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Interactive comment on "Critical analysis of the relations between the velocities of elastic waves and effective anisotropy of ice polycrystals" *by* A. Maurel et al.

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Comment from Johanna Kerch, PhD student at the Institute of Environmental Physics, Heidelberg University

In my research I, too, study calculations of seismic velocities from fabric data and I would like to contribute with a few observations I made while reading your manuscript.

Why have stochastic methods been preferred (line 40)? Is that a statistical observation or have these methods been found to be more profound than velocity averaging already in the past? Could you give some references to support this statement?

To my understanding, you compare the methods in a theoretical way, using artificial

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fabrics. Are you then really quantifying the resulting error for practical situations (line 50)? I think, it is rather one step before that.

For someone who is not familiar with the approach of using the crystal's elasticity tensor in the global coordinate system, it could be helpful to mention that eq. 7 describes a transformation rather than a rotation (as you actually did in Maurel et al., 2015).

In section 3.1.1 I thought that you could offer some references for general reading on the Christoffel equation and its solutions, thus offering the reader the chance to follow up and you would clarify which content is a repetition (for example of Maurel et al., 2015) or an application of known equations.

I wonder, in which case the statement 'the quasi longitudinal wave is in general not along e3' would be relevant. Could you provide some references for the reader to be able to follow up on that? Perhaps, you included such references already in Maurel et al. (2015), but it would be convenient to have them in this manuscript as well.

Are you considering certain conditions or assumptions when averaging the velocities according to eq. 20 (line 169)? I would find it helpful if there was some kind of descriptive discussion of how the averaging step works.

To my knowledge the c-axis is defined for the description of a monocrystal's order of atoms and resulting symmetries. To describe the symmetry of the effective (bulk) medium by a corresponding c-axis is a picture that is highly suggestive for this simple symmetric case but, in my opinion, somewhat misleading for the general case in which the probability distribution might be rather complicated and not symmetric at all (line 198). I would like to suggest the phrasing '$\hat{c}^{eff}$ is the symmetry axis of the effective medium (in our example)' or similar.

Last, in your conclusion I got the impression that the conclusions you drew from your comparison would only be relevant for the application of sonic measurements, was that your intention? If you think your results to be possibly relevant for seismic and radar

measurements (also lateral waves) as well, it did not become clear to me.

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