

Solid Earth Discuss., editor comment EC1  
<https://doi.org/10.5194/se-2021-143-EC1>, 2022  
© Author(s) 2022. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## Editor Comment on se-2021-143

Michal Malinowski (Editor)

---

Editor comment on "Angle-domain common-image gathers from Fresnel volume migration" by Tomi Jusri et al., Solid Earth Discuss.,  
<https://doi.org/10.5194/se-2021-143-EC1>, 2022

---

Dear Authors,

I had now a closer look at your responses to reviewers' comments. I also went through the manuscript and the reviewers' comments again. My general observation is that the real data example from a hardrock site is too much of a jump from the synthetic example presented. I don't agree with your reasoning that since the velocities are not much differentiated in crystalline rocks, therefore your simple 2-layer model is a sufficient justification. There are other challenges, including steeply dipping reflectors, complex wave interference and scattering. A more complex synthetic example can help you in explaining the benefits of FVM vs KPSDM for AVA, as noted by Reviewer 1:

"The problem is not the method but the simplistic model, which excludes the potential interference of smeared migration artifacts on AVA data. The impact of such interference on AVA curves (which should be more significant for KPSDM) can only be demonstrated by using a slightly more complex model with several geological layers. Such an example is necessary to show how FVM can help and improve AVA analysis".

In other words, the synthetic data need to have some degree of migration noise from layers interfering with the amplitudes of reflections from the shallower layer(s). Therefore, I insist on making another synthetic example with more layers and/or complex structure (dipping reflector, wedge) to better illustrate the above issue.

Another thing is the real data example. It is not very meaningful as it stands right now. It is just illustrating that the common-angle stacks from FVM are less noisy as compared to KPSDM (Isn't it a general property of FVM as compared to KPSDM, something you will observe also for offset gathers). Getting from there to the quantitative interpretation is a long way ahead (primarily because of the amplitude handling during processing and scarcity of the wireline logs).

Reviewer 1 was also advocating for "A field example from a less complex geological environment with supporting petrophysics (i.e. wireline logs for quantitative analysis)". I agree with this comment – if only you can have such an example, it would be much more beneficial for demonstrating the perspectives of your method for QI (which is the ultimate goal of developing your method, anyway). Going one step further from your AVA gathers / stacks to either reflectivity inversion or impedance inversion would be a great benchmark for your method (confronted and calibrated with the borehole data). And you can use

standard industry tools for this step.

I understand that the new real data example might be more challenging, as it depends on the data you have. Therefore, to sum up: in my opinion, a more complex synthetic model example is a must. New real data example – depending on whether you can find a suitable target for your analysis. Definitely, it will strengthen your manuscript.

Best regards,

Editor