

## ***Interactive comment on “Changes in growth of pristine boreal North American forests from 1950 to 2005 driven by landscape demographics and species traits” by M. P. Girardin et al.***

**Anonymous Referee #1**

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The authors address questions pertaining to the growth of boreal tree species, including how observed tree growth changed over a recent fifty year period, how growth trends varied with stand demographics, and how observed patterns compared with process-based model predictions. They find a continuum in the magnitude of fifty-year trends in tree growth index (TGI), with decreases at 42%, increases at 16%, and no change at 42% of the 242 plot sample. Positive trends were more prevalent in jack pine and mature stands relative to black spruce stands and over-mature stands.

The paper makes a valuable contribution by bringing together numerous data sources and applying innovative analysis techniques. Research questions, methods, and re-

C60

sults are well communicated despite a high level of complexity. I recommend the study be published.

My only major comment is that, without a stronger indication that the standardization is working, the conclusion of significant changes in boreal tree growth and subsequent analysis of demographics-stress interaction needs to be accompanied by a more earnest description of the uncertainty. The authors state that “all tree-ring data were processed using a procedure that aims at preserving low-frequency trends” and cite Cook and Peters (1997). The cited study focused on specific concepts of standardization, yet did not discuss the overall capacity to differentiate low-frequency environmental signals from the age decline to the extent that it has in numerous other papers. Moreover, those authors were later involved in advancing “regional curve standardization” as an alternative to the site-specific standardization method because it was “fraught with uncertainty” (Esper et al. 2003). If understood correctly from examples in Fig. 1, age-response functions were fit to relatively short individual core time series, which seems like it would have the flexibility necessary to remove a finite component of any low-frequency anthropogenic signals. What reasons do we have to believe the applied standardization was successful in differentiating multi-decadal environmental signals from age decline and all the additional gap dynamics present in densely occupied stands?

It is interesting that model trends were more positive than the TGI trends. Is this an artifact from including simulations at younger ages?

Ultimately, it would be valuable to evaluate tree growth in gravimetric or volumetric units. TGI is only one dimension of a three-dimensional problem and “SD units yr<sup>-1</sup>” is difficult to interpret. Is the relative magnitude of a trend in TGI directly comparable with that of model NPP?

Pg. 1031, line 18: Should BF3 be in the equation? It says below (line 28) that species presence also affects TGI.

C61

Pg. 1033, line 15: These trends are valuable information. To facilitate comparisons, it might be helpful to also report the trend in relative terms (i.e., relative to long-term mean NPP).

References: Cook, ER, and K Peters. 1997. Calculating unbiased tree-ring indices for the study of climatic and environmental change. *Holocene* 7: 361-370.

Esper, J, ER Cook, PJ Krusic, K Peters, and FH Schweingruber. 2003. Tests of the RCS method for preserving low-frequency variability in long tree-ring chronologies. *Tree-Ring Research* 59: 81-98.

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