Patterns of moisture source and climate variability in the southeastern United States: A four-century seasonally resolved tree-ring oxygen-isotope record

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This study presents a climate reconstruction utilizing a seasonally resolved 417-year oxygen-isotope record of tree rings from southern Georgia, United States (1580–1997 CE). Oxygen isotopes within the cellulose predominately reflect moisture source observed on a seasonal scale between earlywood and latewood growth. Signatures of large climate oscillations were captured in modern and subfossil wood. Spectral and wavelet transform analyses of seasonally resolved oxygen isotopes showed distinct periodicities coinciding with the Atlantic Multidecadal Oscillation and other major climate oscillation phenomena. Oxygen-isotope values in latewood growth revealed a significant correlation with North Atlantic sea surface temperature anomalies. This correlation suggests that the precipitation source was strongly influenced by fluctuations in the Atlantic Multidecadal Oscillation and teleconnections with other major climate phenomena such as the North Atlantic subtropical high-pressure system, El Niño Southern Oscillation, and Pacific Decadal Oscillation. These results emphasize the utility of oxygen isotopes in tree rings for revealing seasonal influences associated with major climate drivers over centuries and enhance our understanding of long-term climate behavior on a detailed scale.