Chapter 6: Teleseismic Monitoring Research: A Canadian Stronghold

The Yellowknife Seismic Array: Old and New

Teleseismic monitoring pertains to distances greater than 2,000 to 3,000 km. The Canadian involvement in this field dates back to 1962 when a cluster of seismic stations arranged in a cruciform configuration were installed near Yellowknife, Northwest Territories (Figure 5a). Known as the Yellowknife Seismic Array (YKA), it is one of the few such facilities in the world with a continuous recording history spanning nearly three decades. Its central location with respect to most nuclear testing sites makes the YKA particularly valuable.

External Affairs and International Trade Canada together with Energy, Mines and Resources Canada made possible the refurbishment of the array in 1989, turning it into a state-of-the-art facility for monitoring global seismic activities, both natural and man-made. The refurbished YKA now features three different types of digital recording instruments: a) 18 short-period, vertical-component stations; b) 4 broadband, three-component instruments; and c) 1 high-frequency, three-component instrument sampling at a high, 100 points/sec rate. Data from the YKA have proven extremely valuable in the University of Toronto forensic seismology research described below.

An International Experiment

The YKA has also recently made a significant contribution to an international seismic data exchange experiment conducted by the Geneva-based Conference on Disarmament's Ad Hoc Group of Scientific Experts (GSE). The GSE received a mandate from the Conference on Disarmament in 1976 to undertake the conceptual design of an international seismic data exchange system that would assist in monitoring a test ban treaty and providing the data required for national verification of compliance. Two seismologists from the Geological Survey of EMR — Dr. Peter Basham and Dr. Robert North — represent Canada in the GSE. In 1988, they accepted the role of Coordinator of a major experiment called GSETT-2 (GSE Second Technical Test). GSETT-2 was an experiment designed to test the seismic data exchange concepts in practice using existing or newly installed facilities. It involved 35 countries and 56 seismograph stations, with special processing facilities at experimental international data centres in Australia, Sweden, U.S.S.R. and U.S.A. The final phase of the experiment ran for 42 consecutive days from April 22 to June 2, 1991, detecting and locating between 50 and 100 global seismic events per day. The YKA