North Korea: a real test for the CTBT verification system?

by Dr Robert G Pearce

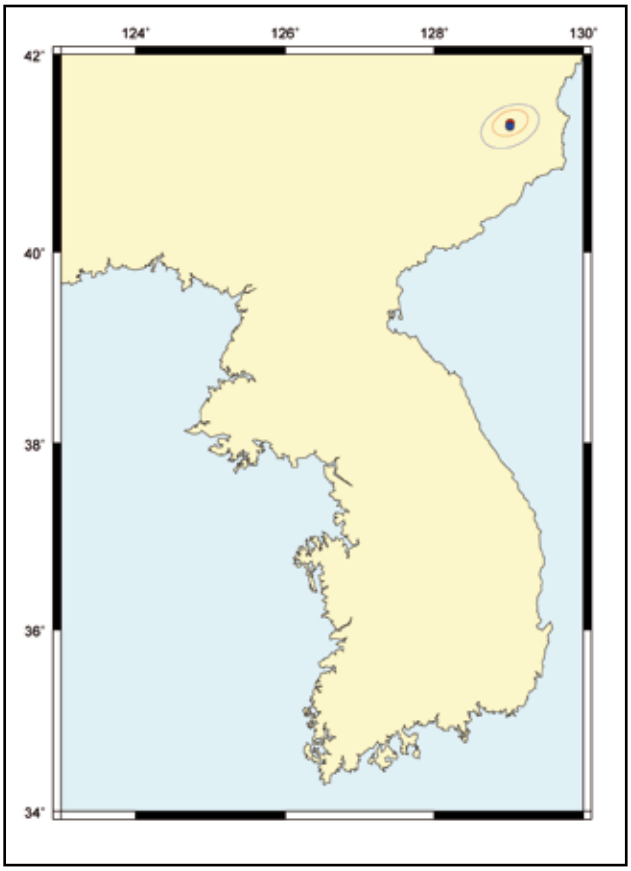
The International Data Centre (IDC) receives daily several gigabytes of data from the International Monitoring System (IMS) network. The IDC processes and analyses these data, and makes available to authorized users from States Signatories the results, which are referred to as 'IDC Standard Products'.

One of the IDC standard products is Standard Event List 1 (SEL1). It includes the preliminary locations of mostly underground events from which signals have been detected by at least two primary seismic stations of the IMS. Most of these events are earthquakes or perhaps chemical explosions carried out during mining activity. SEL1 is prepared entirely automatically 24 hours a day and is issued for every 20-minute interval of time. Typically, SEL1 includes well over 100 events each day. Some of these events are not real or are poorly located, but SEL1 is the most rapid event list issued by the IDC; it is issued within two hours.

On 9 October 2006, SEL1 included an event located in the Democratic People's Republic of Korea (DPRK) using signals detected at more than ten IMS primary seismic stations throughout the world. The uncertainty estimate for the location (referred to by seismologists as the 'confidence ellipse') covered an area close to 2,500 square kilometres.

This event generated considerable interest among States Signatories. In view of this, the Provisional Technical Secretariat (PTS) decided to expedite the issue of its primary waveform product, the Reviewed Event Bulletin (REB) for 9 October. 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 (referred to as the 'event definition 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 DPRK event was just one event of over 100 in the REB for 9 October; each event presents its own set of issues for analysts. The REB for 9 October was issued late on 11th.

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 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, the confidence ellipse covering less than 1,000 square kilometres. Figure 1 shows both the SEL1 and REB locations together with their confidence ellipses. The depth of the event was fixed to the earth's surface. This happens for many events and signifies that the uncertainty in the depth determination allows the event to be close to the surface.



THE LOCATIONS AND CONFIDENCE ELLIPSES OF THE 9 OCTOBER 2006 DPRK EVENT AS GIVEN IN THE IDC SEL1 (BLUE) AND REB (RED).

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) provides that the IDC applies approved 'screening criteria' to REB events in order to exclude events compatible with natural phenomena or non-nuclear man-made phenomena when the Standard Screened Event Bulletin (SSEB) is issued. This is an automatic bulletin of events which is issued shortly after the REB. The IDC currently applies approved experimental event screening criteria. The DPRK event was one of ten REB events on 9 October that were 'not screened out' after application of these screening criteria. This information was included in the SSEB that was issued automatically two hours after the REB.

Under the terms of the Treaty, it will not be for the CTBTO to pass final judgement on the origin of any particular event after entry into force. Rather, it will make available to States Parties all the IMS data and IDC products in a timely way, and provide upon request technical assistance to help States Parties to make their own judgements.

So what prognosis does this event provide for the CTBTO's future capability to meet these responsibilities? This event was well-recorded world-wide. The PTS made available a good location in SEL1 within two hours. It issued the REB for 9 October within the timescale planned for after entry into force, and the REB location corroborated the location issued in SEL1. Moreover, the REB

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reduced the location uncertainty to less than the 1,000 square kilometres, the maximum allowed for an on-site inspection under the Treaty. Thus the PTS was able to provide States Signatories with valuable information that would assist them to make their judgements – the system worked as intended. This was achieved with less than 60% of IMS stations contributing to provisional operations, at a time when IDC's data processing systems and formal procedures are still incomplete or under development, and when the organization is in a test and provisional operation mode only. This bodes very well for the future verifiability of the CTBT.

Also included in the IMS network are radionuclide particulate stations and radionuclide noble gas stations, although the latter are currently operating only on an experimental basis. Radionuclide monitoring results relevant to this DPRK event will be described in the next edition of *CTBTO Spectrum*. ■

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29th Session 12 – 15 November 2007

Working Group A:
31st Session 4 – 6 June 2007
32nd Session 8 – 10 October 2007

Working Group B:
28th Session 5 – 17 February 2007
29th Session I 21 May – 1 June 2007
29th Session II 20 August – 7 Sept. 2007

Advisory Group:
28th Session I 23 – 27 April 2007
28th Session II 14 – 18 May 2007
29th Session 10 – 14 September 2007

Joint Session for WGA and WGB:
Monday, 12 February 2007
Monday, 21 May 2007
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