

## REVIEW OF REVISED MANUSCRIPT TC-2023-19: SEISMIC ATTENUATION IN ANTARCTIC FIRN

The author have made a considerable effort to address the comments of the reviewers. A discussion section has been added, the introduction and the results sections have been extended, new figures were added and existing figures were enhanced. The new figures show additional information on the data used to calculate the attenuation of the firn under observation and to illustrate the influence of the firn layer with its high attenuation on AVO analyses of glacier bed properties. In Figure 14 the density of the firn was added as an alternative axis making it possible to compare the results with porosity based Biot models of snow or firn.

In the introduction and discussion section the authors explain the consequences and benefits of the new findings on the investigation of glacier beds with seismic methods: “Studying the structure of polar ice sheets and basal materials is essential for modeling the response of ice masses to climate change. ... The mechanisms of basal movement of glaciers strongly influence the mass balance of Antarctica and are poorly understood. ... Seismic methods are the only way to map the properties of the glacier beds over large areas.”

The study shows a novel approach to interpret and explain the observed seismic wave attenuation in firn. The approach is based on a physical model that uses parameters that can be measured on firn samples in the laboratory by means completely independent from the use of seismic waves. In consequence, the model allows to interconnect seismic experiments with mechanical laboratory analyses of firn samples collected on the study site, allowing for both, calibration of the seismic experiment and inversion for firn properties.

As stated in my previous report, I value the manuscript as innovative, technically sound and important. The revision of the manuscript has further clarified the methods applied, the results obtained and the context which the results impact. I therefore recommend to accept the manuscript in its actual form.

### 1. TECHNICAL CORRECTIONS

#### Technical corrections:

- Line 43: "... not the case for polar firn."
- Line 44: "... about  $Q_p = 715$  at ..."
- Line 169: "... method is only applicable ..."