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Interactive comment on "Structure of Suasselkä Postglacial Fault in northern Finland obtained by analysis of local events and ambient seismic noise" *by* Nikita Afonin et al.

Nikita Afonin et al.

elena.kozlovskaya@oulu.fi

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Interactive comment on "Structure of Suasselkä Postglacial Fault in northern Finland obtained by analysis of local events and ambient seismic noise" by Nikita Afonin et al. Dr. Malehmir alireza.malehmir@geo.uu.se Received and published: 22 July 2016

Dear authors: I went quickly through this discussion article and would like to raise a few minor comments: You write: "The length of the PGFs may vary from 2 to 150 km and the maximum height of the fault scarps from 1 to 12 m, yet in the extreme cases up to 30 m (see compilation in Olesen et al., 2004)." The paper by Olesen et al. (2004) likely does not include the most recent PGFs reported by Mikko et al.; Smith et al. and Malehmir et al. from central part of Sweden among others and this could be included

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Discussion paper

and mentioned that these faults are no longerrinter-friendly version confined to only northern parts of the northern countries as previously thought to. However, they may not be active like others in the north and in your case.

Reply: We are thankful for Dr. Malehmir for his notice about new relevant studies. Publication Mikko et al.; Smith et al. and Malehmir et al added to references list. Corresponding text added to the Introduction part.

You write: "That is why the most plausible explanation is that the low velocity area is a fractured zone inside the fault that can correspond to the fault damage zone (FDZ)." Multi-phase deformation zones are likely responsible for the location of most of PGFs. See the recent study by Malehmir et al. (the same journal) and how they conclude an existing and earlier structure was responsible for the Bollnäs PGF and the complexity of the situation. A major low-velocity zone was also observed there to an extent that delineation of a fresh bedrock movement was impossible to observe (highly fractured and crushed rocks).

Reply: We agree with Dr. Malehmir, but we also would like to notice that the low-velocity zone responsible for Bollnäs PGF and revealed by the high-resolution geophysical study in Malehmir et al. is of smaller scale than the area considered in our study. The former can be attributed rather to the fault core. In our study we obtained integrated characteristic of the area that most probably contains not only the fault core, but also the fractured area around the core. Fault growth commonly produces a fault core composed of slip surfaces and comminuted rock material, and also a broader volume of distributed deformation called the damage zone.

There are also typos in the text here is an example I spotted: The velocity boundary at a depth of about 1200 km is seen in both velocity models obtained from average dispersion curves for Group 1 and Group 2. I guess this meant 1200 m!

Reply: Typos in the text were corrected and references are added to the list and referred to in the text.

Suggested refs: Brandes, C., Winsemann, J., Roskosch, J., Meinsen, J., Tanner, D.C., Frechen, M., Steffen, H., and Wu, P.: Activity of the Osning thrust during the late Weichselian: Ice-sheet and lithosphere interactions, Quaternary Sci. Rev., 38, 49–62, doi:10.1016/j.quascirev.2012.01.021, 2012. Malehmir, A., Andersson, M., Mehta, S., Brodic, B., Munier, R., Place, J., Maries, G., Smith, C., Kamm, J., Bastani, M., Mikko, H., and Lund, B., 2016. Post-glacial reactivation of the Bollnäs fault, central Sweden - a multidisciplinary geophysical investigation. Solid Earth, 7, 509–527. Mikko, H., Smith, C. A, Lund, B., Ask, M., and Munier, R.: LiDAR-derived inventory of 25 post-glacial fault scarps in Sweden, J. Geol. Soc. Sweden, 137, 334–338, doi:10.1080/11035897.2015.1036360, 2015. Smith, C., Sundh, M., and Mikko, H.: Surficial geologic evidence for early Holocenenter-friendly version faulting and seismicity, Int. J. Earth Sci., 103, 1711–1724, 2014.

Reply: The references are added. Best regards, Alireza Malehmir

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