

Special Feature 2

The Event of 9 October 2006: A Test Case for the CTBT Verification Regime

The announcement by the Democratic People's Republic of Korea on 9 October 2006 that it had conducted a nuclear test was met with a practically unanimous global expression of concern. The United Nations Security Council condemned the act as a clear threat to international peace and security. The Chairperson and the Executive Secretary of the Preparatory Commission expressed grave concern at the declared test and characterized the event as an action against the letter and the spirit of the CTBT.

The Commission held a Special Session to discuss the announcement on 13 October 2006. At the session, a large number of States Signatories made statements expressing their deep concern and regret. The PTS provided two technical briefings on the event related to the announcement for States Signatories on 9 and 13 October. States Signatories expressed their appreciation to the PTS for the timely provision of reliable IMS data and IDC products.

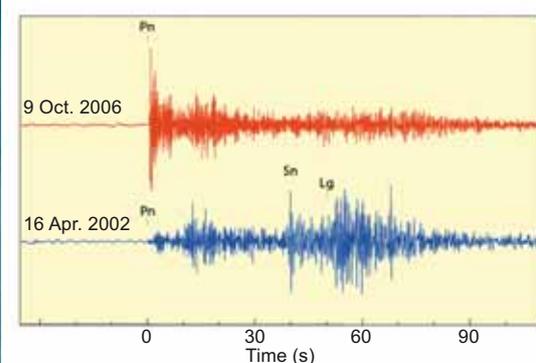
This event can be regarded as an unplanned test of the reliability of the CTBT verification system. The event provided a special opportunity to demonstrate the technical capabilities of the PTS, to test its procedures and to highlight the added value that the system can bring to States Signatories in a situation of such political importance. Under the Treaty, IMS data and IDC products are provided to States Parties to enable them to draw their own conclusions. It is the States Parties' prerogative to assess the nature of an event.

The event was well recorded throughout the world by the IMS. The signals originating from the event were detected at more than ten primary seismic monitoring stations. Less than two hours later, States Signatories received the first automated data product, Standard Event List 1 (SEL1), containing preliminary information on the time, location and magnitude of the event. The IDC in Vienna expedited analysis of the seismic recordings and applied time lines for data processing and dissemination as envisaged by the Treaty. As a result, the PTS was able to distribute its primary data product, the Reviewed Event Bulletin (REB), to States Signatories on 11 October 2006.

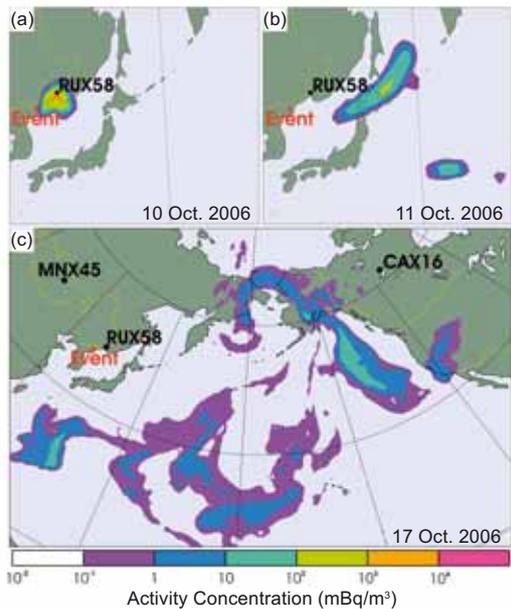
The REB for a given day contains all those events which have been detected at IMS seismic, hydroacoustic and infrasound stations and which meet specific quality criteria. All the data and parameters for every event in the REB have been reviewed by waveform analysts in the IDC, and seismic events may include data from IMS auxiliary seismic as well as primary seismic stations. For the IDC waveform analysts the event in the Democratic People's Republic of Korea was just one of over a hundred events in the REB for 9 October.



Locations and confidence ellipses for the event of 9 October 2006 in the Democratic People's Republic of Korea. The blue ellipse associated with the location resulting from automatic data processing (and provided in Standard Event List 1) had an area of 2389 square kilometres. In contrast, the red ellipse for the location resulting from the subsequent review by IDC analysts (and given in the Reviewed Event Bulletin) had an area of 880 square kilometres, which is less than the maximum area of 1000 square kilometres allowed for an OSI under the Treaty.



Waveforms for a nuclear explosion and an earthquake recorded at the IMS primary seismic array PS31 at Wonju, Republic of Korea. The upper trace shows the waveform recorded at PS31 for the announced nuclear explosion in the Democratic People's Republic of Korea of 9 October 2006 ($m_b = 4.08$). The lower waveform trace is for a shallow earthquake that occurred on 16 April 2002 ($m_b = 3.93$) and whose epicentre was within 80 km of the explosion. An explosion generally has a very impulsive, large onset of compressional waves (Pn) and produces little shear energy (Sn and Lg) and smaller surface waves in comparison with an earthquake of similar size, giving rise to the regional screening criterion.



Temporal evolution of the ground level concentrations of xenon-133 as calculated by the PTS ATM software for an assumed immediate venting of radion xenon at the time and coordinates of the event of 9 October 2006 (shown by the red dot). The plume is shown at 03:00 Coordinated Universal Time (a) one, (b) two and (c) eight days after the event. The three radionuclide stations shown are participating in the International Noble Gas Experiment, but RUX58 was not operating at the time of the 9 October event.

The REB confirmed the validity of the event issued in SEL1, and its location and time. Moreover, the inclusion of signal detections at one additional primary seismic station and a range of well distributed auxiliary seismic stations, together with the improvements associated with analyst review, resulted in a reduced uncertainty in the location for a possible inspection area of well below 1000 square kilometres – the maximum allowed for an on-site inspection under the Treaty.

In addition to the observations made in the REB based on the findings by the seismic, hydroacoustic and infrasound technologies, the radionuclide technology, measuring radionuclide particles or noble gases in the air, may be able to allow unambiguous identification of a nuclear explosion. At the time of the announced nuclear explosion, 10 of the planned 40 radionuclide noble gas monitoring stations of the IMS were already equipped but were running in experimental mode only. A part of the experiment is the analysis of these data. Information related to observations made at the IMS radionuclide noble gas station at Yellowknife, Canada, as part of the International Noble Gas Experiment was made available to authorized users on the IDC secure web site on 30 October and 1 November, and this was followed by updated information on 6 November. A technical briefing on this information was given to States Signatories on 10 November.

In summary, the IMS data and IDC products provided very reliable parameters characterizing the event, including its location, and to an accuracy that would be required for initiating an on-site inspection after entry into force of the Treaty. This was done with only about 60% of the IMS stations in use. Thus the event demonstrated that the PTS is capable of receiving and reviewing data for an event of special interest in accordance with the time lines envisaged under the Treaty, and of providing States Signatories with relevant data products.

It should be noted that such a demonstration under the current provisional mode of operation of the verification system is only valid for an exceptional circumstance. In this particular case, diversion of resources from other work was necessary in order to expedite the early issuance of the REB for 9 October. The event in the Democratic People's Republic of Korea also highlighted the need for a rapid build-up of the CTBT verification system, in particular of the radionuclide monitoring stations.

Seismic signals of the event of 9 October 2006 recorded at IMS stations.

