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**Title:** *Temperature and Vegetation Seasonality Diminishment over Northern Lands*

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Global temperature is increasing, especially over northern lands (>50° N), due to positive feedbacks. Because this increase is most pronounced in winter, temperature seasonality ( $S_t$ ) – conventionally defined as the difference between summer and winter temperatures – is diminishing over time, analogous to its equatorward decline at an annual scale. The initiation, termination and performance of vegetation photosynthetic activity are tied to threshold temperatures. Trends in the timing of these thresholds and cumulative temperatures above them may alter vegetation productivity, or modify vegetation seasonality ( $S_v$ ), over time. Therefore, the relationship between  $S_t$  and  $S_v$  is critically examined here with newly improved ground and satellite data sets. The observed diminishment of  $S_t$  and  $S_v$  is equivalent to 4° and 7° (5° and 6°) latitudinal shift equatorward during the past 30 years in the Arctic (Boreal) region. Analysis of simulations from 17 state-of-the-art climate models indicates an additional  $S_t$  diminishment equivalent to a 20 degree equatorward shift this century. How  $S_v$  will change in response to such large projected  $S_t$  declines and the impact this will have on ecosystem services is not well understood. Hence the need for continued monitoring of northern lands as their seasonal temperature profiles evolve to resemble those further south.