

## ***Interactive comment on “Drill bit noise imaging without pilot trace, a near surface interferometry example” by Mehdi Asgharzadeh et al.***

**Anonymous Referee #1**

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Discussionl comments

The paper presents an interesting work on seismic while drilling using the drill bit source without rig pilot signal. In the absence of rig-pilot signal a conventional geophone is used for cross correlation of data recorded during drilling of wells. The obtained signals are good and promising for further investigations. However, I would like to ask some clarifications and additional comments.

Points for discussion are:

C1

1. There are works in literature on optimal focusing of drill bit signals only from geophone data to create a reference trace (for example as proposed by Haldorsen et al., 1995, Geophysics 60, 978-997). The approach followed by authors is different in my understanding as they use only one near-geophone reference trace. For completeness of the work authors should consider and comment also this approach.

2. Could you please specify better which type of bit is used in the experiments? I understand a Hammer bit with periodic hammering action (e.g., as in figure 3). Also roller bits have a percussive action. Please describe better.

3. Just a comment on the analogy with Vibroseis sweep. The vibroseis sweep typically is designed to contain, by definition and construction, ‘non repeatable’ components. In figure 3 you show a very repeatable in time hammering signal. So your statement at line 13 of page 2 seems not appropriate, even if the use is similar. May be after deconvolution. I suggest to rephrase in some way.

4. Comment for Figure 3a. I understand that this is correlation and stacking. However I see only causal signal parts (I suggest to specify the zero of cross-correlation time). So, may be I’m wrong, but I would interpret that this is correlation and stacking and also Deconvolution applied. Please specify better when you correlate, stack (I assume without shifts) and deconvolve the data in the example.

5. Again comment for Figure 3a. The data quality is good. However not clear the interval of stacking. Only few meters of bit descent, or all the data recorded along all the drilled interval? This is a very important information, because you can focus different events. Please introduce details.

6. In relation to previous comment, I’m wondering if you want to focus the rig as a source or focus the bit as a source (as I would understand from Fig 1). It strongly depends on stacking of stationary and non-stationary components, as chosen by you. Both can be valid, however please specify.

C2

7. In the work of Poletto et al. 2011 (“Drill-bit SWD and seismic interferometry for imaging around geothermal wells” SEG San Antonio Expanded Abstracts, 4319-4324), a similar approach and use of the drill bit source is shown (in this case with pilot data). However the main point is if the coverage illumination for stationary interferometry conditions is met. This, when you want to recover by interferometry stacking the surface related multiples to extend the illumination. In Poletto et al (2011) for example the extension is shown, with merging of conventional drill bit SWD and interferometric drill bit SWD data in a well experiment. However in this case the retrieval of the interferometric drill bit signal (only by stacking before migration) does not depend on the subsurface model (as was verified in this work as an approximation).

8. The stationary condition, indeed is not needed if you use the Cross-correlogram migration. However in this case you have to use a subsurface model. In this case, depending on the interferometric approach, you are dependent on the model estimation, unlike the virtual source. If you apply in complex areas this is something you try to recover, I would image. So, comments on these aspects should be given.

Apart from these discussion points, that I hope may help to improving the paper, the paper for me is interesting and presents good quality results that, however, in my opinion should be better explained.

My evaluation is moderate revision.

I think that after moderate revision with discussion and clarification of these aspects the paper can be accepted for publication.

Thanks and best regards, Reviewer

Please also note the supplement to this comment:

<https://www.solid-earth-discuss.net/se-2019-35/se-2019-35-RC1-supplement.pdf>

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Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2019-35>, 2019.