Abstract Title:
Stationarity and Climate Response Signals of Long-Term Oscillations in Tree-Ring Data from the Southeastern United States

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Abstract:
The main objective of this study was to help our understanding of how large-scale climate patterns affect tree growth in the Southeast and the importance of the interaction between climate oscillations and ecosystem. Three tree-ring chronologies obtained from field collection and previous research were used to represent tree growth in the Southeastern U.S. along a longitudinal transect. Tree species included Table Mountain pine (Pinus pungens), longleaf pine (Pinus palustris), and shortleaf pine (Pinus echinata). Correlation and response function analyses were used to examine the climate-tree growth relationship at three sites. The temporal stationarity of climate signals, including divisional climate variables and the large-scale climate oscillation indices, was tested using moving correlation analysis in DENDROCLIM2002. Results showed that winter temperature was the only limiting climate factor at the western mountain site, while moisture was more important for tree growth in the eastern mountain and coastal area sites. However, all significant climate factors were not stable over periods studied. The tendency of a shift from precipitation signal to temperature signal is notable in mid-20th century. The North Atlantic Oscillation, Atlantic Multidecadal Oscillation, Pacific Decadal Oscillation, and El Niño-Southern Oscillation were the four oscillations used for studying spatial variations of trees' response. Although non-stationarity also existed, gradient features of some significant climate index signals were apparent along this coastal-inland transect. Land-sea boundaries and high mountains may determine the climate response patterns in the Southeast, as well as other factors such as microenvironment, human disturbance, and biological reaction of trees to climate change.

Keywords:

tree-ring network, dendrochronology, climate oscillations, southeastern United States

New Query