Tropentag, October 9-11, 2007, Witzenhausen

"Utilisation of diversity in land use systems:
Sustainable and organic approaches to meet human needs"

Climatic Signals in δ13c Time Series from Tropical Tree Rings

Esther Fichtler, Martin Worbes

Georg-August-Universität Göttingen, Institute of Agronomy in the Tropics, Germany

Abstract

Terrestrial paleoclimatic records from tropical regions are essential to our understanding of past changes in the Earth's climatic system, equator-pole linkages, and the sensitivity of tropical regions to future climate change. While studies on stable carbon isotopes in trees from temperate zones provide manifold paleoclimatic data, tropical trees are still disregarded in this context. Therefore this study examined the variability of inter annual carbon isotopic pattern in several tree species from various tropical climates and identified the potential of these time series to serve as proxies for the reconstruction of past climatic events. Samples of nine broadleaved tree species from various tropical sites along a climatic gradient were investigated concerning their δ^{13}C values. The inter annual variability between species and sites was studied. Further the relation to precipitation time series and the potential for cross dating time series was analyzed.

Tropical tree species show a similar variability in carbon isotopic composition as temperate species. The radial distribution of carbon isotopes varied considerably between species and within trees. Local site conditions dominate the isotopic signal. Correlation between precipitation and tree ring δ^{13}C was significantly negative. The significant correlations found were even strong, independent of the humidity of the sites or the phenology of the trees. Successful cross dating of a tree ring δ^{13}C time series with annual precipitation time series highlights the potential of carbon isotope measurements for tropical tree ring analytical studies. Tropical broadleaved trees capture a carbon isotopic signal in their annual rings and can therefore be used as a source of past isotopic data.

Keywords: Cedrela, stable carbon isotopes, Swietenia, Terminalia, tree rings

Contact Address: Esther Fichtler, Georg-August-Universität Göttingen, Institute of Agronomy in the Tropics, Grisebachstrasse 6, 37124 Göttingen, Germany, e-mail: enaumer@gwdg.de