Dear Kristin Poinar and Andreas Köhler,

Thank you for your feedback on the paper. We appreciate the time and effort that you have dedicated to our manuscript. Please find below our response to your suggestions and updated figures as you requested. The revised manuscript contains the updated figures 8 and 9, as well as some minor text edits. In section 5.3 of the revised manuscript we discuss the preferred the low-velocity scenario.

We hope you appreciate our reply and updated figures and manuscript and we can continue the publication process.

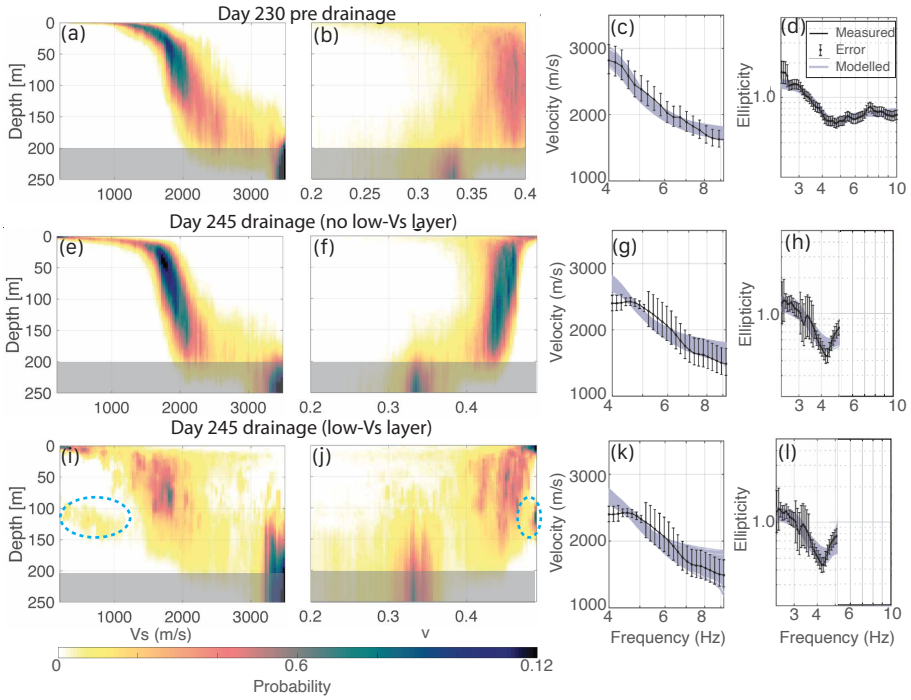
Sincerely,

Janneke van Ginkel, Fabian Walter, Fabian Lindner, Miroslav Hallo, Matthias Huss and Donat Fäh

Response to the suggestions:

Figure 8: There seems to be a mistake here. The measured dispersion curve in (g) is apparently the same as in (c). But the dispersion curve in (g) is supposed to be the one measured during the drainage, i.e. should be the same as in (k) if I'm not mistaken. I'm wondering if this is just a plotting error or an actual wrongly done inversion. This needs to be checked by the authors and may have consequences for the next point.

Thank you for pointing this out. Indeed, there were a mistake in the latest version of the figure, we sincerely apologise for this issue. Nevertheless, that was just visualisation error caused by the figure update after previous revision, not to be interpreted as an error in our analysis. As was also correctly shown in the earlier versions of the paper, the dispersion curve in (g) is not the same as in (c) but as (k). The figure is updated accordingly:



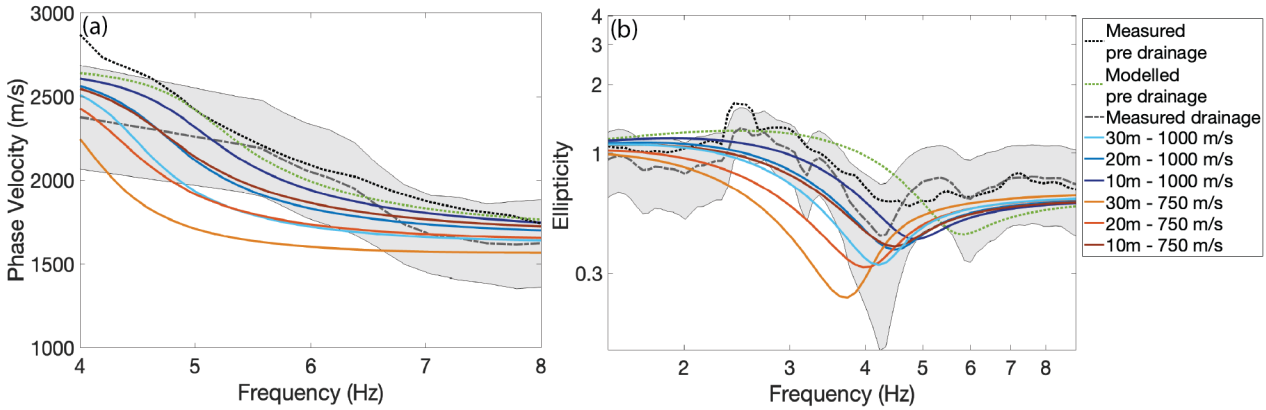
Updated figure 8

As to the significance of obtaining a better fit with a low velocity layer, I am also still not 100% convinced. I agree that variance reduction indicates a better fit even through visually there is not clear difference between 8(h) and 8(l). However, I cannot follow the argument that the modelling in Fig 9 supports the low-velocity model better. I would strongly suggest to add the forward-modeled dispersion curve and ellipticity for the no-low-velocity layer case into Figure 9. Only this would allow to decide against or in favor of the low-vel layer. This is necessary because it seems from Fig 8h, that the non-low-velocity layer model is also able to produce a sharp through in the ellipticity.

Thank you for your feedback and we acknowledge your point that Fig. 8h also produces a trough as we use the ellipticity with a trough as input, resulting in a trough in the inversion fitting (this is explicitly stated in lines 256-262 in the revised manuscript). Nevertheless, the trough produced by the inversion without low-velocity zone is weaker compared to the inversion with the low-velocity layer. It is reflected in the mathematically rigorous measure of the data fit by Variance Reduction (VR). Note that there an improvement in the VR in the inversion using a low-velocity layer (lines 257 and 270).

Next, following reviewers recommendation, please find below the update figure 9, where the measured pre-drainage (no low-velocity layer) dispersion and ellipticity and the forward modelled no low-velocity layer is added (green dotted line). Here we do not see such a sharp trough in the ellipticity model as for the drainage measured and modelled ellipticity. This, once again, supports our statements about low-velocity layer, as we discuss in lines 288-292 in the manuscript. Also, in the manuscript we acknowledge that the fit of the dispersion curve is not as good as the ellipticity (explicitly stated in lines 284-285 in the revised manuscript).

The inversion and the forward modeling are two separate tests (independent of each other). As we are aware of the low (blurry) probability of the low-velocity cluster (Fig 8i), we subsequently perform the forward modeling with the constraints on the input thickness and velocities from the inversions. The fact that forward modeling independently implies the same conclusions as the inversion is encouraging. Florent Gimbert, the other reviewer suggested the following: "Convincing from the forward modelling, not as much from the inversion. The authors should acknowledge this". That's why we phrased line 301-302 in the manuscript like this: "The low-velocity layer, particularly highlighted by forward modelling, helps to explain the observed trough in the ellipticity curve, although the saddle in the dispersion curve was not accurately captured"



Updated figure 9