

DETECTION LIMITS AND AMBIENT NOISE LEVELS OF THE NORWEGIAN NATIONAL SEISMIC NETWORK

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The Norwegian National Seismic Network (NNSN), run by the University of Bergen, consists of 32 seismic stations, which have been upgraded to mainly broadband stations in the last few years. The station locations are between 68°N and 80°N and between 10°W and 30°E. This includes stations on the Norwegian islands Bjørnøya, Jan Mayen and Spitsbergen. The highest station density is in southern Norway. The main objective of this study was to quantify the ambient noise level in Norway and to determine the detection limits of the NNSN. Therefore the dataset of 2013 of the NNSN was complemented with additional datasets from two temporary Norwegian networks (Magnus and Neonor 2). The noise levels for each station were determined using the McNamara (2004) approach: the power spectral densities were calculated and this was used to compute the probability density functions. We examined the diurnal, seasonal and geographical variation of the ambient noise level for four frequency bands. In order to find out about the noise source the data were compared to weather conditions such as wind speed, atmospheric pressure and sea level. Furthermore, the noise levels of the individual stations were compared to the residual travel times from earthquake locations. The last approach to determine the detection limits of the NNSN was done by a geometrical analysis of the station distribution combined with the observed ambient noise levels. A significant diurnal noise variation was observed for the frequency range 4-8Hz. This cultural noise was mainly visible for bigger towns such as Bergen and Trondheim and decreased during the weekends. A permanent high noise level exists for periods between 4s and 8s, which is caused by oceanic waves. A comparison of summer and winter months showed that the noise level decreases during the summer. Furthermore, the noise peak of this period band shifts to smaller periods during the summer. The same was observed for the interval 8-16s. A strong correlation between the weather conditions and the two period bands (4-8s, 8-16s) was noticed. The geographical noise distribution for middle and long periods is relatively homogeneous. The observed ambient noise levels and the detection limitations of the NNSN will help us understand noise levels in Norway in general, will allow us to improve the network and should be useful in tomographic studies.

REFERENCES

McNamara D and Buland R (2004) "Ambient Noise Level in the Continental United States," *Bull. Seismol. Soc. Am.*, 94: 1517-1527

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