

Interactive comment on “Eliminating the “divergence problem” at Alaska’s northern treeline” by M. Wilmking and J. Singh

Anonymous Referee #1

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Review of the manuscript entitled: 'Eliminating the 'divergence problem' at Alaska's northern treeline' submitted by M. Wilmking and J. Singh for publication in Climate of the Past

This manuscript presents a compilation of individual tree-ring width (TRW) measurement series from seven sites (partly downloaded from the ITRDB) across the northern treeline (roughly at 68° N and 140–160° W) in Alaska. Data were corrected for age-trend biases using the Regional Curve Standardization and classified into subsets of individual series that correlate (i) significantly or (ii) non-significantly with instrumental summer temperatures. Based on this stringent pre-selection, the authors created two mean chronologies of different late 20th century trends: increasing (i) and stationary (ii) indices after ~1980, with the later subsequently indicating some offset with rising

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temperatures.

Methodological details provided for the rather imprecise analysis are not sufficient and the proxy plus target database considered is limited. Therefore, I consider this brief analysis to be not a suitable input towards a better understanding of the currently debated 'Divergence Problem' in tree-ring research. This is of particular importance, since the apparent inability of formerly temperature sensitive TRW chronologies to track global warming since the mid 20th century, in combination with their failure to reflect high-frequency temperature signals forms a serious problem for tree-ring research and thus deserves dedicated scientific research - everything else merely confuses the issue.

Title: is misleading as the so-called 'DP' is created rather than eliminated. The authors to some extent generated offset between the instrumental target and proxy reconstruction 'artificially'. Two aspects are critical in this regard: the applied approach of simple site differentiation into 'responders' and 'non-responders' (those data that do or do not correlate with climate) without considering independent calibration/verification periods can result in a circular reasoning. Moreover, the post-1980s offset appears to be as large as divergence at the beginning of the time-series P 743, I3: the frequently cited D'Arrigo et al. paper was published in Volume 60, 2008 (289-305) and not in 2007 P 743, I11: the northern latitudinal band described by Büntgen et al. (2008) must be 44-48° P 743, I22: northern Alaska is a fairly unreliable region in terms of instrumental station quality and quantity, and thus most likely not the best area for an in-depth study of (temporal) relationships between tree growth and climate. This argument is mainly valid along the entire northern circumpolar ecotone P 743, I23: the expression 'physiological growth threshold' could be more precisely explained (summer warming at the latitudinal and altitudinal treeline should shift growth conditions from formerly temperature limited to now optimal conditions without exceeding some threshold towards drought limitations, for example) P744, I4-10: what is novel about the current manuscript and how does it transcend existing work: detrending, data

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splitting, temporal analysis, alternative reconstruction? All of these arguments have been tested before P744, I12: add 'the' between 'from northern' P744, I13: change 'year 2000' to '21st century' P744, I15: change 'treeline building species' to 'dominant treeline species' P744, I20-21: there are various approaches to developing a mean chronology after RCS detrending, and RCS is certainly not a 'silver bullet' in terms of proper standardization. Most critical issues are related to the fact that the authors don't utilize composite (i.e., including living and relict wood samples) data, which can potentially bias the overall long-term evolution of the resulting time-series P744, I22: the authors should provide details about their methodological application of ARSTAN: was any variance stabilization considered on the series level (e.g., power transformation) and later on for chronology development (using a bi-weight or arithmetic mean for example) P745, I8: more information on the CRU grid-box data could be helpful: were min, mean, max temperatures compared, which ones were finally used, was the CRUTS2.1 version used, and did the authors reflect on potential trend issues as stated in the original publication P745, I9-10: the performed selection is based on a subjective rather than objective decision P745, I10-12: this sentence should be moved to the results chapter P745, I14-18: it remains unclear which calibration technique was performed in the end. Such information, however, is relevant, as calibration impacts the reconstructed amplitude P745, I22: 'climate parameters' should be 'temperature' P745, I23: how high, respectively significant are 'positive correlations'. The authors should be consistent throughout the entire manuscript P745, I27: change 'mostly' to 'most' P746, I1: see P745, I22: 'climate parameters' should be 'temperature' P746, I7: change 'increase in temperature' to 'warming' P748, I22-29: the authors stress a serious limitation of their study. Not only are carefully selected and well-replicated tree-ring data necessary to detail potential instability in growth responses to climate, additional uncertainty may also be the result of instrumental station and methodological grid bias. The homogenization procedures applied, 'micro-site' effects, influences of the 'urban heat island', and interpolation can all influence the calibration procedure. See also my earlier comment on P 743, I22 P 749, I12-15: this is just not true, as both commonly

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applied Rbar and EPS statistics are usually obtained via moving window approaches. As a side point, such statistics solely provide information on common signal strength within a data-set/chronology, but don't allow conclusions on (changing) external forcing parameters to be drawn P 749, I21-24: the ITRDB is a unique databank and represents a great opportunity for the entire paleo-community including climatologists, ecologists, and biologists. This archive should not be treated as a black box with any misuse relying upon individual users

In short: this manuscript should not be considered for publication in *Climate of the Past*. The authors, however, could alternatively perform a more in-depth analysis of an extended tree-ring network and use various versions of instrumental target data. Methodological improvements with respect to chronology development and calibration technique would further assess temporal stability/instability of growth responses to climate variability.

Interactive comment on *Clim. Past Discuss.*, 4, 741, 2008.

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