

*The author responses are given in italics below individual reviewer comments.*

Dear authors,

Thank you for the opportunity to read this preprint of your work. I'm very intrigued by your methodology, which has made me think a lot about future practical applications. Please find below a few comments that you may (or may not) consider useful for the final version of your manuscript.

1) L23-25: I would suggest writing "can affect", since basal friction might also exert important resistance (unlike over e.g. ice shelves). At least from a modeling perspective, it is not yet clear (to me) how little basal resistance is needed before shear margins significantly affect the character of ice-stream flow.

*- Changed to "can affect"*

2) Page 7 between eqn. (1) and (2): Maybe it would be useful to explicitly state that you, therefore, are considering a homogeneous, constant-fabric slab/layer (unless I misunderstood)?

*- Added sentence to state this assumption between eqn (1) and (2).*

3) Discussion section: I would be very interested in a discussion that also treats (possibly briefly) how your VSP method might be applied to regions where a vertical preferred direction CPO is expected. Is it correctly understood that in order to get the largest P and S phase-velocity variations, you would have to sample in a plane perpendicular to the CPO plane-of-isotropy (horizontal plane), and hence consider very wide angle experiments at the surface?

*- It is correct that the plane perpendicular to the CPO plane-of-isotropy should be sampled. In the Vertical cluster CPO case the plane to sample would be a vertical plane, since the horizontal plane is isotropic. A walkaway VSP experiment such as the one described in the manuscript can achieve this. If one wants to sample horizontally incident raypaths, indeed wide angle experiments are needed.*

4) Discussion section: I wonder whether you have thought about (or possibly modelled?) what kind of ultrasound sampling scheme could be adopted if the (approximate) CPO is not known a priori? That is, what set of sampling directions would I need to consider to make an unambiguous estimate of the CPO using your method without knowing the plane that the single maximum is in?

*- We have not modelled different sampling strategies to apply to an unknown CPO, but this is a very interesting problem. Probably a good start would be to measure multiazimuthal ultrasonic velocities in two orthogonal planes, e.g. horizontal and vertical. One could then distinguish already Horizontal or Vertical Cluster CPO. CPO forward modelling could then be applied to inform a most likely CPO geometry and guide another round of ultrasonic sampling.*