

Interactive comment on “Seismic imaging in the eastern Scandinavian Caledonides: siting the 2.5 km deep COSC-2 borehole, central Sweden” by C. Juhlin et al.

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We thank the reviewers for their comments on the manuscript. Concerning the comments from reviewer #1 we agree that there could be more discussion. However, the main focus of the paper has been to present new geophysical data and to justify the need to drill. We expect a number of followup papers after publication that deal with the more geological oriented questions raised by reviewer #1. In particular the idea of the basement reflectivity being related to the opening of the lapetus ocean. We also appreciate the comment concerning the need for greater clarification of the two different major thrust zones (the Caledonian sole thrust and the Jämtlandian décollement). Ambiguity in a previous paper (Hedin et al 2012) has been removed from the presently

C1

revised manuscript, which is based on substantially more geophysical data.

Please find the fully annotated version of the revised manuscript as a supplement to this comment.

Comment 1: We agree with reviewer 1 that the option for the deformation pattern seen below the Jämtlandian décollement is likely a combination of Caledonian and pre-Caledonian. We have added the following sentences beginning at line 14 on page 23 in the original MS.

"Additional evidence for some Caledonian deformation is found where reflections present below the interpreted Jämtlandian detachment appear to continue through it and offset the interpreted alum shales. Perhaps the best example of this is between CDPs 2600 and 2800 (Fig. 6) where the "double reflection" may offset the detachment and appears to have disturbed the overlying alum shales."

Comment 2: At present we cannot say whether the Olden-Oviksfjällen (O-O) antiform is thrust above or below the Jämtlandian décollement (JD). Based on the seismic data and correlation with the CSP it is most likely thrust over the JD. The exposure on the antiform is rather poor, but quartzites have been identified along with more mafic rocks. The contrast between these could generate reflections. However, the pronounced reflectivity below the JD is interpreted to originate from magnetic basement (magnetite bearing granitoids). Therefore, the only way to investigate the nature of the basement reflectivity is to drill it. We have added the following sentences beginning at line 21 on page 19 in the original MS.

"Furthermore, the Oviksfjällen and Olden antiforms do not have a strong magnetic signature. The depth extent of the basement reflectivity is on the order of 10 km and presumably originates in magnetic basement, therefore, it is not clear how these antiforms can be linked to the origin of the basement reflections."

Comment Seve Nappe reflectivity: In the paper by Hedin et al. (2016,

C2

www.sciencedirect.com/science/article/pii/S0040195115006769) the Seve Nappe reflectivity is discussed in the detail. In this paper, the reflective nature of the nappe is attributed to the contrast between amphibolite and gneiss, the main lithologies drilled to 1700 m in the 2.5 km deep COSC-1 borehole. This reflective pattern is quite different from what we observe in the interpreted basement further east. Therefore, we cannot use the results from the COSC-1 borehole to directly interpret any of the distinct basement reflections we see east of CDP 1200. We have added the following sentences beginning at line 5 on page 11 in the original MS.

"Results from the 2.5 km deep COSC-1 borehole show that the reflectivity of the Seve Nappe Complex is due to the contrast between the high metamorphic grade gneisses and amphibolites (Hedin et al., 2016). Some of the reflections originating from below the bottom of the borehole, interpreted not to be part of the Seve Nappe Complex, can be traced towards the east, but do not extend to the surface."

Minor comments:

Page 17: Line 11: ...some OF which...?

Fixed

Page 21: Line 26:...is present in A klippen?

Fixed

Fig 7: Total magnetic field 'anomaly'? With values of 50000nT I think is not an anomaly but the total magnetic field. Also, is this data reduced to the pole?

Data were not reduced to the pole since this is generally not necessary at high latitudes. The map represents the total magnetic field with variations in it. We refer to these variations as anomalies.

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/se-2015-129/se-2015-129-AC1-supplement.pdf>

C3

Interactive comment on Solid Earth Discuss., doi:10.5194/se-2015-129, 2016.