The Cryosphere Discussions

The Cryosphere Discuss., community comment CC1
https://doi.org/10.5194/tc-2021-7-CC1, 2021

Comment on tc-2021-7

David Prior

Community comment on "Acoustic velocity measurements for detecting the crystal orientation fabrics of a temperate ice core" by Sebastian Hellmann et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-7-CC1, 2021

Some comments from Dave Prior, University of Otago on: "Acoustic velocity measurements for detecting the crystal orientation fabrics of a temperate ice core" by Sebastian Hellmann et al.

Hi Sebastian. Interesting paper. I have a few comments - sorry read the paper about 6 weeks ago and then ran out of time to post comments. These done in a rush to meet discussion deadline - so hope they make sense.

Your lab measurements in fig 4 have a sinusoidal variation with a peak to peak separation of about 90 degrees. This pattern is there at 22 and 33m in the COF calculated Vp pattern, but not really at 2, 45 and 65m. The measurements at and calculations at 33m appear to be phase shifted by ~ 30 degrees. This makes me wonder whether your core cross section is a circle or something else. An eccentric shape (circle flattened in orthogonal directions towards a square shape) would give this pattern. 1mm of eccentricity would give ~74m/s variation in velocity if diameter were always assumed to be the same (at 68mm).

I'm not sure what would cause an eccentric shape- an elliptical shape would be easier to understand (relaxation?)- whatever some clarity as to whether your cross sections are actually circular would be important.

In our work on mechanically recovered cores we have found that the diameter is not constant for different azimuths at a single depth. I do not have enough data to say what the pattern is (if there is a consistent pattern) but we have two solutions. One student measured the diameter corresponding to each particular azimuth individually. This is very time intensive and I don't recommend it. In more recent work we have machined the samples on a lathe to get a diameter that is constant (with azimuth at a single depth) with a tolerance of better than 0.1mm. This approach is straightforward and effective.

The text around line 160 does not make it clear whether you have measured the diameter for each azimuth or whether you are assuming that diameter is constant with azimuth at a particular depth. I think you need to clarify here. You quote a statistic of 68+_0.36mm. If you take this at face value then there will be a velocity error of +_ 26m/s on each measurement. You should show this as an error bar on fig 4.

I have other comments scribbled on the manuscript and can send that to you if it is

useful- just email me.