Interactive comment on "Migration of Reflector Orientation Attributes in Deep Seismic Profiles: Evidence for Decoupling of the Yilgarn Craton Lower Crust" *by* Andrew J. Calvert and Michael P. Doublier

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The authors present an interesting concept on how additional information on reflector orientation may be obtained by taking advantage of crooked line acquisition geometry. The fact that the methodology is automated makes the methodology highly relevant for being employed on an "industrial" scale. This is in contrast to a recent paper that was just accepted in Solid Earth in which the crossdip estimation is manual. The authors may want to reference this paper:

se-2018-120: The crossdip correction as a tool to improve imaging of crooked line seismic data: A case study from the post-glacial Burträsk fault, Sweden, Ruth A. Beckel and Christopher Juhlin

It would be interesting to hear the views of the authors concerning other advantages of their method compared to the "classic" cross-dip correction.

Some other comments:

1. It would be useful to see a geometry plot of the crooked line with examples where the source-receiver azimuths are sufficient for accurate estimation of reflector strike and where they are insufficient.

2. The interpretation presented seems reasonable. However, I wonder if there are more reflections in Figure 4 that can be interpreted as originating from mafic sheets in a granitic host rock. For example, the opposite dipping reflection intersecting the R1 reflection at point "T" could represent what was once a near-vertical feeder dike that has been deformed. The entire area may have been intruded by a generation of horizontal and vertical mafic sheets that were later deformed. This would be a similar situation as we may have in the more modern Scandinavian Caledonides. See

Juhlin et al., 2016. Seismic imaging in the eastern Scandinavian Caledonides: siting the 2.5 km deep COSC-2 borehole, central Sweden. Solid Earth, 7, 769–787.

3. The authors mention 3D pre-stack migration as an option, but discount it based on the assumption that the data are too sparse. Another option would be to perform 3D binning and process to stack to map the orientation of some reflections. Was this tried? The paper below shows a successful example in locating an off-profile diffractor:

Malehmir, A., Schmelzbach, C., Bongajum, E., Bellefleur, G., Juhlin, C., and Tryggvason, A., 2009. 3D constraints on a possible deep >2.5 km massive sulphide mineralization from 2D crooked-line seismic reflection data in the Kristineberg mining area, northern Sweden. Tectonophysics, 479, 223–240.

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