Solid Earth
Discussions

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Interactive comment on "Monitoring induced distributed double-couple sources using Marchenko-based virtual receivers" *by* Joeri Brackenhoff et al.

Anonymous Referee #2

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The paper "Monitoring induced distributed double-couple sources using Marchenko-based virtual receivers" by Brackenhoff et al. proposes a method to create virtual receivers to monitor the response from subsurface sources. The paper is very well written and the underlying theory, which is mainly developed in a companion paper, is briefly laid out. The numerical examples using both synthetic and field data are well chosen and show nice applications of the proposed strategies. I appreciate that the authors make the source code available open source to reproduce the examples. I think this will be a nice paper that is relevant and interesting to the target audience.

The only major point that I find missing is a slightly more quantitative analysis of the

numerical results. You mainly focus on showing (normalized?) snapshots of the wave-fields and traces. For the synthetic tests, where you have the full modeled wavefield available, I would suggest to include plots of the differential wavefields as well as error plots. From the current figures I find it hard to judge the accuracy of the method.

I have a few more minor comments, which I list below. p.3, eq. (1): I was wondering if there is a particular reason for using a negative sign and the time derivative for the delta source?

p.3, l. 20: Typo: Missing closing parentheses .

p.4, Fig. 1: I know it is just a sketch, but I would recommend to add a colorbar for the velocities.

p. 5, l. 3: Instead of "We will not consider" I would rather say, "we will not describe / explain this method".

p. 5. l. 22: Typo: "an arbitrarily"

p. 5. l. 32: Instead of just "where functions" are available, I would explicitly mention what you are referring to. I assume Green's functions?

p. 6, Fig. 2: Is there a reason why you use the time-domain in the annotations, but the frequency domain in the representation in eq. (10)?

p. 6, l. 16: There is an extra space after reversal.

p. 9, Fig. 3: I am not sure if this figure is necessary. Is it just to show that the wavefields emitted by monopole and double-couple point sources are different? If you decide to keep the figure, I would suggest to at least change the caption and say "Sketch of the wavefields caused by . . ." instead of "Difference between".

p. 10, l. 5: No comma after superscript k.

p. 13, l. 16: Typo: "in" instead of "it".

p. 14, Fig. 5: I was wondering whether plotting the differential wavefield in (e) − (h) and in (i) − (l), respectively, would make it easier to see the differences? On a printout, the contrast between the wavefield and the background medium is pretty poor. Maybe they grayscale is not needed for the medium and/or you can plot the wavefield in color.

p. 15, Fig. 6: Please plot the errors between modelled and virtual receivers in addition to the absolute signals.

p. 16 l. 9 − 13: Could you comment to what extend the results are affected by the specific choice of the random scaling? For instance, would two seeds of random scaling factors still result in similar wavefields? As a related question: are you using the same seeds for the random amplitudes in Fig. 7 (e) − (h), and (i) − (l), respectively?

p. 18, l. 10 Could you please provide a few details, how the data was preprocessed?

p. 19/21, Fig. 9/10: The aspect ratio of the white box in Fig. 9(a) looks different than the zoom-in in Fig. 9(b) and Fig. 10.

p. 22, Fig. 11: Shouldn't the label in (e) be "Real line source" instead of "Virtual real source"?