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Biogeosciences Discussions

# *Interactive comment on* "Dispersal distances and migration rates at the arctic treeline in Siberia – a genetic and simulation based study" *by* Stefan Kruse et al.

**Anonymous Referee #1**

Received and published: 19 September 2018

General comments:

The manuscript by Kruse et al. describes an empirical study of effective seed dispersal using molecular markers which is used to adapt and parametrize a simulation model on larch migration rates at the arctic treeline. The topic of this study is of general interest because estimates for the capability of species to shift their distribution ranges are important for assessing the impact of climate change on many ecosystems. Especially tree species are of interest since they are the foundation species of many ecosystems and exhibit life history traits, which make direct observations difficult. The study offers a nice example for a combined approach with empirical data and simulations



although its direct implications are somewhat limited due to the lack of replications and the rather small study site. However, the authors acknowledge these limitations in their manuscript and it will be nice to see some replicates in the future to judge the range of migration rates possible at different locations.

The manuscript is overall well written and clearly structured. The applied methods are well chosen and experiments and data analyses are described in sufficient detail. The results are discussed in a concise way using the available body of literature and conclusions are well founded.

In general the manuscript is of high quality and I have not found any major flaws. Please find below a few specific comments.

Specific comments:

Page 2 lines 53 ff: These sentences are a bit hard to follow. Also it does not immediately become clear that the authors refer only to the Taymyr peninsula. Since there is so much literature on this available, it should maybe added somewhere that this region is well studied, which is a further argument for chosing this region for the study.

Page 3, lines 70 ff: I suggest to elaborate a bit more on the specific aims of the study here at the end of the introduction. Some aspects have been mentioned in earlier paragraphs but rather indirectly and not specifically related to this study.

Page 9, lines 195 f: Is there an explanation how ramet pairs can occur 30 m apart in Larix? How about the chance for full sibs to have identical genotypes?

Page 15, line 320: When I read this, I asked myself if the model includes the case of established individuals ahead of the treeline, which are not able to reproduce, yet, because conditions do not allow this at the moment. When the conditions change, the treeline might progress quite rapidly at first and then slow down. Since I am not familiar with the model in detail, I cannot judge if this is a point worth discussing or a scenario worth simulating.

Page 15, lines 325 ff: The migration rates mentioned here, are they 20-60 m/20-50 m for the entire time period respectively or per year in these time periods? Is it possible to translate the elevational shift into a migration rate comparable to the model?

Page 15, line 330: Establishment will for sure be affected not only by density-dependent mortality but also by abiotic conditions and their stochasticity in this extreme region of the planet.

Technical comments:

Page 5, line 102: “inferred” Why are the microsatellite data described as inferred? To me they seem quite directly measured.

Figure 5: The x axis is quite cramped in this figure. Maybe it could be stretched out a bit?

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