Wind-induced seismic noise at the Princess Elisabeth Antarctica Station

Point-by-point answer

Dear Referee 1,

Thank you for your review, which helped us improve the manuscript.

Please find answers to your questions here below.

Baptiste Frankinet,

For the authors.

Report #1

Thank you for your comments and suggestions.

We followed your suggestions, in the PDF and in the short list you attached. For the remaining questions, please see hereafter:

Question 1) Model for wind-induced seismic noise
In the revised version, you introduced a piecewise continuous function (eq. 1) to describe wind-induced noise. Is the function overall continuous, i.e. also at 6m/s wind speed? From the text, I conclude that the parameters for both function pieces are determined independently from each other via linear regression, in which case the two slopes will very likely intersect at a different wind speed than 6m/s (hence introducing an offset at 6m/s). However, from Fig. 3b, I conclude that the resulting function (red line) is continuous at 6m/s – is there some condition on the continuity of the function, i.e. y1(6m/s)=y2(6m/s)?
Please clarify these issues. ##

Thank you for this remark, the 2 parameters for both functions are determined independently and no continuity was imposed, other than including the 6 m/s value in both linear regressions. As you suggested, we computed the difference between y1 and y2 for a wind velocity of 6 m/s, and then plotted their difference for all periods on the Figure R1 below. As it can be seen the difference is minimal, in the order of 0.01 dB, and the 2 linear functions can be considered continuous.

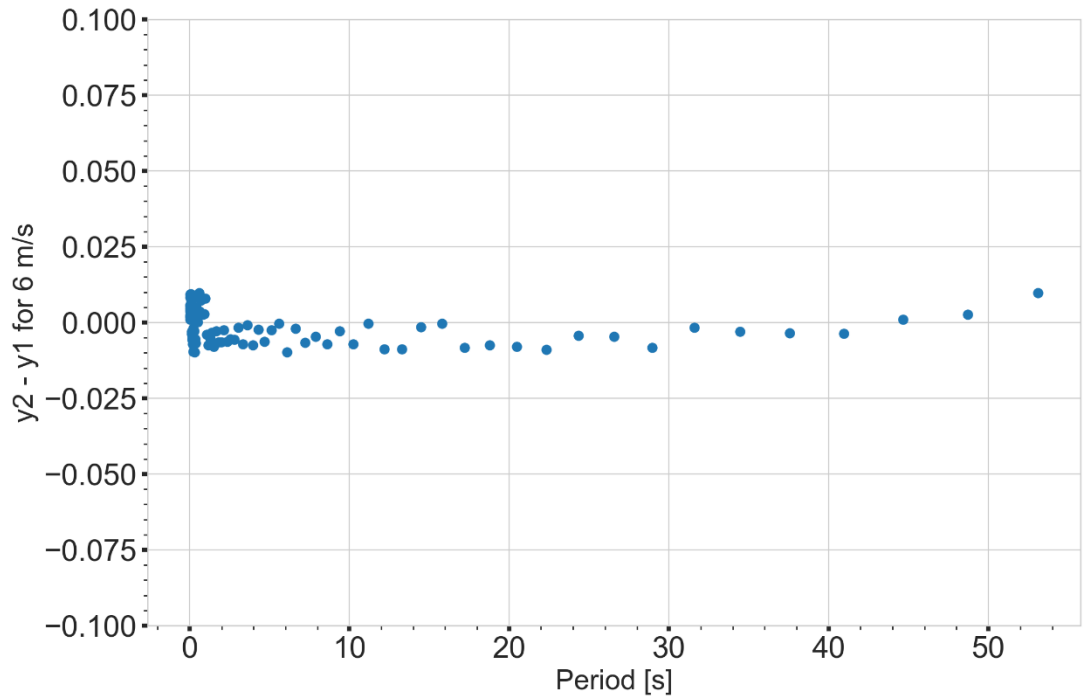

Figure 1: R1, the Y axis represents the difference between the noise amplitude predicted by the two linear relations, for a wind speed of 6 m/s, and is expressed in dB.

In addition, you state that the model is frequency dependent, yet, in the abstract you present values for the slopes in dB/m/s without any frequency context.

We adapted the abstract, the period was lacking indeed, thanks!

Also, I think it would be good to briefly state that the seismic power appears to scale to first order linearly with wind speed or something similar. In the current version, it sounds a bit that it would be a given that there is a linear relationship.
Finally, it is not clear to me, why the RMS amplitude of ground velocity calculated from the model increases exponentially with wind noise (Fig. 4b), whereas the acceleration PSD scales linearly with wind noise. Where does the exponential relationship come from?

The relation between wind speed and seismic *power* is linear, therefore the relation is exponential between wind speed and seismic *amplitude*. We added a sentence in the abstract too, to make sure those linear/power relationships are properly understood.

2. Presentation quality
Most importantly, the spectrograms and fonts of Fig. 6 are way too small and make the figure unreadable.

Thank you for this comment, indeed the fonts were still too small and to improve the readability of Figure 6, we removed the RMS for all stations except ELIS. The figure now focusses on the main information visible inside the spectrograms, which are now large enough.

In addition, the quality of the manuscript's text would greatly benefit from a thorough proofread. Many parts are written imprecisely and suffer from grammatical errors. Some sentences are hardly understandable, e.g. „The wind speed used in this study is the average of the maximum wind speed recorded by the AWS which is measured at 2 m height every 10 minutes and averaged for each hour of 2017." Please revise the text. ##

We also did a proofread of the manuscript and improved the discussion part were some sentences needed to be improved.

3. I still think it might be worth to show the icequake detection rate as a function of the wind speed. In their response letter, the authors present a similar figure, but both quantities as a function of time. To stress the point that less icequakes are detected at high wind speeds, it would be better to plot the icequake rate (y-axis) directly as a function of the wind speed (x-axis), independent of time. This would stress the point that wind puts a bias on icequake detections and would strengthen the results of the paper.

Indeed, thank you for this suggestion to add information about the relation between the seismic rate and the average wind speed, independent of time. We therefore added a Figure 5 b and a description showing the relation between the icequake rate (y-axis) and the wind speed (x-axis). This figure can be seen below (R2) and is added as Figure 5 b) in the final manuscript.

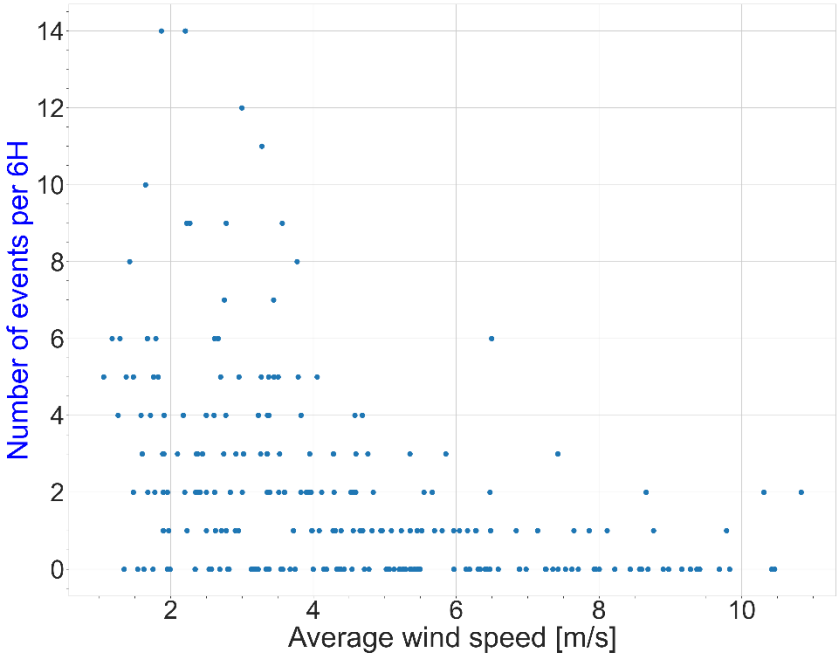

Figure 2 : R2

Other comments

- Introduction: give reference for the crevasse propagation velocity

I have added reference

- Sentences like „owned by ETH-Zurich“ and „map was drawn with QGIS“ should probably be moved to the acknowledgements section

I moved these sentences to the acknowledgements.

- The formatting of equation 1 and its explanation need to be reworked e.g. say „… where x is the wind speed ...“ instead of „x = wind speed“

I reviewed the Equation 1 formatting and its explanation below.

- In connection with Fig. 5, „cumulative“ number of icequakes is wrong, as it is actually an icequake rate

This is correct, I modified the text accordingly.

- „472 events were manually detected by Thierry Camelbeeck (Lombardi et al., 2019).“ It is not relevant here, who detected the events, delete!

I removed the irrelevant information.

- Fig3, caption: the last sentence does not make sense

I modified the Fig3 caption to make it clearer.

- I think the term spectrogram is not correct. You are calculating noise levels as a function of frequency and wind speed, but that‘s not really a spectrogram (nor a seismogram, which is also mentioned once in the text, I believe).

This is true, I replace « synthetic spectrogram » by « synthetic frequency and wind-speed dependent noise model »

- Table 1: the elevation of the automatic weather station is missing

This was indeed missing, I therefore added the elevation of the automatic weather station to the Table1

I hope these modifications will have improved the quality of our manuscript.

Kind regards,

Baptiste Frankinet