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

Anonymous Referee #2

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General comments: The paper describes a combined surface to drill hole seismic survey to compare a passive drill bit noise approach applying interferometry to convert geophones to virtual sources with a 3D seismic using an active source to image the subsurface. As a pilot signal for crosscorrelation and deconvolution of the data the nearest geophone trace to the drill hole was used. The drill bit noise imaging approaches are in general of great interest as a cost-efficient alternative method to active seismic experiments such as vertical seismic profiling. The paper describes concisely the theoretical background, the experiment set-up and the results. I missed a more detailed discussion of possible shortcomings, necessary preconditions for applications (data sampling resp. distribution and extension of receiver locations), limitations of this approach (drilling depth, drill bit type, geology, signal-to-noise ratio) and comparison

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with other drill bit noise experiments worldwide.

Specific comments: The chapter “Abstract” is sufficient and the main facts are described. In the following chapter “Introduction” the motivation for the research presented in this paper and the theoretical background of the interferometric approach are well explained. Advantages of the interferometric approach to get IVSP data are described in detail. “Passive seismic survey acquisition”: Which kind of weight drop source was applied for the survey (see also the suggestion about a table with technical details below)? “Analysis of seismic while drilling data”: On page 6 it’s mentioned that the application of interferometry to drill bit noise is a 2D process? Why, please explain. Regarding figure 4, please make a statement about the signal-to-noise ratio of the crosscorrelated and stacked traces vs. active source traces. I assume the seismograms are trace normalized. The shear waves of the correlated traces seems to be stronger than in the active seismic survey. What are possible reasons for this? “Interferometry and virtual source migration”: The migrated images of the virtual shots and the corresponding active seismic shots in figure 5 reveal different depths of reflections. What kind of velocity model was used to image the active seismic shots? What are the differences to the 3 layer velocity model used for imaging the virtual shots? The frequencies of the drill bit noise image is lower than that of the active shot image. Please make a statement on this and show average frequency spectrum for both images for comparison. This would allow the readers to get an impression on the resolution of both data sets. Does any of these reflectors are corresponds to the target reflectors mentioned in chapter introduction? “Summary and conclusions”: under point 3 of the summary it is mentioned that drilling deeper wells leads to a large signal-to noise ratio in the final image. I have some doubts in this general statement because on the one hand the number stacked events increase but on the other hand the signal to noise ratio of the drill bit events are getting lower because of the longer travel path of the waves.

Technical comments: A small table which summarizes technical information on the

sources, receivers, recording system, drilling equipment would be helpful.

Remarks to the chapters:

Remarks to the figures Figure 1: ok. Figure 2: Improve the readability of the location of the survey area in the map on the left side. Figure 3: Enlarge the screenshots or enlarge the scale in particular the time scale. Mark the ground roll events in the f-k diagram with an arrow instead of just with a line. Figure 4: Enlarge the screenshots or enlarge the scale in particular the time scale Figure 5: In c) and d) the labelling of the ordinate axes is missing.

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