Noise and detection levels for the Norwegian National Seismic Network

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The University of Bergen, Norway, is responsible for the Norwegian National Seismic Network (NNSN) and operates about 30 stations on mainland Norway and a number of arctic islands. About two thirds of the stations are equipped with broadband seismometers; several of them are the result of a recent upgrade of the network that still continues. The performance of the stations varies due to different equipment and vault construction that are used, and the geographic location. We critically evaluate the network to understand and then improve the overall performance. The first step was to determine the noise level of each station through computation of long-term probabilities of power spectral density and identification of noise sources from spectrograms. The noise plots allowed identifying issues with individual stations. We also looked into noise levels across the region at different frequencies, where the microseismic peaks due to the ocean are relatively high as expected. The next step was the evaluation of earthquake detectability that is highly important to judge the quality of the network as detection of regional earthquakes is the main objective of the NNSN. Additionally, we analyzed the geometry of the network to specify, what the network itself is capable of to detect. Combining those results enabled us to verify shortcomes of the network and to reduce errors in earthquake location. We also looked at travel time residuals from earthquake location in relation to the measured noise levels. In conclusion we classified the quality of our data from individual stations and the network in total, which will improve future research results.