



EGUsphere, author comment AC2
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Reply on RC2

Laura Gaßner and Joachim Ritter

Author comment on "Ground motion emissions due to wind turbines: observations, acoustic coupling, and attenuation relationships" by Laura Gaßner and Joachim Ritter, EGU Sphere, <https://doi.org/10.5194/egusphere-2022-108-AC2>, 2022

In the following section ("Signals at place of immission"), the authors discuss signals which have been recorded in the village of Kuchen, in about 1 km distance from the closest wind farm. Obviously, some residents feel disturbed by the wind farm and one of the project goals lies on how residents experience the WT emissions. Unfortunately, it then turns out that the recordings in Kuchen cannot be evaluated, because here the wind turbine signals are completely covered by the vibrations of a nearby and heavily frequented railroad line. Therefore, I would shorten this section significantly and also remove Fig. 8 since, in my opinion, it does not contribute anything to the targeted questions.

- We think it is a significant finding that the train signals are of such high amplitudes that the WT emissions are masked but the residents nevertheless claim to be disturbed rather by the WTs than the trains. Therefore, we would like to keep Figure 8 in the manuscript.

From the amplitude ratio of infrasound and ground motion, the authors derive the so-called coupling transfer coefficient at different frequencies. The results are well documented by text and figures, however, I miss the discussion of the significance of this parameter, which is not very common in seismology. How is the mechanism of the transmission of airborne sound to ground motion, are there any insights on this? Or, which information can be derived from this parameter, what does this coupling factor depend on, e.g. properties of the subsurface? This section should be expanded accordingly.

- We have added a passage to the manuscript to clarify this point (lines 220-225).

One of the most important results of this manuscript is the presentation of the b-values describing the spatial decay of the seismic wind turbine emissions. There are already numerous publications on this topic, but the results vary quite strongly depending on e.g. the number of wind turbines, wind farm geometry, or geological conditions. I think each further experiment can help to bring systematics into the results and to better understand the emitted seismic wave field of a wind farm. Table 3 gives a nice compilation of published b-values. However I would also like to see a graphical representation, which enables a better and quick overview.

- We added a graphical representation to the manuscript (Fig. 16) and simplified Table 3.

To calculate the b-values, the authors use both, absolute PSD amplitudes and relative PSD values. The comparison shows that the relative PSD method results in somewhat more stable and more reliable b-values, particularly if the registration of wind turbine emissions is superimposed by transient noise. I would appreciate if this aspect would be discussed in more detail, as it could lead to unified measurement rules with which comparable b-values can be obtained in future.

- We have added a passage to the manuscript to clarify this point (lines 292-294).

In the discussion section there are some statements, which are not proofed by the presented results, concerning the range of the emitted wind turbine signals. At page 17, line 289 the authors write that the signals can be observed "over distances of several kilometers". However, no PSD recorded at several km distance from a wind turbine is shown in this manuscript.

- We clarified this point in the manuscript (lines 306-308) and added a reference.

Fig. 1: at WF Lauterstein there are 3 white WT symbols which means that these WTs were "not studied". - How is it possible to exclude them from the measurements?

- The adjacent WF is of course responsible for part of the recorded signals, nevertheless, we have no operating data from those turbines. We rephrase to "no operating data available".

page 12, line 182: ... The closest recording station (IW02F, 20m distance) ... - due to Fig.1 and Fig.8 the closest station is IW02G, IW02F is at 80m distance to the railroad track

- This is correct and was changed accordingly.

Fig.8: I would sort the legend entries by distance

- Done.

page 12, line 183: you should use just one unit for the PSD amplitudes throughout the manuscript (same in text and figures): either dB relative to 1 (m/s)2/Hz or dB relative to 1 (micrometer/s)**2/Hz**

- The spectra have been changed to (m/s)²/Hz, the spectrograms are kept with (µm/s)²/Hz to match the respective time series shown in units of µm/s.

page 13, lines 192, 193: I think ground motions and acoustics were registered only at 2 resident sites simultaneously (IMC-B1 and IMC-B2)

- The names IMC_B1 and IMC_B2 refer to the indoor and outdoor acoustic measurements, respectively. The names remained the same for each resident site. This is now explicitly explained in the text (lines 196-197).

page 13, lines 199, 200; "Both, ground motion and acoustic, spectra contain clear signals ..." - move the comma to "Both, ground motion and acoustic spectra, contain clear signals ..."

- Done.

page 13, lines 217, 218: please add the appropriate unit to the CAS values

- Done.

page 14, Fig.10, caption: "Signals with frequencies $32 \times \text{BPF}$ can be observed in all three data sets." - Please mark the addressed signals as you did in Fig. 9.

- Done.

**page 17, line 286: "At sites with 150 m to 1900 m distance to the nearest WT ..."
- Obviously you are talking about WF Lauterstein. You should name it here.**

- Here we discuss both wind farms, closer stations (from 150 m) are at WF Tegelberg, stations up to distances of 1.9 km are at Lauterstein.

page 18, line 287: "Measurements at different wind farms ...", the same as above. This is WF Tegelfeld.

- Same as before, both wind farms are discussed.

page 22, lines 329 330: "Thus, recordings with seismometers and high sampling rates may be used in the future to monitor infrasound signals in the near-field of WTs." - You cannot monitor infrasound with seismometers, can you?

- Changed to "signals in the frequency range of infrasound".