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# **Semiannual Technical Summary**

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### 7.3 Development of a regional database for seismic event screening

#### *Introduction*

Efforts have started to create a database of regional seismic recordings to be used in a subsequent research effort to study the seismic event screening problem (see the Protocol to the Comprehensive Nuclear Test-Ban Treaty for the concept of event screening). This contribution gives an account of the event and station selection criteria, the approach adopted to arrive at a list of events, and the current status of the effort of compiling this database.

#### *Event and station selection criteria*

The database will mainly be composed of recordings that are obtainable from NORSAR's historical archive of recordings from the NORSAR teleseismic array, the Fennoscandian regional (high-frequency) arrays (NORESS, ARCESS, and the Spitsbergen array in Norway, FINESS in Finland, and the Apatity array on the Kola peninsula of northwestern Russia), and the GERESS array in Germany. Since the database is to represent regional wave propagation, the source region will thus be centered on Fennoscandia. An additional objective is to choose events in such a way that all propagation paths are contained within a relatively homogeneous region, geologically speaking. To achieve this, it was decided to limit the region to that part of the Eurasian plate that is encompassed by the Urals to the east, the Mid-Atlantic Ridge to the west and the Alps and the Carpatians to the south. More specifically, the selected source region is composed of one large rectangle [10°W-60°E] x [47°N-70°N] to cover most of the area, and a smaller rectangle [13°E-70°E] x [70°N-82°N] to cover relevant parts of the Arctic region (see Fig. 7.3.1 for a map of the area under consideration).

As to the size of events to be included in the database, it was decided to initially consider events for which at least one agency had reported a magnitude (of some sort, e.g.,  $m_b$  or  $m_l$ ) exceeding 3.5. If it is decided at some future time to extend the database to include events of lower magnitude, there will be a multitude of events of magnitudes lower than 3.5 to choose from. The initial event selection is also made with a view to include special events with magnitudes below 3.5 (see next paragraph).

For events that occurred prior to 1984, only data for the NORSAR teleseismic array are available in NORSAR's archives. The regional arrays in Fennoscandia (and GERESS) all became operational during 1984-1992. It was thus decided that the database should primarily consist of events from the period 1984-1997. Again, exceptions are made in order to include data for the NORSAR teleseismic array from events of particular interest that occurred prior to 1984.

As to the length of the data segments, it was decided to extract 30 minutes of data for each station for all events, with segment start time 10 minutes prior to the expected P arrival time. This is considered to provide a sufficient amount of pre-signal noise data for various possible future purposes, and is at the same time an appropriate length to accommodate all phases of interest, including surface waves, for the distance intervals considered here.

### *Approach adopted to generate a list of events*

The main approach for selecting events for this database has been a search of available bulletins. At our disposal for this purpose were the PDE and ISC bulletins, the REBs (Reviewed Event Bulletins) of the Prototype International Data Center, as well as a number of regional seismic bulletins issued by various agencies, e.g., the University of Helsinki in Finland and the LDG in France.

We started the bulletin search by selecting those events that matched the criteria described in the previous paragraph, and that in addition were defined by three or more of the bulletin agencies. This resulted in a total of 82 events. Of these, 56 were selected for the database in such a way as to maximize the geographical coverage. A bulletin search for events listed by two agencies only resulted in an additional 56 events, out of which 30 were added to the list of events for this database, based on their occurrence in regions not well covered by the initial 56 events. Finally, 17 events were added that were either defined by one agency only, or were special events that did not meet the criteria in the above paragraph. Among these special events were a couple of shots conducted in connection with seismic refraction experiments, a calibration shot in a mine, the recordings of the sea-bottom impact resulting from the accidental sinking of a concrete oil production platform, a dynamite explosion aboard a wrecked ship and a lightning-triggered explosion of an array of underwater mines.

The locations of the 103 events selected so far for this database are plotted in Fig. 7.3.1. Two other databases involving regional seismic recordings are planned to be constructed at NORSAR. One of these involves recordings of events in the Novaya Zemlya region (therefore events in this region are not shown in Fig. 7.3.1), and the other is a compilation of recordings of PNEs conducted in the European part of the Soviet Union before 1984. The merging of these two databases with the one considered here will contribute to an improvement of the event coverage shown in Fig. 7.3.1.

For the Novaya Zemlya and PNE databases, the recordings are being stored in the CSS3.0 format, which will also be used for the database described in this contribution. In this way, all three databases will be consistent (also with respect to the length of each data segment), and the databases will eventually be merged into one database of regional seismic recordings.

### *Current status of effort and remaining work*

As of the date of this report, data have been copied from the archive for about 80 of the 103 events selected for the database. The copying effort started with the oldest data, and what remains are events from the period 1993-1997. Taking into consideration that the most recent events have the highest number of stations contributing data, it is our assessment that 60-70% of the copying effort for these 103 events has now been completed. The recovery of data from the archive has met with a high degree of success, as very few intervals have been irretrievable. Station downtimes have affected the database construction to a small degree only. For each data segment copied, standard plots have been produced and arranged in a binder, where also specific information that is available (e.g., newspaper and other reports on special events) has been compiled.

When all waveform data have been entered into the database, it remains to add the metadata (e.g., station coordinates, station transfer functions, etc.). When all this is in place, we will consider copying the database on to CD-roms, as the primary medium for external distribution.

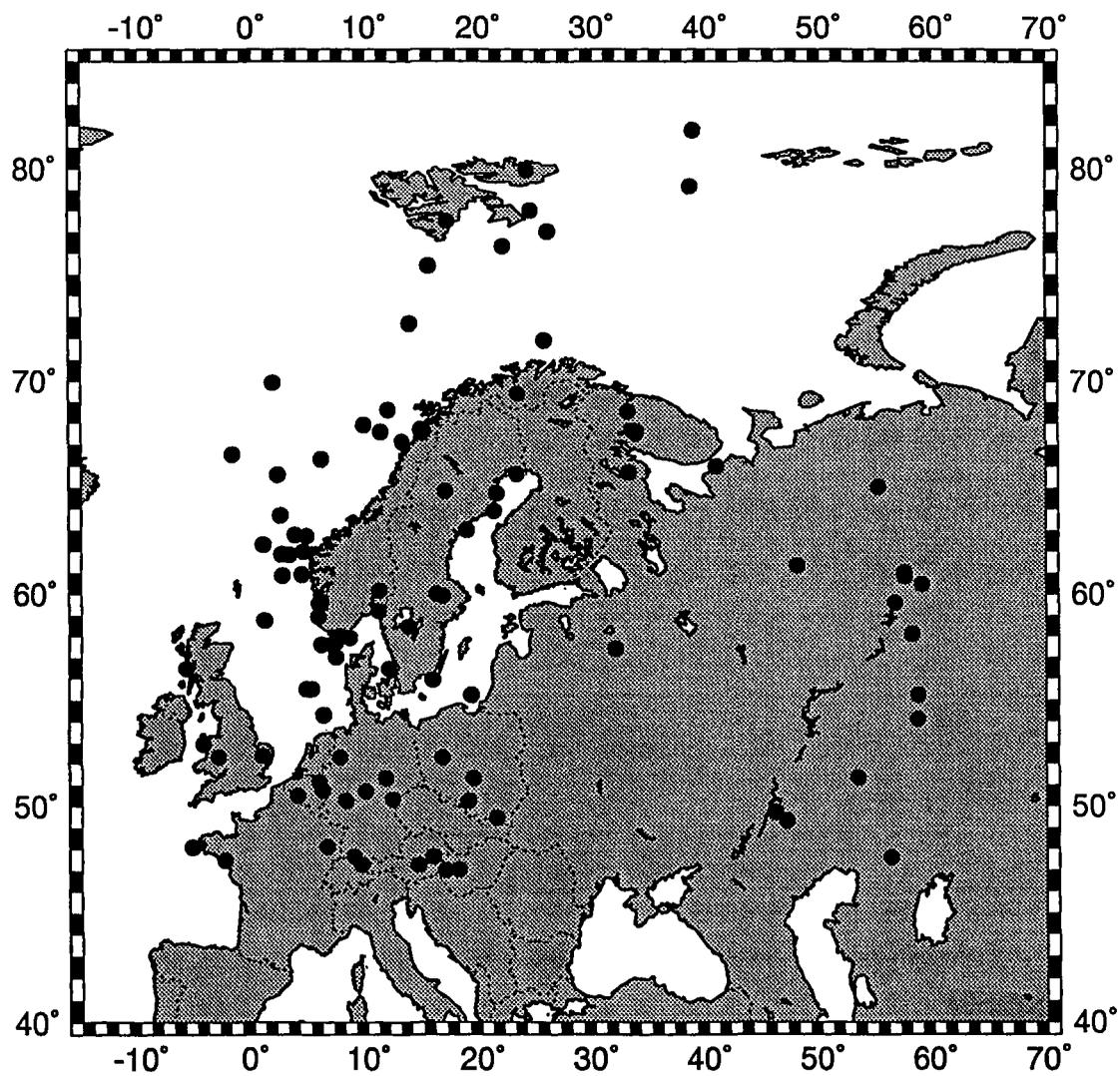
The next progress report on this effort will include a listing of all events in the database, along with an indication of which stations have contributed data for each event.

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# Database events



*Fig. 7.3.1. The map shows the 103 events so far selected for the regional database described in this report.*