

Annex

Summary of scientific presentations given during the  
1990 Oslo Symposium on Regional Seismic Arrays and  
Nuclear Test Ban Verification

Development of regional arrays

Reviews of recent developments with regard to regional seismic arrays are presented for NORESS and ARCESS in Norway [1], GERESS in the Federal Republic of Germany [2] and FINESA in Finland [3]. Paper [1] summarizes the design considerations leading to the establishment of the first regional array, NORESS, and describes how the success of this new array concept motivated the deployment of additional arrays of this type. The paper documents the basic signal processing techniques used in real-time data analysis for regional arrays, and demonstrates the excellent detection performance of such arrays at regional distances (less than 2,000 km). It is shown that NORESS and ARCESS are capable of detecting seismic events of magnitude 2.5 with 90 per cent probability, if these events occur within 1,000 km distance. It is stressed, however, that the event identification threshold is necessarily higher than the detection threshold. The FINESA array is also documented to have an excellent performance [3], and together, these three arrays are capable of locating weak seismic events in Fennoscandia very accurately (typically to within 10-20 km). The GERESS array currently under development shows many of the same excellent features [2], and will contribute further to an excellent regional coverage of large parts of Northern Europe.

Processing of data from a network of regional arrays

Recent technological advances have allowed very sophisticated processing techniques to be applied in seismic monitoring research using a network of seismic arrays and single stations, and this is highlighted by the development of the Intelligent Monitoring System (IMS) [4], [5]. Two of the goals for this system are (1) to demonstrate the monitoring performance and capability of the system for small events at regional distances and (2) to explore the promise of an expert-systems approach for providing improved monitoring performance as experience accumulates. The first operational version, described in [4], processes data from NORESS and ARCESS, whereas later versions will be expanded to networks including both arrays and single station. The IMS is ambitious in exploring and integrating many new computer technologies, but the validity of the concept is documented in an evaluation of its initial operational performance [5].

Signal analysis methods

A number of presentations addressed methods for processing seismic signals recorded by arrays as well as 3-component stations. It was demonstrated that both types of stations can provide information very useful in phase identification, azimuth estimation and estimating the apparent velocity of detected phases. From theoretical considerations as well as from experimental comparison [12], [26], [14] arrays are shown to be superior in this regard at low signal-to-noise ratios, although the precision e.g. of azimuth estimates is influenced by a number of factors, including phase