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Simulations of a Microearthquake Network

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Sites of vulnerable facilities, such as power plants, are required to be evaluated and monitored for possible earthquakes. Seismic networks having a recording capability for microearthquakes are well suited for acquiring more detailed information on local seismicity. When a dense, local seismic network is set up, numerous microearthquakes are expected to be recorded within a relatively short time period. Thus seismotectonic interpretation and seismic hazard evaluation of the area can be improved with the accurately locatable earthquakes recorded by the microearthquake network.

This study gives an example of simulations of a local microearthquake network centred around a future power plant -site. The site area is characterised by low intraplate seismicity, with earthquake magnitudes rarely exceeding 4.0. The network is required to fulfil the preconditions of azimuthal coverage better than 180° and automatic event location capability down to ML∼0 within the study area. Automatic event detection capability is simulated based on a relationship derived between event magnitude and maximum observation distance. The azimuthal coverage and the threshold magnitude are then computed for different station configurations and the results are presented as contour maps.

An optimal configuration of ten seismograph stations is proposed for further on-site research. The threshold magnitude within the study area and the annual number of earthquakes detected by the network are estimated. Also the automatic earthquake location accuracy for horizontal coordinates and depth is approximated. Location accuracy can be further improved by the application of local velocity models and relative location schemes. Modifications to the optimal configuration are expected in the deployment phase, because the area is surrounded by industrial noise sources.