Clim. Past Discuss., 9, C3395–C3401, 2014
www.clim-past-discuss.net/9/C3395/2014/


Climate of the Past Discussions



# *Interactive comment on* "Treeline dynamics with climate change at Central Nepal Himalaya" *by* N. P. Gaire et al.

**N. P. Gaire et al.**

npgaire2007@gmail.com

Received and published: 10 February 2014

Reply to Anonymous Referee #3

Thank you for your good comments.

Comment #1: The manuscript presents a number of limitations: - While the area studied in the manuscript is of great importance for its uniqueness and implications under the future climate scenarios, the manuscript presents results only for one study site at a mountain slope with only 2 plots (pseudo replications). For the aim of this study, this must have been replicated otherwise it mainly remains descriptive of one particular site. Treeline dynamics and forest dynamics in general, highly depend on several factors such disturbance history and site conditions. As reported in other studies, treeline



Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

position and dynamics could vary depending on the aspect (south vs north), elevation, slope, etc. Therefore, the results presented here will just represent the local conditions and history and cannot be used to make broader generalizations or to study the effect of climate variation on the tree growth regeneration of the Manaslu Conservation Area.

RESPONSE: Thanks for your comments. Regarding the number of replicate plots, it would be better to include more plots in the study. However, this is not practical for the present paper. The authors have noted several papers based on two or three transect plots and published in good impact factor journals. The major constraint at present is time and resources compounded by harsh environment and steep topography that do not permit frequent visit of the study sites. The authors fully agree that the treeline position varies with several factors. The present study is a case study of local scale to test the impact of climate change. After several such studies we can draw concrete conclusion on treeline dynamics in the whole central Himalaya. Our result represents the dynamics of natural climatic treeline in the Manaslu area because unpublished other studies have also reported similar trend. The present result fulfills some acute gaps in understanding the impact of climate change in the Himalaya.

Comment #2: The study only represents the dynamics of the forests and treeline at that mountain slope, remaining very local and limiting broader implications (such climate change); I found this out of the scope of the Journal. I think this is a great study and the authors must consider submitting it to a more local or ecological journal.

RESPONSE: Thank you for your good suggestion. Regarding the content our study in light of the scope of the journal, we will respect the decision of the editorial board. As we were looking impact of past to present climate change, we believe that our MS is not out of the journal's scope. It is our pious motive to contribute for the special issue of the journal dedicated to publish the outcomes of the multi-aspects climate change researches.

Comment #3: The authors used the two transect plots "with the hope to learn about



CPD
9, C3395–C3401, 2014

lateral migration".I do not see how this sampling design (just 2 plots) can help with that. Furthermore, there is no information on how far apart the plots are (it cannot just be determined from the map). I think this issue needs to be removed from the methods and results as it remains vague.

RESPONSE: Regarding the issue of lateral migration, it is not always possible to measure it. In our study area it was possible to assess lateral migration because of the appropriate topographical set up (A long and big lake downside the plots is acting as a barrier for the upward migration of the tree individuals from opposite downside of the lake). Plots were about 1km apart. We were talking on local scale horizontal migration on that particular area. As per your suggestion we deleted this sentence from methodology and results.

Comment #4: My other big concern is the climate reconstruction presented in the Results and later discussed in the Discussion. First, this issue is not addressed in the Materials and Methods section as it should be. Second, the authors analyzed a 229 year long period (1782-2010) and this is not correct for several reasons. At glance, it can be seen that before 1850 the ring width index exhibits high variability and depicts the growth of only 5 radii which most likely correspond to 2-3 trees. This means this part of the chronology is no reliable and cannot be used for a reconstruction; you should guarantee at least a sample size of 10 (not before than 1860). Along with this, and perhaps more important, the authors need to assess the quality of the chronologies by looking at the variation of the RBAR and the EPS using a moving window. The running RBAR and EPS must be checked and then it can be decided the point at which the chronology becomes "stable" and can be used for a reconstruction; I would guess the earliest portion of the chronology runs below the 0.85 EPS threshold. Also, the thirty years of climate records available might not be the best dataset for pursuing a climate reconstruction as they just provide a limited period of time. The available records encompass a period where climate changed dramatically compared to the previous 2-3 decades and therefore using such short period would not represent the climatic con-



CPD
9, C3395–C3401, 2014





ditions of the past century. Lastly, and specifically for the model presented, I consider the R value and the Adjusted R square value modest to make a climate interpretation of the reconstruction. Given the relatively short precipitation record for calibration and verification (15 years), I suggest to develop the reconstruction model using the "leave-one-out" cross-validation procedure (Michaelsen, 1987; Meko, 1997). In this approach each observation is successively withheld; a model is estimated on the remaining observations, and a prediction is made for the omitted observation. At the end of this procedure, the time series of predicted values assembled from the deleted observations is compared with the observed predictors to compute the validation statistics of model accuracy and error. The goodness of fit between observed and predicted precipitation values should be tested based on the proportion of variance explained by the regression (R2adj), the F-value of the regression, the linear trend and the normality of the regression residuals, and the autocorrelation in the residuals measured by the significance of the linear trend and the Durbin-Watson test (Draper and Smith, 1981). As additional measures of regression accuracy, authors can computed the Reduction of Error (RE) statistic over the verification period, as well as the root-mean-square error (RMSE) statistic as a measure of inherent uncertainties in the reconstruction. I strongly recommend discarding the reconstruction from the manuscript and focusing on the growth pattern provided by the tree ring chronology. Warm-cool periods for the studied site could be interpreted from it and then be compared with the regeneration and treeline dynamics.

RESPONSE: Thank you for your good concern, which the authors fully respect. The authors agree that the entire chronology cannot be used for the climate reconstruction due to poor sample replication in the earlier section of the chronology. Looking the variation of the RBAR and the EPS using a moving window, in the revised graph we have shown the length of the chronology in which EPS cross the threshold value. Realizing the insufficiency of the climatic data to perform the proper calibration and validation test to assess the quality of the reconstruction, according to your suggestion and also discussion with our other colleagues working in the field, we decided to remove the



CPD
9, C3395–C3401, 2014

climate reconstruction from our manuscript. It is the most commented section by the reviewers. Actually the climate reconstruction is not the major objective of this study. We had added it considering the scope of the journal though it was not included in our initial submission.

Comment #5: The entire Discussion section needs to undergo a deep revision. As it stands, it contains very general and vague statements, and some of them are wrong interpretations of the results (P5955 L13 (one site only), P5956 L27-29, P5957 L11-15, P5957 L27-28, P5959 L2-5, P5959 L27-29, P5961 L16-19, etc). This section does not explore in detail the findings of the manuscript at all. This section, in particular, is also poorly written.

RESPONSE: Thank you for your good comments. We have tried our best to revise the discussion section and make it clearer. We tried to make sentences as simple as possible. We have corrected wrong interpretations as suggested and described the findings in details.

Comment #6: There are also an important number of references on the subject missing. I strongly encourage the authors to explore the “treeline dynamics” literature as I find the manuscript discusses/compares only a limited number of studies.

RESPONSE: Thank you for your good comments. To the best of our knowledge and access, we have included all relevant references on the subject. Regarding the reference citations, previously we thought that there might be the limitation in the reference number in the CP journal and the inclusion of review paper represents the many references included in that review paper. So we intentionally made our reference list short. We have an inventory of a good number of papers dealing on treeline dynamics. As suggested, we have added and cited more numbers of relevant references. More than 20 new references have been added in the revised manuscript.

Comment #7: Overall, the English could do with substantial editing.



CPD

9, C3395–C3401, 2014



RESPONSE: We agree with your comment and tried to improve it.

Comment #8: Thus, while I find value in the findings reported here, I suggest that greater attention needs to be given to the analysis/interpretation of the specific findings related to the treeline dynamics and that it may be more appropriate for a more specialized journal. I think the work would have greatest value for researchers and ecologists in the geographic region, or for those working primarily in treeline ecosystems, rather than for a global audience.

RESPONSE: Thank you for your suggestion. We have elaborated the analysis/interpretations related to the treeline dynamics. We believe that those researchers who are working on the impact of climate change on biological community taking treeline as reference, our paper definitely will have great significance. There is a paucity of literature based on studies from the Nepal Himalaya. Similarly, for those audiences who want to know the impact of climate change or other changes in the Himalaya, also known as the third pole, in particular and treeline in general our paper will be interesting and give some idea. The authors hope that the paper will specially be helpful to those who are desperate to know about the impact of climate change in the Himalaya.

Once again, the authors appreciate your good and critical comments to improve the quality of the manuscript. Thank you again.

Reference added

Danby, R. K., and Hik, D. S.: Variability, contingency and rapid change in recent subarctic alpine tree line dynamics, Journal of Ecology, 95, 352-363, doi: 10.1111/j.1365-2745.2006.01200.x, 2007. Moiseev, P. A., and Rigling, A.: 20th century treeline advance and vegetation changes along an altitudinal transect in the Putorana Mountains, northern Siberia, Boreas, 41, 56-67, 2012. Leonelli, G., Pelfini, M., Cella, U. M. d., and Garavaglia, V.: Climate warming and the recent treeline shift in the European Alps: the role of geomorphological factors in high-altitude sites, AMBIO, 40, 264–273, doi: 10.1007/s13280-010-0096-2, 2011. Lloyd, A. H.: Ecological histories from Alaskan



CPD

9, C3395–C3401, 2014

tree lines provide insight into future change, Ecology, 86, 1687–1695, 2005. Mamet, S. D., and Kershaw, G. P.: Subarctic and alpine tree line dynamics during the last 400 years in north-western and central Canada, Journal of Biogeography, 39, 855–868, doi:10.1111/j.1365-2699.2011.02642.x, 2012. Sakai, A., and Malla, S. B.: Winter hardiness of tree species at high altitudes in the east Himalaya, Nepal, Ecology, 62, 1288-1298, 1981. Vittoz, P., Rulence, B., Largey, T., and Frele′choux, F.: Effects of climate and land-use change on the establishment and growth of cembran pine (Pinus cembra L.) over the altitudinal treeline ecotone in the central Swiss Alps, Arctic, Antarctic, and Alpine Research, 40, 225–232, doi: 10.1657/1523-0430(06-010)[VITTOZ]2.0.CO;2, 2008.

Interactive comment on Clim. Past Discuss., 9, 5941, 2013.