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Solid Earth Discussions

Interactive comment on "Evaluating Seismic Beamforming Capabilities of Distributed Acoustic Sensing Arrays" *by* Martijn P. A. van den Ende and Jean-Paul Ampuero

Anonymous Referee #1

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This paper focuses on discussing the applicability of beamforming to DAS by comparing co-located seismometers in the Brady geothermal field. Authors showed different results from DAS array and seismometer array from one earthquake. Authors discussed the potential problems from the DAS strain rate measurements. Finally, the local heterogeneity could be the major source of this inaccuracy.

1. Line 53, please add the focal depth information. And why this earthquake?

2. Section 2.2, Any further explanation why chooses MUSIC. It's confusing that you describe a lot about classical beamforming approaches and then say you used MUSIC, with very less details to follow. Could you elaborate the MUSIC method here and why

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this is the choice here over classical beamforming.

3. Fig 3 shows P wave but why there are two arrivals (17.5s and 22.5s)? What's the phase of second arrival if it is not S wave? And please add a line to help show the arrival time difference across the array.

4. Followed by comment 3, From figure 3 the waveforms from Z-component are strong. Please add explanation why the beamforming results from Z component in the frequency band 0.5-1 Hz is not good. Is this because the wavelength is close to the scale of array?

5. Please clarify the time window length of data sections used for beamforming. Since you mention many scattered P waves, will different time windows improve the results, shorter window with fewer phases? For example, just choose a few seconds (4s maybe?) of recordings around the P-arrivals that only include the first arrivals.

6. figure 6 is hard to read (where is P and S?) and possibly misleading. According to the geometry of fiber, DAS data is strain rate recordings of many directions. Figure 6 shows horizontal seismic data from all azimuths. The polarity of S-wave could be flipped at each fibre corner. Could you try the image display instead of wiggles?

Line 134, "polarity flips are anticipated", I want to remind that this is true for shear waves, but may not true for other phases. This could be very important to correct for S wave before doing beamforming. This may be the reason of the diffusion of the focus in Figure 7.

I am curious whether a short "L" shape segment can be demonstrated.

Regarding to using long DAS array to locate the source, "the source localisation results will greatly benefit from the large lateral extent of the DAS arrays", I refer you to look at recent publication by Zhu and Stensrud ,2019 to backpropagate full waveform DAS data to locate the source.

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