

## ***Interactive comment on “How different sources of climate databases influence assessment of growth response in dendroclimatic analyses – case study from Lapland” by R. Sitko et al.***

**R. Sitko et al.**

vido@tuzvo.sk

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Reply to General comments of Referee#2:

Comment: Missing structure of paper and hypothesis?

Reply: We agree that the hypotheses were not explicitly introduced into our manuscript. Three hypotheses are examined in our paper and they will be added into our revised manuscript:

1) Swedish part of Lapland over the polar circle is appropriate locality for extraction of significant climatic signal from tree rings dendrochronologies of spruce for both main

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climatic characteristics, temperature and precipitation.

2) The nearest meteorostation to locality of radial increment formation, is the most appropriate for dendroclimatic growing response analysis.

3) Gridded data sets of temperature and precipitation are appropriate enough for extracting existing significant climatic signal by dendroclimatic growing response analysis in areas with rare network of meteorological stations. There are no significant differences between gridded and observed data sets.

Our revised manuscript will answer raised questions in following structure:

1) What is the bias, precision and overall accuracy of gridded data sets at the location of meteorostation for monthly/seasonal average temperature and precipitation totals? Answer is connected to results presented in Supplement Tab. 3 and Tab. 4.

2) How does the strength of correlation change between modelled and observed databases with increasing distance between points with modelled (gridded) data and observed data (meteorostation)? Does this correlation decrease slower with increasing distance for temperature data sets due to its lower spatial variability? Does this correlation decrease faster with increasing distance for precipitation data sets due to its higher spatial variability? Answer is connected to results presented in Supplement Fig. 3a, 3b.

3) What is the growing response of spruce to monthly/seasonal temperature and precipitation? The climate of which months are significant (positively or negatively) for radial increment formation? The climate of which season is significant for radial increment formation? Which of two examined climatic characteristics is more important factor of radial increment formation? What is prevailing climate regime in months which are significant for radial increment formation? Answer is connected to results presented in Supplement Fig. 4a, 4b, Fig. 5a, 5b and Fig. 6a, 6b.

4) Which climate databases have the highest correlation regarding to radial incre-

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ment of spruce? How significant are differences of correlations between used climate databases and radial increment of spruce? Answer is connected to results presented in Supplement Fig. 4a, 4b and Fig. 5a, 5b.

We believe that above outlined structure of paper and explicitly defined hypothesis and solved questions make the revised manuscript clearer and results uprising from this structure will answer all research questions satisfactorily.

Comment: Incorporate SPEI to analysis:

Reply: Because it was the same suggestion as Referee 1 had, we reply the same answer: Some specialized dendroclimatic application can analyze relation increment vs. SPEI, but they mostly analyze temperature and precipitation influence to increment separately (Babst et al. 2013, Rybníček et al., 2010, Büntgen et al., 2007). The reason is that one of them is more limiting factor depending on latitude or altitude, tree species and so on. A lot of applications analyzing growing response of trees are connected to climate change models to predict yields in the future. Our work considers mostly methodological aspect (we hope it will be clearer after supplementing of central hypothesis to our manuscript) of using various sources of climatic data in dendroclimatic applications, so we suppose it is not necessary to analyze any other special climatic indices, especially when they are derived characteristics. We understand reviewer suggestion to use SPEI as a complex indicator of multiple effects of precipitation and temperature (evapotranspiration). However because of the variable temporal scale of the SPEI, there is a question of the appropriate time scale to be applied. We understand this as a research question more applicable in specific article dealing with correlation between e.g. tree rings and variable time scales of the SPEI (interesting idea – thanks for that). Therefore we see this suggestion very complicated to be applied in presented paper. In addition because of the specific climate in polar areas (humid climate feature – according to the Koppen-Geiger climate classification Dfc and relatively low air temperature) air temperature is the major driver of the ecological processes in the area. This is also confirmed by higher correlation coefficients for growing response to tem-

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perature as to precipitation in our results (Supplement Fig. 5 and Fig. 6). However we see that this should be expressed in explicit form in our manuscript. Therefore we decided to modify our manuscript by adding the section “Climate of the studied area” (Supplement Fig. 2).

REFERENCES: Babst, F., Poulter, B., Trouet, V., Tan, K., Neuwirth, B., Wilson, R., Carrer, M., Grabner, M., Tegel, W., Levalic, T., Panayotov, M., Urbinaci, C., Bouriaud, O., Lais, P., and Frank, D.: Site and species-specific responses of forest growth to climate across to European continent, *10 Global Ecol. Biogeogr.*, 22, 706–717, 2013 Büntgen, U., Esper, J., Verstege, A., Nievergelt, D., Frank, D. C., and Wilson, R. J. S.: Growth responses to climate in a multi-species tree-ring network in Western Carpathian Tatra Mountains, Poland and Slovakia, *Tree Physiol.*, 27, 689–702, 2007 Rybníček, M., Četmák P., Žid, T., Kolář, T.: Radial growth and healthy condition of Norway Spruce (*Picea abies* (L.) KARST.) stands in relation to climate (Silesian Beskids, Czech Republic), *Gochronometria*, 36, 9-16, 2010

Reply to Minor comments: New map of location of meteorostations is presented in Supplement Fig. 1 and will be build-in to revised manuscript. The quality of figures and its legends was improved by incorporating new labels of data sets with less using of indexes (Supplement Tab. 1). By this simplification has improved readability of the legends as it can be seen at all figures presented in Supplement.

Thanks a lot for a global view to the structure of our paper and recommendations.  
Authors

Please also note the supplement to this comment:

<http://www.earth-syst-dynam-discuss.net/6/C787/2015/esdd-6-C787-2015-supplement.pdf>

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