Response to Reviewer Comment #1 (https://doi.org/10.5194/egusphere-2025-3456-RC1**) – please see our response in blue, beneath each review comment.**

This manuscript presents an interesting and clearly written study applying gravimetric methods to estimate glacier ice thickness. The approach is generally well explained, and the results appear reasonable. The paper is concise and direct, which is appreciated. However, I find that the manuscript is currently too limited in scientific depth to warrant publication in its present form. With targeted additions, it has the potential to become a valuable contribution.

We thank the reviewer for their comments and suggestions, addressed below.

To increase scientific relevance, I recommend strengthening the manuscript by expanding the analysis beyond the current two-site application. Options could include adding a comparison with existing model-derived ice thickness estimates (e.g., those from Farinotti et al.) to contextualize their results. Given that Comox Glacier (e.g., GLIMS ID G234649E49550N; RGI ID RGI2000-v7.0-G-02-07858) is likely included in global modelling datasets, this comparison could help quantify the method's performance and assess any bias. For example, if the measured thickness is much lower than estimated by other modelling approaches, what are the implications for retreat and disappearance of this glacier (which can also be obtained from global estimates such as Rounce et al., 2023)?

This is an excellent suggestion – we have now checked and both glaciers are indeed included in the Farinotti et al. database. In our revision, we will add a comparison of our gravity-derived ice thicknesses with these model-derived estimates, and will consider the implications for glacial retreat, and within a broader context, as suggested.

Additionally, incorporating a discussion of methodological uncertainty (is the varying density of crevasses/melt pockets likely to cause a big shift in the results? Is the grid size a big influence?), including potential sources of divergence between gravimetric and radar measurements and whether measurement year might influence results, would significantly enhance the scientific contribution. These are just initial thoughts on how this manuscript would be expanded, but I am certain there are other avenues as well.

This is also a good suggestion. As alluded to in the paper, the presence of crevasses and melt pockets or gravel inclusions within the ice will have some influence, but this is expected to be minor and competing effects will at least partially cancel each other out. We don't expect much change in the results, but we will carry out some quantitative testing based on the literature (e.g., mean 0.8% water content estimated by Pettersson et al., 2004). As for the influence of the topographic elevation grid used for calculation of the terrain correction, only very minor differences would be observed in the final solution under a finer grid size than 25 m. With only small-scale deviations (i.e. generally less than a meter) taking place in the topology over short distances around each station, it is expected that taking a finer grid size would introduce a negligible change to the topological corrections (generally a smaller magnitude gravity correction here) and thus modelled ice thickness, while simultaneously increasing computational demand. Therefore, while it may be important for other studies under more varied short distance terrain, in this study we believe a 25 m grid to be sufficient.

Minor comments

Please include the GLIMS and/or RGI glacier identifiers in the study site description to facilitate spatial reference.

We will add the identifiers in the revised version.

In the introduction, the Scott citation focuses on the Hindu Kush region only; consider incorporating a broader reference such as Viviroli et al. (2020) for global or multi-mountain context.

We thank the reviewer for this useful suggestion and reference, which we will cite in the revised version.

Figure 4: clarify the distinction between your measurements and those from Pelto (2020) in the figure itself, not just the caption.

We will make this change to improve clarity in the revised figure, along with several others suggested by the other reviewer.

References:

Viviroli, D., Kummu, M., Meybeck, M., Kallio, M. & Wada, Y. (2020). Increasing dependence of lowland populations on mountain water resources. Nature Sustainability, 3(11), 917–928. https://doi.org/10.1038/s41893-020-0559-9

Rounce, D. R., et al. (2023). Global glacier change in the 21st century: Every increase in temperature matters. **Science**, 379(6627), 78-83.

Pettersson, R., Jansson, P., & Blatter, H. (2004). Spatial variability in water content at the cold-temperate transition surface of the polythermal Storglaciären, Sweden. Journal of Geophysical Research: Earth Surface, 109(F2), https://doi-org.ezproxy.library.uvic.ca/10.1029/2003JF000110