

The authors rely on twelve eddy covariance setups across the European Alps to investigate the applicability as well as the potential error propagation from  $z_0$  and MOST into flux estimates in complex terrain, specifically over snow. The authors find that applying MOST in these terrains comes with serious limitations and proscribing a simple constant roughness provides more robust results. The study is meticulously described, scientifically sound and is of large interest, especially for future understanding on the development of snowpacks. The author's access to a variety of datasets (and measurement heights) makes this an incredibly useful study that fits well into the scope of the Journal.

Since both methods, language and to a large degree figure quality is appropriate there remain a relatively small number of concerns I have, listed below, which should be doable with a relatively minor revision.

#### Comments:

L105: I believe this needs a table caption. May be up to editorial decision but in my view to save space you could consider removing variables that are commonly known across (g, sigma, ...). But maybe in the end that also doesn't make such a big difference. In the text however you introduce all of those again – that makes me wonder whether you need the table at this scale or you rather choose to say in the text at the beginning of methods 'see Table 1 for all symbols used in this study'. Otherwise this seems quite redundant.

L164: I would add here 'in complex terrain over snow surfaces'. For complex terrain a more extensive discussion and literature review would also be required and anyway you may want to already here focus on the core of your work.

Table 1: I miss here – or at the start of the Results before you go into the Law of the Wall – a summary on how many valid data points (+ possibly number of days with cover and how many days with  $SCF=1/SCF<1$ ) you have for each station during snow covered periods, which would put the results into perspective.

L430: Nicely done overall also relying on the footprints. As you do this I think it would be prudent however to also check whether the footprinted area is indeed covered in snow (or not or just patchy). That would influence your results of course. And since these are areas with relatively easy access to satellite imagery during the time of your measurements (be it Sentinel or Planet) it would be low hanging fruit. Maybe it would also allow you to discard days where the station for some reason had snow but most of the footprint didn't anymore. This would become obsolete if in L175 you would provide more detail on the VIIRS analysis – what is its footprint/resolution? Would it cover all the footprint you calculated from the stations for all cases? If that is all covered then for the  $SCF=1$  cases you I think would have ensured that already (but could check with some optical imagery if it was indeed the case).

Figure 3: As noted above, to check the footprint is a generally good idea. In these two cases features that could be obstacles (without any snow) even when there is cover are negligible, I am wondering however if you have considered to test this for all other sites as well, which could eventually also give you some indication on how to interpret large error propagations for section 4.3 and whether something else than slope could explain the spread. – Now I see of course you

did this in the Appendix, great! Could you mention this earlier in the methods already? And how do the footprints match up with the VIIRS footprint?

Figure 5 to 8: I appreciate that sometimes one needs to show a lot of data, but here the reader can't learn much due to the small size of individual plots. If you need to show all data in the main manuscript you will need to find a solution to combine plots to reduce white space considerably.

Figure 9: The font size in the legend is awfully small, needs to be increased.

L572f: The Discussion and Conclusion are very well structured and argued. I think what could be expanded is the reflection with other studies that have put the applicability of the law of the wall in question for complex environments (beyond snow). For rock glaciers I think (Amschwand et al., 2024) have done this very well, for debris-covered glaciers (Nicholson and Stiperski, 2020) did as well and we (Steiner et al., 2018) have done much less convincingly. This isn't snow, but acknowledges that others have stood there before in complex mountain environments (where  $T_s$  changes a lot) and actually came to very similar take homes (although you now back this up with much stronger data). Above citations are not a 'must' to include and others may be available from urban spaces, but I think some reflection in this direction would strengthen the take homes from this excellent study.

#### References:

Amschwand, D., Scherler, M., Hoelzle, M., Krummenacher, B., Haberkorn, A., Kienholz, C., and Gubler, H.: Surface heat fluxes at coarse blocky Murtèl rock glacier (Engadine, eastern Swiss Alps), *The Cryosphere*, 18, 2103–2139, <https://doi.org/10.5194/tc-18-2103-2024>, 2024.

Nicholson, L. and Stiperski, I.: Comparison of turbulent structures and energy fluxes over exposed and debris-covered glacier ice, *Journal of Glaciology*, 1–13, <https://doi.org/10.1017/jog.2020.23>, 2020.

Steiner, J. F., Litt, M., Stigter, E. E., Shea, J., Bierkens, M. F. P., and Immerzeel, W. W.: The Importance of Turbulent Fluxes in the Surface Energy Balance of a Debris-Covered Glacier in the Himalayas, *Front. Earth Sci.*, 6, <https://doi.org/10.3389/feart.2018.00144>, 2018.