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. The Treaty is a cornerstone of the international nuclear non-proliferation regime. It opened for signature in New York on 24 September 1996, and today has achieved strong worldwide support.

The CTBTO Preparatory Commission is an international organization consisting of a plenary body composed of all States Signatories and the Provisional Technical Secretariat. It carries out the necessary preparations for the effective implementation of the Treaty, and prepares for the first session of the Conference of the States Parties to the Treaty after its entry into force.

Inside this issue

CTBT contribution to global seismology: An ISC perspective

By Dr Avi Shapira

Seismic monitoring is one of the most important verification technologies applied to monitor compliance with the Comprehensive Nuclear-Test-Ban Treaty (CTBT). The 170 International Monitoring System (IMS) seismic stations transmit data through the Global Communications Infrastructure (GCI) to the International Data Centre (IDC) in Vienna, Austria. Here, the data are processed, and, together with IDC products, released to Member States for further analysis. As seismic stations mainly monitor the earth's crust, almost all the data in the IDC Reviewed Event Bulletin (REB) refer to earthquakes.

Since 2000 the International Seismological Centre (ISC) based at Thatcham, United Kingdom, has been receiving all REBs once a year and integrating them into its ISC Bulletin, thus making CTBT seismic data available to the international seismological community. The Centre was founded in 1964 and reconstituted in 1970 as an international, non-governmental body. The ISC is a non-profit organization, charged with the final collection, analysis and publication of earthquake source information from around the world. It is widely recognized as the most comprehensive, reliable listing of global seismicity data.

The ISC has the world's largest seismic parametric database (data regarding the time, location, magnitude of earthquakes, associated arrival time and amplitude measurements at the seismic stations). Every year the ISC receives earthquake catalogues and seismic phase readings from almost 3,000 seismograph stations (see Figure 1), representing every part of the

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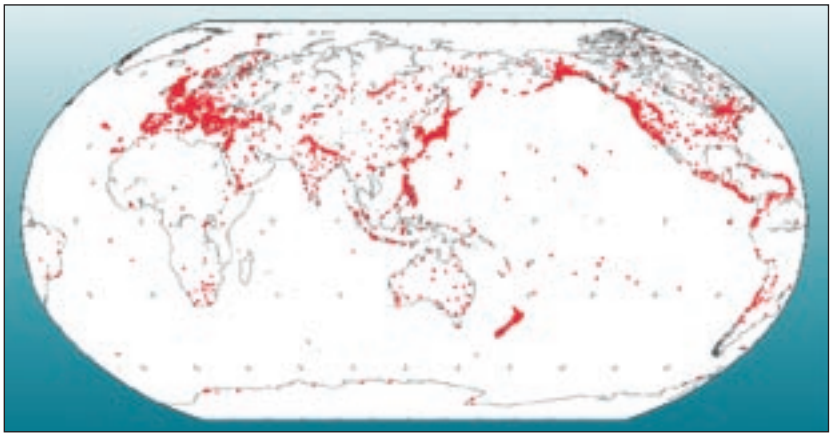

FIGURE 1: LOCATION OF STATIONS CONTRIBUTING TO THE ISC BULLETIN IN 2003

CTBT contribution to global seismology ...

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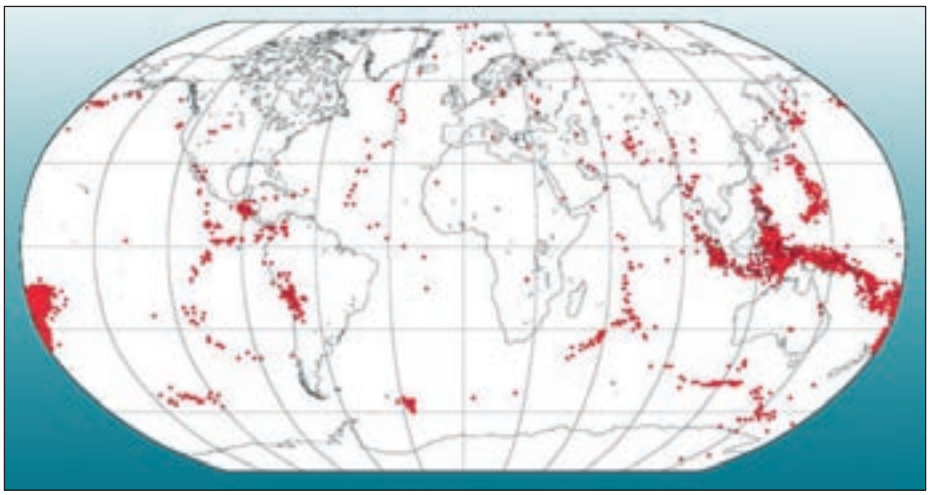

FIGURE 2: LOCATIONS OF EVENTS WHICH OCCURRED IN 2001 AND WERE ONLY REPORTED TO THE ISC THROUGH THE IDC REVIEWED EVENT BULLETINS

globe. The Centre's main task is to re-determine earthquake locations and magnitudes, and to search for previously unidentified earthquakes. More about the ISC and its products can be found on its web site: www.isc.ac.uk.

In recent years, the most significant new contributions to global seismology have been the installation of the global IMS seismic network and the release of the parametric data by the IDC, which are systematically included in the ISC Bulletin. In many cases, the IDC locations serve as first approximations to the ISC location procedures and the IDC phase readings help improve the accuracy of locations in the ISC Bulletin, thus providing the seismological community with increasing numbers of observations and accurate data which are used in seismological research.

Despite the relatively small number of IMS stations, about 10% of the phase readings in the ISC Bulletin come from the IDC and help in event location. Furthermore, thanks to the IDC's careful analysis procedures, the ISC Bulletin is enriched with many events that are not reported by any other seismological agency. The map in Figure 2 shows the locations of events reported in the 2001 ISC Bulletins that were only reported by the IDC. Therefore, it is evident that the CTBTO network and operations help to close the gaps in monitoring areas where no national or regional networks exist, particularly in the oceans.

The ISC purposely waits until all possible data has been collected from all operating seismic stations before editing its bulletin. Following this practice the ISC is likely to prepare the most complete and accurate earthquake catalogue, which, in turn, is used by the IDC to evaluate its own performance in terms of completeness and location accuracy.

There is no doubt that the close interaction between the ISC and the Preparatory Commission contributes significantly to improving the performance of both organizations. This cooperation is an example of the direct civil and scientific applications of CTBT verification data and technologies. These data facilitate a wide spectrum of seismological studies, such as the exploration of the three-dimensional structure of the earth; earthquake hazard and risk assessments; earthquake forecasting and engineering; earthquake source processes; and tectonics. Therefore, it is important that the States Signatories and the scientific community continue to work towards further progress in the field of CTBT data accessibility. ■

Biographical note

Avi Shapira is based in Thatcham, United Kingdom, where he heads the International Seismological Centre (ISC).

Originally from Israel, he holds a Doctor of Science degree from the Uppsala University in Sweden. Dr Shapira has held several research positions related to seismology, including Director-General of the Geophysical Institute of Israel and advisor to the Government of Israel on earthquake preparedness. He is the author of approximately 45 peer reviewed papers, over 50 invited reviews and publications in proceedings of conferences, and over 150 reports and abstracts on seismological research. ■