

Boreal Cool Season Temperature Regimes: Trends and Low Frequency Mode Modulation

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During boreal winter, transient anomalous temperature regimes (ATRs), such as cold air outbreaks (CAOs) and warm waves (WWs), provide important regional influences upon the continental US. We review current knowledge regarding the long-term variability in ATRs and the modulation of ATRs by prominent low frequency modes. We also introduce a framework for validating ATR behavior in models.

There is little evidence of significant recent trends in ATRs over the continental US. On interannual time scales, CAOs are modulated by the (a) NAO over the southeast US and (b) PNA over the northwest. WW frequency is modulated by (a) the NAO over the eastern US and (b) the combined influence of the PNA, PDO and ENSO over the south. The influence of ENSO upon ATRs is found to be mainly limited to a modest modulation of WWs over the South. Parallel analyses of CMIP5 historical simulations indicate that the collective influence of low frequency modes upon ATRs is generally underestimated by CMIP5 models. We suggest that predictions of future ATR behavior are limited by the climate models ability to represent the evolving behavior of low frequency modes of variability, particularly the PDO and NAO.