

Dear anonymous reviewer,

Thank you very much for the valuable comments. We will consider them in our final version. Please find our detailed answers to your comments below.

- Section 3
 - It is better to show the day of data acquisition because its timing is discussed in Section 5. It would be easier for the reader to understand and evaluate the results in this manuscript.

We assume your comment refers to the legend of Fig. 1? We have considered this suggestion in the final version of this figure.

- Section 3, line 169
 - It is not clear what the author trying to describe by “Geophones at the surface of the glacier complemented the measurement setup.”. It would be better to mention the purpose of geophone and their usage in this study (included in the inversion?).

Agreed. We have added additional details to make it more obvious that these geophone lines between the source and the two receiver boreholes are also included in the inversion for an enhanced ray coverage:

“Geophones, equally spaced at 1m between the source and receiver boreholes, were placed at the surface of the glacier. These additional receivers further increase the azimuthal resolution of the tomographic experiment. The enhanced ray coverage in the area of investigation reduces the ambiguities between model parameters.”

- Section 4, lines 252 – 254
 - It is difficult to understand which part of Fig. 7b is mentioned in this sentence. It would be better if the author describes the more detail of the figure and explain which part is polynomial coefficients one through 4th degree. Also, it is difficult to see which parts are a value > 0.99 since the color bar is monotone above the value > 0.2 .

We have rephrased the respective sentences, and added additionally: “For the borehole inversion parameters, the relationship between estimated and true parameters is much stronger, especially for the polynomial coefficients of degree one and two. As shown in Fig. 7b, the third and fourth element of each set of borehole coefficients representing degree one and two, show high values > 0.99 . Therefore, these coefficients are well resolved in the inversion.”

In conjunction with a comment of the other reviewer, the colour bar has been refined.

- Sections 4 and 5
 - Although the number of polynomials in the inversion is discussed in 6.2, the author does not show the value in their application to synthetic and field data. Its value is important for anisotropic effect according to 6.2. Please include the number of polynomials that are used for inversions in the manuscript.

We have added the respective numbers for the synthetic data (“Each borehole is approximated by a set of two mutually perpendicular polynomials of degree four.”) and an additional table showing the number of coefficients for both polynomials of each borehole used for the field data (polynomials of degree 3-5).

- Section 5, line 304
 - This sentence explains that the author used two starting models for trajectory inversion. However, the result of interpolated trajectory case (second starting model) is already described in Fig.8b in line 289. It is easier for a reader to understand if the prerequisite is described before or just after its results are shown.

In our revised version, we have rearranged the respective lines and provide the information, where considered the first time.

- Section 5, line 305
 - According to the caption of Figure 8b, it is the result of using interpolated trajectories as an initial model. However, this sentence says that Figure 8b is the result using vertical boreholes as a starting model. It is inconsistent. The results of using vertical wells as an initial model are not shown in this manuscript. Please add the results.

We add a Fig 8c showing the results of the inversion with initially vertical boreholes. In this context, we have revised the caption of Fig. 8 and add the correct references in line 305.

- Section 6.1 line338
 - “lower that” should be “lower than”.

Thank you, we corrected this typo.

- Figures 3, 4, 8 (a)
 - Legends in this figure are confusing since these are velocity inversion results without coordinates updated. The expression “updated coordinates” seems not right.

Indeed, the wording is inconvenient here. We have considered this point during the revisions.

- Figures 3, 4, 5
 - It seems black asterisks and triangles in Figures 3 to 5 are coordinates for geophones. Please describe what “start coordinates” in the legends mean. The term “start coordinates” is also used in Figure 6, but it seems different from figures 3 to 5.

We have considered these points in our reviewed version.

Kind regards,

Sebastian Hellmann and Hansruedi Maurer
(on behalf of the co-authors)