

## ***Interactive comment on “A millennial summer temperature reconstruction for northeastern Canada using oxygen isotopes in subfossil trees” by M. Naulier et al.***

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Received and published: 22 February 2015

As the authors note there has been a paucity of paleoclimatic data in the Labrador region of northeastern Canada and the authors should be commended for having added a much needed dataset which helps to ameliorate this issue. As a researcher who works in the region this type of information is much needed to inform other research.

However, I do have a few brief comments on the manuscript:

[1] In reading the manuscript I believe that it would be strengthened with some additional discussion and with some additional references provided. In particular, I noted that the authors do not provide comparisons with the D’Arrigo et al (1996, 2003) tree

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ring record from northern Labrador which provides somewhat different results;

[2] Many of the interpretations provided in the text and some of the information would benefit by comparison with the results of Way and Viau (in press) which characterizes the regional drivers of climate variability in Labrador over the past century. This work is relatively recent and has only been online since August of 2014 but it certainly would reinforce and help with the interpretation of results;

[3] An additional point of discussion is the authors provide discussion of the role that multidecadal variability plays in the region relative to their results and particularly with respect to whether it is detectable in the air temperature reconstruction provided - I believe noting this type of variability would add to the discussion - does the reconstruction agree well with AMO reconstructions for instance?;

[4] The authors state that they do not train on the period of 1900-1929 due to the lack of weather stations within 300 km of their study area during that time. Was there a particular reason to choose 300 km and 1930 as the specific thresholds? Many authors have noted that temperature anomalies are correlated at distances exceeding 1000 km (Hansen and Lebedeff, 1987; Rohde et al., 2013; Cowtan and Way, 2014) therefore interpolation methods such as those employed in the CRU TS dataset should perform reasonably well in the absence of local station data.

[4] The authors exclude the post-2000 data from calibration because of a divergence which they attribute to a change in growing season that affected the relationship between temperature and the S18 values. Would this change in growing season and the resultant non-linearity not be a concern for other decades of rapid warming throughout the record? Similarly could there not be additional causes for the divergence which could be considered viable?

[5] The authors state that the i-STREC values are representative of the natural variability of the region based on the relatively good correlation ( $r^2=0.64$ ) with the CRU TS series; however, the authors also note that both series were smoothed at 9-year

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intervals therefore it is expected that the strength of this relation may be somewhat overstated;

[5] The authors state that a warm phase of the AMO could cause the warm period observed during the MWP but they also state that there was an overall decline in temperatures consistent with orbital cooling (reduced summer insolation). It would seem that there is little need in speculating as to the relationship with the AMO during that time period as there is not a clear understanding of the AMO state during the MWP. Sicre et al (2014) have argued that during the MWP there was enhanced Labrador Current activity which would seemingly argue against North Atlantic SSTs being the major driver of regional warming at that period.

[7] The authors note the difference between reconstructed MWP summer temperatures in their reconstruction and prior works which have found unprecedented warmth in recent decades relative to that period at the hemispheric scale. Here it is worth noting that this is not necessarily contradictory in that the reconstructions have different target seasons (annual versus summer). As anthropogenic warming at high latitudes has a strong winter signal relative to summer, it would not be unexpected that summer air temperature reconstructions may give different results than an annual average. According to Way and Viau (in press), winter air temperatures in the region have increased at a much faster rate than summer air temperatures therefore this point should be considered.

[8] In discussing the tree ring response to volcanic events it is worth discussing Tingley et al (2014) - particularly given the high latitude study area in question.

[9] Brown et al (2012) should also be mentioned in the text given that it also examines climate in this region.

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Interactive comment on *Clim. Past Discuss.*, 11, 521, 2015.

**CPD**

11, C37–C41, 2015

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