

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-422

Anonymous Referee #2

Referee comment on "Tree migration in the dynamic, global vegetation model LPJ-GM 1.1: efficient uncertainty assessment and improved dispersal kernels of European trees" by Deborah Zani et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-422-RC2>, 2022

REVIEW – gmd-2021-422

There is much to like about this manuscript, and I see little to revise in this submission. To me, it is effectively ready for publication.

The authors present a very clear rationale for this contribution, and also a very clear purpose: the reader knows exactly what this work is doing, and where it fits in the wider context of modelling tree migration over large spatial scales. I appreciated that the authors focus their sensitivity analysis on a battery of computationally inexpensive tests. For as technical as this paper is, and as technical as the underlying model is that this paper examines, the authors have made their approach and findings accessible for different kinds of readers. Those who are looking for high-level explanations of what large-scale tree-migration models do can find it; those looking for parameter ranges and recommendations regarding the relative merits of different dispersal kernels can find that, too.

My only question for the authors to consider has to do with how they address the role of anthropogenic landcover fragmentation in vegetation range shifts. The authors go into substantive detail about reproducing migration rates since the last glacial maximum, and explore the essential ingredients of their model necessary to reproduce post-glacial migration rates. But – and the authors acknowledge this – post-glacial migration rates manifested in a landscape not yet fragmented by human land-use and built environments. So while the potential effects of habitat fragmentation (~L145) and the potential limitations of this model for predicting future range shifts (~L665) get some mention, anthropogenic forcing struck me as underemphasised, overall. In terms of predicting future range shifts at continental/regional scales, fragmentation and built environments function like natural physical barriers (e.g., mountain ranges), and looking forward, might reasonably be an external forcing as strong as climate change. Do post-glacial vegetation migration models work in the latest Holocene? Will understanding range shifts through

aggressively fragmented landscapes require a different kind of model?

I don't suggest the authors change anything about the quantitative exercise they have undertaken. My only query is whether they might amend a portion of their introduction to push the problem of anthropogenic fragmentation, and the open questions that raises for global vegetation migration (real and modelled), more into the foreground. Doing so would shift the framing of anthropogenic disturbance that comes at the end of the Discussion away from being a "limitation" and toward an avenue of future research.