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# Calcium [Ca] tracers using X-Ray fluorescence (XRF) as a potential high throughput measurement technique in ringless highly diverse tropical ecosystems.

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Our understanding of plant responses to climate change, and their feedbacks to the climate system, rely heavily on consistent long-term observations. Yet, measuring tropical plant species is particularly demanding and results in a lack of spatial and temporal coverage to build relationships between forest dynamics and climatology in the central Congo Basin. Here dendrochronology and wood chemical analyses might provide important ecophysiological information addressing this knowledge gap, especially in tropical forests where the lack of a pronounced seasonality often makes it difficult to discern variability in xylem cell size and density. Conventional optical dendrochronology measurements therefore have strong limitations within these ecosystems, however chemical and elemental analysis can provide additional information. For example, seasonal fluctuations in the carbon (δ13C) and oxygen (δ18O) stable isotope composition of cellulose is linked to variations in local climate and changes in physiological function. A fewstudies have shown that intra-annual and inter-annual variations in the content of calcium [Ca] in tropical tree rings can be used to age tropical trees without rings, constraining estimates of biomass accumulation. Other studies have linked calcium accumulation in different plant organs to the rate of transpiration in trees making it a powerful predictor of inter-annual variability in rainfall for monsoon regions and a strong novel proxy for drought stress.

Here we present the first results of X-ray Fluorescence (XRF) measurements conducted at the SOLEIL synchrotron and analysis of [Ca] and [Sr], combined with ancillary data such as anatomical, stable isotope and climatological measurements for three tropical tree species. Most species show variability in calcium corresponding to previous proxy measurements, corroborating previous results and showing the potential of non-destructive XRF measurements of wood samples in support of ecophysiological research. The potential of high throughput scanning, in contrast to stable isotope measurements, opens possibilities to gather data on the large scale required to understand diverse tropical forest ecosystems and their responses to (drought) disturbances.