REVIEWER # 2

First of all, thank you for the constructive and detailed comments to the manuscript. Below, you can find the point-by-point answers to all points you raised.

On behalf of the authors,

Vaclav Treml

Main comment 1:
The justification for selecting the lower part of the treeline for data collection in your experimental design remains unclear. In various sections of the manuscript, including the title, specific reference is made to "the lower part of the treeline ecotone". The reasons your hypotheses are only applicable to trees within this elevation zone are not specified. The introduction should provide justification for choosing this specific area of the treeline and explain why it is more suitable for conducting the study.

Reply: In our opinion, our analysis showed that absolute growth is influenced not only by temperatures but also by nutrient availability. Ideally, we would like to relate this finding simply to treeline. However, we are aware that our sites are not located at the very cold margin of trees' fundamental niche (treeline sensu stricto) as our sites are in the lower part of the treeline ecotone and the majority of treelines are currently not in equilibrium with climate. For the sake of exactness, we prefer to state that our findings cannot be generalized for treeline sensu stricto but for the parts of treeline ecotone which are located below the treeline sensu stricto (potential treeline). In fact, this applies to the majority of contemporary treeline ecotones. Based on your comment we inserted sentences justifying our selection of the lower part of treeline ecotone to Abstract (L20,21) and to Introduction (L48-51, L89-91).

Main comment 2:
The ring-width chronologies have not been sufficiently exploited in the study. Only the results of the correlations between climate and growth have been shown. There is a lack of basic statistics of the chronologies, such as average ring width (or average basal area increment), maximum and average age, serial intercorrelation, mean sensitivity etc. Average basal area increments can be better analysed by comparing the long growth series (100 years?) of the 60 samples taken from north and south sites rather than only the 16 trees (3 cambial years) sampled with Trephor.

Reply: Thank you for this comment. We newly created Supplementary Table with basic chronology characteristics (Table S3).

The results based on mean basal area increments were already in the original version of the manuscript in the Supplementary Materials (former Fig. S4). We newly moved them in the main part of the manuscript (now Figure 5, description at L188-190, 273-274). Basal area increments confirm results derived from microcore sampling.

Main comment 3:
The estimation of insolation on each site does not consider cloud cover. The discussions lack a section

indicating the potential influence of this factor. The results of the correlations between climate and growth show a negative relationship with precipitation in the period DOY 115-125. This relationship is not discussed in the article. The relationship could be due to the negative effect of cloud cover (associated with precipitation), which makes photosynthetic activity less efficient at the beginning of the vegetative period.

Reply: In our opinion, between-site differences in cloud cover are probably very low with any effect on tree growth. Direct distance between sites across the valley is about 700 m, we cannot assume substantial differences in cloud cover between sites. Negative correlation with precipitation around DOY 115-125 is probably due to anticorrelation with temperature (higher precipitation at that time usually in form of snow delays the beginning of growing season). We added explanatory sentence to Discussion (L312-313).

Minor comments:

L 9-10: see main comment 1. *Reply: Accepted, rephrased*

L14-16: Please rephrase this sentence. *Reply: Sentence was rephrased, shortened.*

L 78-79 & L 88: Species names in italic. *Reply: We italicized species names throughout the manuscript.*

L 95-96: Is *Picea abies* the only tree species at the treeline? *Reply: Yes, Picea abies dominates treeline ecotone with scarce occurrence of Sorbus aucuparia and Acer pseudoplatanus. Towards higher elevation Picea abies stands are replaced by Pinus mugo shrubland. This information was added to L 96-97.*

Figure 1: Consider moving Figure 1C and 1D in the results section. You explain how you obtain this graph in M&M (ll 121-123). *Reply: Accepted, we split Figure 1 into new Figure 1 (former Fig. 1a,b) and Figure 2 (former Fig. 1c,d).*

L 119-120: Please specify if you consider continuous period or not. *Reply: We consider all days with T>5°C irrespective whether it was continuous or discontinuous period. We inserted a word "all" into the respective sentence (L 121).*

L 136: Please specify if these six trees are the same sampled with Trephor. *Reply: Accepted, rephrased, now L 130-131* ("Sampled trees included those used for xylogenesis research.")

L 193: "standardization". *Reply: Corrected accordingly*

L 201&210: "°C" instead of "K". *Reply: Changed accordingly including Figures.*

Table 1: Indicate the unit for degree days. *Reply: Here the unit is "degree days" (accumulated °C,K,F above certain threshold), the unit is defined in the name of the variable.*

L294: See main comment 3. It's not clear what is meant by 'entire lifespan of trees' (2012-2014 period or

1961-2013 period?). *Reply: This sentence was rephrased and moved to the next chapter (3.4, now L 271-272). Sentence refers to the new Figure 5 which shows mean basal increments in relation to tree age. ("Mean basal area increments are significantly larger at the N-slope than at the S-slope (Fig. 6) consistently with the higher cell formation rates at the N-slope (Fig. 5).")*