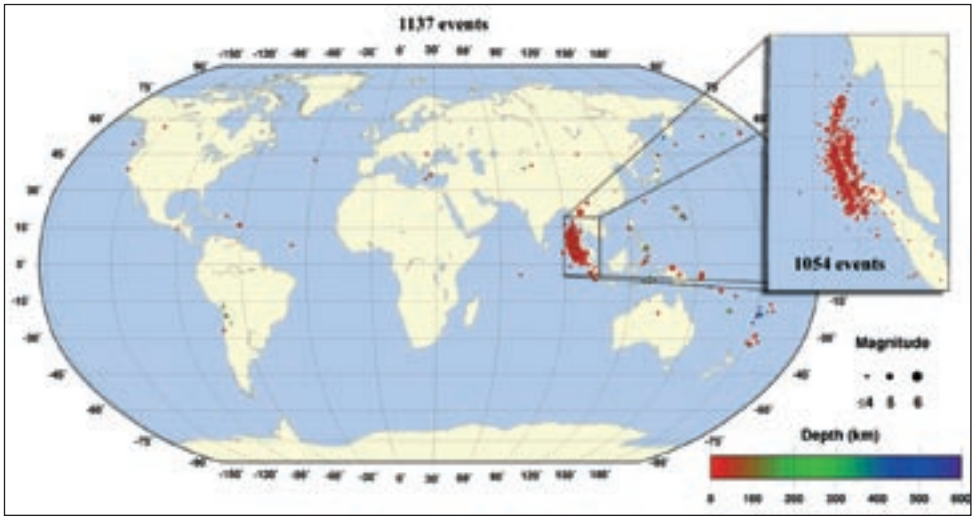

FIGURE 1:THE IDC REVIEWED EVENT BULLETINS OF 26 AND 27 DECEMBER 2004 INCLUDE 1137 EVENTS (MAIN MAP), OF WHICH 1054 EVENTS (INSET) WERE AFTERSHOCKS OF THE SUMATRA TSUNAMIGENIC EARTHQUAKE

Establishment of an effective tsunami early warning system

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catastrophic earthquake in Indonesia, no adequate warning could be issued by the relevant authorities to the population at risk, due to the lack of an integrated and coherent early warning system in the region.

Japan has a long history of tsunami inflicted damage. In order to mitigate tsunami disasters, the Japan Meteorological Agency (JMA) established a tsunami warning service as early as 1952 and has been making continuous efforts to issue accurate and effective tsunami warnings. In 1960, the largest earthquake ever recorded (9.5 on the Richter scale) occurred off the coast of Chile. The tsunami generated by this severe earthquake reached the Japanese islands about 23 hours later, causing extraordinary damage in Japan and in other Pacific Ocean countries. As a consequence of this disaster, the International Coordination Group for the Tsunami Warning System in the Pacific was formed in 1965.

The main purpose of the system is to provide timely tsunami warnings to its participating States threatened by tsunamis. The Group reviews activities in order to implement further cooperation and coordination between the Member States. In 1993, the Group launched a feasibility study and discussed the establishment of a possible regional tsunami warning centre in the Northwest Pacific region. Since then JMA has concentrated its efforts on research and development to meet fully the requirements of the envisaged centre.

The Northwest Pacific Tsunami Advisory Centre of JMA has been providing tsunami advisories to the countries in the Northwest Pacific region since March 2005. The advisories offer user-friendly and regionally tailored information, including expected tsunami arrival time and expected tsunami height at each coast. It also assists recipient countries in improving their plan of action against the tsunami threat.

ANALYST AT JMA HEADQUARTERS, TOKYO, JAPAN

The United Nations World Conference on Disaster Reduction, held in Kobe, Japan, in January 2005, agreed that the Tsunami Watch Information for the Indian Ocean would be issued on an interim basis by JMA and the Pacific Tsunami Warning Centre (PTWC) in Hawaii, United States, until a tsunami early warning system in the Indian Ocean becomes fully operational. Each of the two organizations has already started issuing information to concerned countries, using common criteria on seismic event data and estimates of tsunamigenic potential taken from seismological observations.

As the current tsunami warning criteria are mainly based on seismic data, the acquisition of high quality seismological data in a timely manner is essential for the establishment of an accurate and early tsunami warning system. The existing seismological networks are not deployed uniformly and the data availability is not reliable because it is forwarded through the Internet. However, the International Monitoring System (IMS) seismological network of 50 primary and 120 auxiliary stations is deployed more evenly across the globe and is equipped with the most advanced broad-band seismometers, which record seismic waves over a wide range of frequencies. The advantage of using data from broad-band seismometers for tsunami warning is to estimate the overall size of a large earthquake and to be able to evaluate tsunamigenic earthquakes. Furthermore, the data are transmitted via a dedicated communication network, all IMS seismic stations are maintained by well-trained station operators and the data could potentially be provided with very high reliability. This complies with the requirements for a tsunami warning system, to issue a warning to concerned countries within minutes of a potentially tsunamigenic earthquake.

The Northwest Pacific Tsunami Advisory Centre of JMA is one of two UNESCO recognized tsunami warning centres. The CTBTO Preparatory Commission decided at its special session on 4 March 2005 to cooperate with UNESCO and the International Oceanographic Commission on a possible contribution to an effective tsunami warning system. Following this decision, the Provisional Technical Secretariat is forwarding continuous seismic data recorded at selected IMS stations to JMA for test purposes since 7 June 2005, thereby giving an example of potential civil and scientific applications of IMS verification data. ■

Biographical note

Mr Masahiro Yamamoto is the Director of the Earthquake and Tsunami Observation Division, Seismological and Volcanological Department of the Japan Meteorological Agency (JMA) since 2004. From 2002 to 2004 he served as Director of the Volcanological Division of JMA. He worked for the PTS from 1997 to 2002 and contributed to the construction of the IMS network.

Since the occurrence of the Sumatra earthquake and the subsequent tsunami on 26 December 2004, he has participated in numerous meetings, sharing the experiences and knowledge of JMA in building an effective tsunami warning system. ■