EGUsphere, referee comment RC1
https://doi.org/10.5194/egusphere-2022-1164-RC1, 2022

Comment on egusphere-2022-1164

Thomas Wagner (Referee)

Referee comment on "Local environmental context drives heterogeneity of early succession dynamics in alpine glacier forefields" by Arthur Bayle et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-1164-RC1, 2022

GENERAL COMMENT

The well written manuscript provides valuable insights in the vegetation succession of glacier forefields. While the remote sensing part and the respective analysis is appropriate and the methods and encountered problems are comprehensively described, I have a number of critical comments regarding the evaluation and assessment of the vegetation.

SPECIFIC COMMENTS

- Succession dynamics in glacier forefields

In the discussion, the authors state that their results confirm that the time lag between deglaciation and plant establishment is dependent on the vegetation in the vicinity. However, I think that falls somewhat short, as the establishment of vegetation is generally also influenced by topographic factors and modulated by avalanches and debris flow etc. Larger and more frequent debris flows will clearly reduce (or reverse) recruitment even under equal seed pressure. Further higher elevations are not only accompanied with a less dense vegetation but also with generally lower establishment rates (due to climatic conditions). Although this does hardly weaken the results, this should be included into the discussion.

In this context, it would be also interesting to see the overall turnover of pixels from vegetation to unvegetated for each glacier (in addition to % vegetated, Fig. 5). This could give an idea of the debris flows and habitat loss typical for each glacier.

- Plant assemblages and succession dynamics

This is the part I do have some problems with. The authors use about 15 plots per time period of deglaciation. Due to the different shape of the respective zones, for some of their sites the plots are far from each other while for other sites the plots lie quite close to each other. Hence spatial autocorrelation is likely, which should be considered when applying test.

Another problem is the small plot size. 2x2m plots may be sufficient for lichens, but for higher vegetation they may be too small. Many rare species will be overlooked as they will only be detected using larger plots. Further, a minimum distance between plots may be associated with spatial autocorrelation, particularly when we assume, that colonization is dependent on the seed pressure of the surrounding vegetation.

Further, for example, while one Pinus mugo in a small plot might contribute considerable to the vegetation cover a small Saxifraga might be neglected. Hence correlating vegetation cover derived from remote sensing with a pixel representing ~30x30m and the vegetation survey on a 2x2m plot might be difficult.

For their NMDS the authors use all the plots of a site together, regardless of the period of deglaciation they represent. Hence, different successional stages are combined into one community. Inferences about different succession is consequently not possible, particularly if succession occurs at different rates for the individual glaciers.

I would expect a separate consideration here or, if this is not possible only the communities after a certain time.

Further, instead of a simple envfit, I would prefer to see a Mantel test for the respective environmental variables. Here the authors could also account for the spatial autocorrelation of the plots by simply including the plot coordinates (in UTM, meter) into the distance matrix.

The results of the NMDS in terms of community composition (vegetation associated with the respective glacier forefield) should be discussed briefly.

- Methods general

For future research that does not rely on historic data, the use of UAV data should be discussed, as they provide high resolution just-in-time data (e.g. Woellner & Wagner, Healy & Kahn ...)

Woellner, R., & Wagner, T. C. (2019). Saving species, time and money: Application of unmanned aerial vehicles (UAVs) for monitoring of an endangered alpine river specialist in a small nature reserve. *Biological conservation*, *233*, 162-175.

Healy, S. M., & Khan, A. L. (2022). Mapping Glacier Ablation With a UAV in the North Cascades: A Structure-from-Motion Approach. *Frontiers in Remote Sensing*, 57.

TECHNICAL COMMENTS

L114: heterogeneity in what context? please elaborate

L145: please also provide the resolution of these data

L253 and thereafter: Instead of "local vegetation" I would prefer the term "vegetation cover in the vicinity", to make clear that you do not look at the vegetation composition (which I expected, when I read the term first).

L292: Excluding species with less than 5 occurrences might be a problem, as this will exclude plots in early successional stages.

L297: Please provide number of Iterations and dimensions for NMDS

L299: see specific comments: better use Mantel tests instead of vector fitting

L350: Please consider, that trees and shrubs have a generally higher seed rain and higher dispersal distances!

L379: I suppose this should be Fig. 3

L342ff: Please provide a table with all vegetation data (supplementary material). This is necessary to see the vegetation cover in context of the respective community.

L363: I would chose another term instead of heterogeneity here, as for me, heterogeneity suggests that the species composition differs

Caption Fig. 1: Please include to what chronosequence the colored lines relate to; I presume red is 0 Years, Blue 10 years ...

L376ff: Describing the succession should include naming the relevant species and how community composition changes over time