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Solid Earth Discussions

Interactive comment on "Event couple spectral ratio Q method for earthquake clusters: application to North-West Bohemia" *by* Marius Kriegerowski et al.

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Dear Mr. Fischer,

Thank you for valuable comments. We addressed all your suggestions in the text as well as below.

1. P3: the Method is described in a rather confusing way. Some examples: – t* in Eq(1) is different from t* in Eq(3). Instead t*ijshould be in Eq(1) and t* = t*i0 – t*i1 in Eq(3) – what do you mean by saying 'spectra S0 and S1 are similar' – I think they should be identical so that Eq(3) holds. To make it clear refer to 'below' where this is clarified -

there is a mistake in Eq(3): logarithm is missing in front of G0/G1
We apologize and improved the methodological section considering all suggestions. We moved the clarification on what 'equal' means with respect to the two spectra to an earlier paragraph.

2. Fig. 2: the hypocenters are not visible: what about plotting them in the upper layer?
Done.

3. P5/14: Please specify how are the upper frequency limits corrected to account for the Fresnel volume
We have added one short paragraph to specify the role of the Fresnel volume to limit the frequency content.

4. P5/23: The position of the blue points in Fig 3 is not clear; they do not appear to show the ray
We rewrote the caption of figure 3 to clarify the meaning of the blue points.

5. P7/3: Which three requirements do you have in mind? I have found only two in the preceding text
Corrected.

6. P8: Please explain the difference between synthetic traces in Figs 5, 6 and 7. It is not clear which source time functions were used to generate Fig. 5, 6 and 7. Were these magnitude-dependent in Fig. 7 only? And what about Green functions? To my understanding, the synthetic traces in Fig.5 are computed using 1D model, which means (to my understanding) that the source time functions have been convolved with the appropriate Green function. So what is the difference in data for Figs 5 and 7? Possibly only two instead of three figures are necessary here?
We now explicitly mention in the caption and text the source time function used to plot figure 5, 6 and 7. This implies that figure 7 differs from the previous ones in the usage of the magnitude dependent source time function.

7. There is no reference in the text for Fig. 9
We added a reference and text introducing that figure.

8. Fig. 10: The swarm locations shown on the map look rather scattered – are these indeed the HypoDD locations you have used for the analysis?
The shown hypocentres are the hypoDD relocated events. We improved the map in general and use smaller points now.

9. Fig. 11: How did you determine the incidence angles: from ray tracing or these are measured from the seismograms?
We used a 1D raytracing algorithm. We clarified this in the text.

10. P11/10: that larger -> that for larger
corrected.

11. P11/17: I think that the sentence “This trend is mostly dependent. . .” is not necessary
We didn’t remove this sentence as we think that this is a true feature. See reply no. 12.

12. Fig. 13: It would be more suitable to use a kilometer scale on this plot. Besides, the gap at 50.211 latitude appears enigmatic. I believe this plot should be station independent, because it shows coordinates of the events, so it should be visible at both the stations. Even if different events would be used at different stations, at least some indication of the gap should be visible also at LBC, provided there is some overlap between the event sets. Could you please show the vertical section of used relocations in order to identify the origin of the gap?
We use a kilometer scale now and modified the figure to show the contribution of deeper and shallower sources as a vertical section in the upper panels. The former latitude gap at station NKC was partially due to a plotting problem. However, some gap is still visible and resulting from the spatial non-homogeneous distribution of the deeper sources (Panel b)).

13. P12: I am not sure if only scattering is responsible for the reported waveform complexity at NKC. It could be caused by different effects. One of these could be the proximity to the nodal line, where the P-onsets are usually of emergent nature and later arrivals are more visible. The data shown however look quite impulsive, which could indicate that the two mechanisms have different nodal lines, which not close to the NKC projection. Another reason could be overlap of waveforms with opposite polarity, which makes the image more complex.
We actually consider different hypothesis to explain the complex signals at station NKC including scattering (P 13/13) but also focal mechanisms (P 13/5) and nodal lines (P 13/9). (Line numbers refer to the updated manuscript).

14. âĂć P13/6: Here it would be helpful to discuss more the different ray direction and coverage of the focal zone for NKC and LBC as visible in Fig. 2, which could affect different sensitivity of the stations to attenuation.
We extended the paragraph discussing the focal zone penetration with respect to Figure 2.

15. P14/1-8: It would be suitable to refer here to the study of Wcislo et al (2018) who obtained similar Qp and Qs using different method on the same data. Mentioning this in Conclusions is too late; BTW Conclusions usually do not contain citations.
We agree and now cite the work of Wcislo earlier in the discussion.

Best regards

Marius Kriegerowski and co-authors

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