

Solid Earth Discuss., referee comment RC2
<https://doi.org/10.5194/se-2021-143-RC2>, 2022
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Comment on se-2021-143

Anonymous Referee #2

Referee 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-RC2>, 2022

Dear authors,

This manuscript considers the method of extracting the angle domain common image gather (ADCIG) and common angle stack (CAS) from Fresnel volume migration (FVM), where beside the kinematic properties of the migration image the focus is on improving the accuracy of the dynamic properties. The performance of the proposed method is investigated in amplitude versus angle (AVA) analysis. The manuscript is well written, organized satisfactorily and the idea is promising.

Main comments:

- Fresnel volume migration is a well-developed method to modify the Kirchhoff pre-stack depth migration to eliminate the artifacts. On the other hand, the ADCIGs are the most precise gathers suggested as a solution for multi pathing, which are used for velocity and AVA analysis. There are some nice studies which show the superior performance of ADCIGs in imaging where the velocity model has complex structure. Actually in front of complex geology, the single ray path assumption is violated and the multi-pathing occurs. In these situations the role of ADCIGs which uniquely define ray path based on their opening angle not their offset, becomes important. Therefore to show the predominance of ADCIG, authors need to use some geologically complex synthetic model, for example a model with some low velocity inclusion, or some benchmark model likes Marmousi to verify the dominant performance of ADCIGs constructed during FVM.
- To augment the manuscript to become easier to follow for the reader, I advise to add more explanation about the theory and the performance of FVM and ADCIG with some supporting figures in the theory section.
- In figures 1 and 4, and in all basemaps the horizontal label Y is meaning less and is introduced after using. Also in figure 11, it changed to X. So I advise to unify them and change it to distance, maybe become more sensible.

Minor comments:

Increase the X and Y axis ticks and labels in figures 6, 7, 11. It is difficult to read them now.

Line 68: Introduce the x' after equation 5 too.

Line 78: Using the "noise-free" is an exaggerating phrase here, because beside the KPSDM result, it is a clear image but not generally free of any artifacts.

Line 89 and 91: It is better to change one of the names for scattering azimuth angle or illumination azimuth angle, because their symbols in figure 2 are hardly distinguishable.

Figure 8: There isn't any red circle in the figure which is introduced in the caption.

Based on supplying a synthetic example which the single path is violated on, I recommend a major revision.