

## Author response for manuscript tc-2021-358

We thank the reviewers for their in-depth reviews of the manuscript. Responses to their reviews and the proposed changes based on their suggestions are listed in detail in Author Comments:

- <https://doi.org/10.5194/tc-2021-358-AC1>
- <https://doi.org/10.5194/tc-2021-358-AC2>

Furthermore, we would like to propose the following changes (additions highlighted in blue):

- Add a phrase to the abstract: "In the VV polarization, we obtained ... at X-band, **assuming an optically thick medium**". This is in order to reflect the expanded snow modeling considerations based on inputs from Reviewer 1.
- In section 2.3.3, we propose to expand the explanation of the likely cause of temporal deviations: "The deviations might originate from bright azimuth or range-ambiguities or areas affected by sidelobes of layover" → "**The deviations might partially originate from bright azimuth ambiguities. We also believe that double-reflections occurring within layover, with a reflection on each side of a north-south oriented valley and an additional propagation path between the two reflections, cause further radar echos appearing beyond the layover area. These artifacts appear stronger at HH than at VV (due to reflections close to the Brewster-angle) and are also stronger with wet snow due to more specular reflection compared to dry snow or summer with more diffuse reflections...**"
- In section 2.2.1, we propose to add at the end of the second paragraph a note describing our recent measurements from March 2022 in the region of interest: "**At the beginning of March 2022, we measured snow temperatures of  $-12 \pm 3$  °C in the upper two meters and  $-4 \pm 1$  °C at -5 m at 3640 m altitude (46.5515°N, 8.0062°E). Both Bannwart's firn cores as well as our snow pit measurements indicate the presence of a few cm thick ice layer resulting from melt and refreeze during previous summers below the several meter thick seasonal snow cover.**"

The submitted revised version incorporates all these changes, as well as minor edits to improve the readability and clarity of the manuscript.