

Interactive comment on “ Post-glacial reactivation of the Bollnäs fault, central Sweden” by A. Malehmir et al.

A. Malehmir et al.

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Referee #2: The authors present a new, highly interdisciplinary geophysical data set collected across the Bollnäs Fault. Thus, the study is highly multidisciplinary. This is an important strength of the acquired data set and the study. The study does present new, important geophysical models important for our understanding of the fault's geometry and evolution. However, the excellent data set has not been used to its full potential. I therefore recommend moderate to major revision of the paper.

[Authors' comments:] We thank the referee for the comments and have aimed to address as many as provided here and those extensive ones from referee #2. We think the manuscript is now in much better shape and has a coherency towards the message we wanted to deliver. We did not want to get into the details of each separate method to avoid making this a lengthy paper and distractive to follow.

Referee #2: Main comment: The different methods and their resolution should be discussed and compared more thoroughly. For example, the bulk part of the seismic rays used in the tomography probably travel more or less horizontally through the fault area providing good vertical resolution but only little lateral resolution. Contrary to this, the potential field data may be more sensitive to lateral variation. Depending on the electrode configuration, the geoelectrical measurements may have different sensitivity with respect to vertical and lateral resistivity changes. For the used geoelectrical gradient-array, how is the balance between lateral and vertical resolution? Thus, the resolution and strength and weaknesses of the different methods should be compared and discussed more thoroughly, and the interpretations of fault geometry and evolution should be discussed in the light of this. Such improved and critical model evaluation and discussions would constitute an important improvement of the paper.

[Authors' comments:] Followed to a great extent by 2D modeling and resolution tests of some of the methods. The revised manuscript contains also a section about this.

Referee #2: Other comments: The authors should be more precise with regard to description of the influence of the inclination on the magnetic anomaly. Exactly how is the magnetic field oriented in the area, and what are the effects of this orientation?

[Authors' comments:] Followed. We thought they were included. The magnetic field vector is nearly vertical thus not so much influencing the anomaly shape and location. This is more evident in the modeling test performed in the revised version.

Referee #2: Implications with relation to natural hazards are mentioned already in the introduction of the paper. They should be elaborated on and detailed in the discussion part of the paper.

[Authors' comments:] We aim at avoiding this and leave the implications to the readers. We have been careful to not speculate so much given the so many uncertainties in the data. It is however clear that there is a fault associated with the scarp and that this must be noted. Further implication is provided.

Referee #2: Figure 6: The offset scale should be linear. In the present format it is difficult to assess and compare apparent velocities.

[Authors' comments:] This is not an easy issue. We can make this linear but then we have to stretch the traces to accommodate for the long offsets of the wireless recorders. This was the main reason to write the velocities on the first breaks. This tested but not followed.

Referee #2: What are the main simplifications if the underlying model used to estimate earthquake strength?

[Authors' comments:] We have mentioned all the assumptions used to calculate the magnitude. One simplification is that the formula is empirical and may not be relevant for intraplate earthquakes.

Others are the assumptions we make about the rheology and geometry of the Bollnäs fault.

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Referee #2: The “Future Studies” section is too extensive. Note only briefly one or two experiments that you could conduct to test the hypothesis/interpretation presented here.
[Authors’ comments:] Followed and shortened to some extent.