The Swedish National Seismic Network, SNSN

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1 Introduction

Over the last few years, 45 new, permanent, digital, broadband seismological stations have been deployed in Sweden (except for one which is located in Åland), from Lannavara in Lappland in the North to Blekinge in the South. The network operates largely automatically, and is now essentially complete in the Eastern part of the country. The primary objective of the network is to gain better understanding of the ongoing deformation processes through monitoring of the local micro-earthquake activity. With the current station spacing of about 100km, completeness down to magnitude 0 is assured within the network. This magnitude corresponds to very small movements, for example to a motion of 0.01mm over a fault area with a radius of about 50m. Several hundred Swedish earthquakes are detected every year. Only a few (5 to 10) of these are so large that they are felt by people living close to the epicentre. While Sweden is a low seismicity area, the high sensitivity of the system means that ongoing deformation processes in the crust can be monitored in detail. As a larger data set is gradually acquired, it will also be possible to use information from these events to elucidate structures within the Swedish crust. In n addition, the network records signals from larger distant (teleseismic) earthquakes, and also regional events of sufficient magnitude. These data are analyzed to reveal details of the structure within the crust and mantle below the recording stations.

The main purpose of the network in Sweden is to gather information from microearthquakes in order to gain information for a better understanding of the ongoing deformation processes in the intraplate, glacially rebounding, shield area (Böðvarsson, 1999b). The results from Iceland (Stefánsson et al., 1993) and previous operation of temporal networks in Sweden (Slunga et al., 1984) have shown the usefulness of the very small microearthquakes as information carriers related to ongoing deformation.

2 Network design

Most stations are equipped with Güralp CMG-3T three component broadband seismometers with digital output. The frequency band of these instruments is adjustable. Currently, the seismometers are trimmed to give a flat velocity amplitude response in the period range from 0.02 to 30 seconds. The digital data is time stamped within the sensor using GPS, with an accuracy of better than 100 micro seconds. Despite the sampling frequency of only 100Hz, this accurate timing is necessary for accurate relative location of events. The seismometers themselves are placed on bedrock 1 to 2 m below the ground. The "vault" in which they are placed is a polyester cylinder 1.2 m in diameter. Some distance (0.5 to 2 km) from the vault, the station's computer is placed in a suitable safe environment. Linux is used as operating system in all computers in the network. Communication with the sensor is via an optical cable. While the communication between the station computer and the central computer is designed to be independent of the form of communication used (telephone, radio-link, or internet), for most stations, communication with Uppsala is via a dial-up telephone connection.

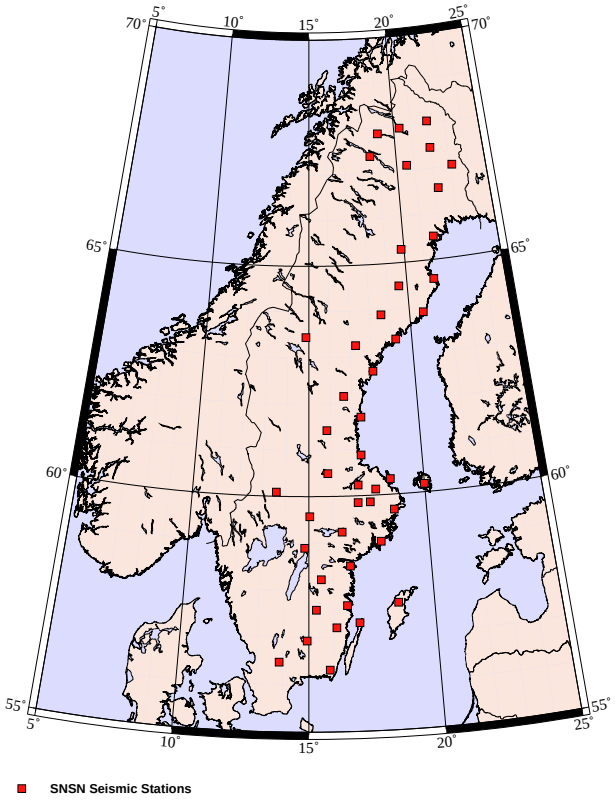

Fig. 1 SNSN broad-band stations

Unix (Linux) utilities are used throughout, providing the best possible portability of the software. The The data acquisition system used is the "SIL" system which was developed within the SIL project, a joint Nordic project for earthquake prediction research in Iceland, 1988 through 1992 ((Stefánsson et al., 1993; Böðvarsson et al., 1996, 1999a). A more detailed description of the implementation of the SIL system in Sweden is given in Böðvarsson and Lund (2003).

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