

Interactive comment on “Revealing the deeper structure of the end-glacial Pärvie fault system in northern Sweden by seismic reflection profiling” by O. Ahmadi et al.

Anonymous Referee #1

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Review of “Revealing the deeper structure of the end-glacial Pärvie fault system in northern Sweden by seismic reflection profiling” by Ahmadi, Juhlin, Ask, and Lund

The paper presents new results regarding imaging the deep geometry of crustal faults related to end-glacial faulting. This imaging is important for understanding the faulting processes and it is critical for future studies involving e.g. drilling. The onshore reflection seismic profiling is state-of-the-art and of high quality. The processing of the data is challenging and very critical for the imaging of the fault zones. The paper will be interesting to readers who focus on reflection seismic imaging or on post glacial rebound and faulting. Illustrations are generally of high quality and they are all needed.

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Points regarding the imaging of the faults:

Some more details regarding the recording geometry and choice of NMO velocity should be given. Moreover, more arguments for choosing the very high NMO velocity of 13000 m/s should be presented. The exact choice of stacking velocity should have a major impact on the strength of the fault reflections.

In Figure 5, R1 is very strong compared to R3. Does a different choice of NMO velocity result in stronger R3 reflectivity compared to R1?

Will a reduced NMO velocity (e.g. 6000 m/s) result in better imaging of sub-horizontal reflectivity in the crust? Imaging of sub-horizontal reflections would potentially allow for estimation of vertical throw across the fault zone, depending of course on the vertical resolution. These aspects should be tested and discussed.

The authors suppress frequencies below 15 Hz during their processing of the data? Why? Other studies (in particular in areas with sedimentary covers) indicate that frequencies of 8-10 Hz propagate over large distances in the crystalline crust and carry much information. Does the low-frequency part of the data not carry any information of importance for the fault imaging?

Other points:

With reference to other studies, it is argued that the Pärvie fault system is related to last glaciation of the area. Is there any evidence (e.g. in the new data) that the fault system was active also during previous events?

A brief mentioning of the amount of post glacial rebound of the studied region is in my opinion needed in the introductory part of the manuscript.

The last 7 lines of the Introduction sound more like conclusions. These lines should be re-formulated or moved to a different part of the manuscript.

On lines 3-5 on page 540 (and in other places), I would write: “deeper-lying” instead

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of “deeper lying”, “east-dipping” instead of “east dipping”, and “west-dipping” instead of “west dipping”.

It is not clear whether or not Figures 5 and 7 are plotted with the same horizontal axis. These two figures should be plotted with the same horizontal axis to allow for direct comparison.

Interactive comment on Solid Earth Discuss., 7, 537, 2015.