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Interactive
comment

# *Interactive comment on* "Near surface structure of Sodankylä area in Finland, obtained by advanced method of passive seismic interferometry" *by* Nikita Afonin et al.

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I have gone through the entire pre-print. It is an interesting study and useful reference. It can be considered for publication, provided some areas can be improved. Please refer below for your consideration: The title of the paper highlights the 'advanced method', which is the SNRS algorithm to estimate the green's function from diffusive ambient noise field. However, the SNRS is just referred to the author's earlier paper, without any elaboration. This makes the title not reflects the content correspondingly. Since the SNRS algorithm is already published and discussed earlier, it is suggested to amend the title accordingly, either highlighting the case study, or the

attempts to characterize the noise field of the sites, etc. Section 4, several synthetic models are created to characterize the noise field of the site, taking into consideration of the nearby major activities. It is quite interesting and worth expanding. The assumptions of major sources need more explanation. The key message of creating the synthetic models are to support the claim that the noise field of site is diffusive. However, it is very common in elsewhere, too. Therefore, it would be better to draw some more novel conclusions from the synthetic models. Noted that each synthetic model is to simulate one type of sources. Would it better to create an overall model that combines all possible noise sources. If this one can be done, the authors may explore full waveform inversion of passive seismic waves. It is essential to beef up the field acquisition in more and clearer details, e.g., the field plan out, geophone type and corner frequency, sampling rate, source signature and location for active testing, etc. Figure 1 is not clear where are the blue/black lines. It is also difficult for the readers who are not familiar with Finland geology without necessary introduction. The quality of Figure 2 needs to be improved to meet the criteria of publication. It is not clear about the caption of Figure 5 (a) that what is the distance of 2000m referring to. Figure 5(b) horizontal axis and color bar scale seem not correct, if it is a dispersion image. Figure 6 (b) and 6 (c) are very interesting. It is worth expanding the explanation why these 2 directions are so different, whereby 6(b) can't see surface wave and 6 (c) can see surface wave clearly. Figure 7 shows the source is mainly in 10-40 Hz, which is quite high. Please explain how such high frequency source can illuminate to 300m below ground. Figure 11 (a), the 2D profile needs to be further tuned to avoid abrupt change in Vs. Figure 12, the data quality of the real data is not good, even though it is acquired in a quiet environment. The green's function is really quite contaminated; therefore, the dispersion image is not clear. Nevertheless, understand the green's function is retrieved from the SNRS algorithm. It would be interesting to compare the green's function and dispersion image retrieved by conventional method. From there, readers would have a more explicit sense of the advantage of SNRS, if any. Figure 13, there are some differences of the results from the proposed method and the conventional active method.

Which one would be closer to real situation? A more discussion would be expected. Same comments to Figure 12 applies for Figure 16. Figure 17, is it have an figure or table to validate or compare with the 2D profile with existing wells?

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