

New insights of seismic disturbances due to wind turbines - long and short term measurements in SW Germany

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Within the scope of the project "TremAc", we present new insights of ground motion disturbances due to wind turbines (WTs) in the vicinity of the town of Landau, SW Germany. The main goal of this project, which is funded by the German Federal Ministry for Economic Affairs and Energy, is the detection of influences from WTs on human health and buildings in an interdisciplinary way.

The interaction between WTs, humans, infrastructure (incl. seismic stations) becomes more and more an important role with the increase of installed WTs. We present averaged one hour long PSD-spectra in a frequency range from 0.5 Hz to 7 Hz depending on the wind speed before and after the installation of characteristic WTs, especially for seismic borehole stations, during one month measurements. The results show a clear increase of the ground motion and a related disturbance of the seismic recordings. The station threshold for signal detection below 2 Hz is reduced after the installation of a new wind farm in the area around Landau. This effect occurs even up to distances to the WTs of more than 5 kilometers. The increasing noise level depends also clearly on wind speed, which indicate also the WT origin related with the signals.

Using short-term measurements during few hours, we are able to determine the maximum of the PSD values for different discrete frequencies as function of distance to the next WT and to fit a power-law decay curve proportional to $1/r^b$ to the data. In this way we can differentiate between near- and far-field effects of the seismic wave propagation of WTs. A clear frequency dependent decay can be observed, for which high frequencies are more attenuated than lower frequencies, probably due to scattering processes. The new results will help for a better understanding of WTs as a seismic noise source and their interaction with nearby seismic stations and other infrastructure. Seismic data were provided by "Erdbebendienst Südwest", "Federal Institute for Geosciences and Natural Resources" and "Karlsruher BroadBand Array (KABBA)". Meteorological data were provided by "KIT Institute of Meteorology and Climate Research - Department Troposphere Research".