

Improving Array Location Accuracy

Use of the YKA data, in place of global network data from hundreds of widely distributed stations, enables Canada to gain location information on anomalous teleseismic events within 20 minutes to 1 hour of their occurrences — this might be fast enough so that necessary actions under an international treaty regime could be taken. However, speedy information access gained this way usually comes at a price: a poor location accuracy due to the limited array aperture.

To improve the array location accuracy, the University of Toronto team has launched a research project consisting of two parallel subprojects. The first involves the introduction into wavefield decomposition analysis of a sophisticated signal processing method developed largely by applied mathematicians working outside the field of seismology. Termed "oriented energy approach", our newly developed wavefield decomposition technique analyses the behaviour of seismic waves arriving from distant sources and recorded by the newly installed three-component broadband recording instruments. By keeping track of the array site ground motions in three dimensions and by comparing the recorded waves with predictions based upon known epicentral locations, we can obtain region-specific location corrections for future use.

The second subproject takes advantage of YKA's large body of archived vertical-component data from the pre-refurbishment era to investigate the behaviour of seismic wave fronts arriving from distant sources as they sweep across the array site. By noting the speed and the direction of these wave fronts and comparing them with predictions based on known epicentral locations, we can again obtain necessary corrections to improve the array's location capability. Preliminary results from these two separate subprojects are encouraging.