Dear Sridhar Anandakrishnan,

Thank you very much for your very motivating and positive comment. In the following, we include your comments in italic followed by our answers in normal font.

*This is an excellent paper ready for publication. The results are new and important. The writing is clear and elegant. The figures are well-drafted and complete.*

*When working with ice core crystal orientation fabric, there are three paths: the crystallographic/mineralogic where you examine thin sections under polarized light; the geophysical, where you study the speed of seismic waves at various angles; and the numerical, where you estimate the aggregate behavior of a collection of crystals from the behavior of a each single crystal combined in the aggregate. Most researchers focus on one or the other; these authors have tackled all three successfully. They have combined the classic and never-improved-upon work of Bennett (1968) with modern methods of estimating aggreagate behavior. They have gone one better, by including the effect of voids by analyzing the bulk structure using x-ray imaging.*

*The seismic profiling was conducted at 1MHz (wavelength smaller than individual crystals) and found good agreement between their estimates from the model and the measurements. They note that while one can validate COF measurements from the ultrasound data, it is difficult to use the ultrasound data to infer COF - the density of raypaths needed is impractical. I note that previous work (Bennett, in particular) used a much simplified model for aggregation (cones of various sizes and directions). A comparison of the error from the Bennett method and this more-complete method would be illuminating. In particular, if the Bennett method isn't grossly inaccurate, then fewer ultrasonic raypaths would be needed to solve for the fabric. That could be a starting point to an improved, more-correct solution.*

*2nd, the scaling from 1MHz to 100Hz (mm wavelength vs 10s of m) should be briefly addressed - what level of detail is needed in the model when we are collecting data using explosive or vibroseis seismic data in the field? There is no point in me belaboring the point - I liked it. People should just read the paper.*

In our paper, we could only investigate two of the three fields. The geophysical application towards surface or borehole seismic applications is still in progress. The modelling approach does not consider the frequency of the seismic waves and is a more general model to calculate seismic velocities from a given elasticity tensor.

In our outlook, we propose that ultrasonics can fill the gap between COF-measurement and surface/borehole seismics but at the current stage, we only have some first ideas how to upscale these measurement results to surface/borehole seismic measurements. One of the remaining issues is the frequency shift (MHz->kHz) that plays an important role when comparing ultrasonic and in-situ seismic data. We hope, that some additional investigations can contribute in the future.

Kind regards,

Sebastian Hellmann
on behalf of the Co-Authors