Investigating seasonal precipitation variations with high-resolution carbon isotope analyses of annual tree rings

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Seasonal variations in precipitation were recently shown to dominate the mean intra-annual variation in the carbon isotope composition of evergreen wood ($\delta^{13}C_{cellullose}$) across a range of biomes (Schubert & Jahren, 2011). Using a new high-resolution carbon isotope dataset of cellulose, we investigated this relationship further. At five FLUXNET sites spanning a significant gradient of moisture (MAP range of 280 to 900mm) and temperature (MAT range of -1 to 18^{o}C) we collected tree core samples and extracted cellulose at high-resolution (≥3 cores per site). For each site, we explored whether the inter-annual variability of seasonal precipitation over the past 15 years dominated the inter-annual variations in the amplitude of $\delta^{13}C_{cellullose}$. Using the process-based model MuSICA (Ogée et al., 2009) that links $\delta^{13}C_{cellullose}$ signals in tree rings to environmental conditions, helped us interpret the observed patterns and explore the sensitivity of $\delta^{13}C_{cellullose}$ to light and temperature as these drivers may gain importance when trees grow without moisture limitations.

References

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