Trees (2011) 25:1–2
DOI 10.1007/s00468-010-0530-x

EDITORIAL

Editorial note for the special issue on 'Tropical Dendroecology'

Achim Bräuning

Published online: 24 December 2010

It is not very long ago that tree-ring studies on tropical trees were in their pioneering stage, being regarded as exceptional studies. Since dendroecology evolved in the temperate climate zones, the majority of dendroecologists trusted in the paradigm that trees growing in tropical climates do not exhibit annual growth rings and hence are not suitable for dendroecology, a discipline based on the principle of exactly datable annual growth structures formed in the wood of trees. The vast majority of the present tree-ring studies is still carried out in extra-tropical environments, whereas 'the Tropics' are still regarded as a region where analyzing annual growth structures in trees is a challenging task. However, 'the Tropics' are by far less homogeneous. The high phanerophyte biodiversity of tropical forests and woodlands, the vast variety of wood anatomical structures and the occasionally faint growth boundaries and tangential growth inhomogeneity of tropical trees are some of the obstacles dendroecologists are facing in studying tropical trees. While temperature is rarely a growth-limiting factor in tropical environments except at high-altitude tree line ecotones, moisture availability and the seasonality of precipitation causes a large number of hydroclimates within the Tropics (located within the Tropic of Capricorn and the Tropic of Cancer) and the subtropics, e.g., in summer-hot regions with a winter-rainfall regime. The number and length of dry seasons, when evapotranspiration exceeds precipitation, and edaphically controlled soil water capacity determine the individual water resources available for trees and hence their physiological activity. Topographic and hydrological factors may strongly alter the general climatic conditions, leading to drought-prone climatic conditions in mountain basins or in the leeward side of high mountain systems, or to seasonal water input or even anoxic conditions in riverine inundation forests. Thus, growth conditions may alter from everhumid to almost completely arid within areas outlined under the same climatic regime. This makes tropical environments more complex and leads to a high spatial and temporal variability of growth patterns of trees. It is exactly this high spatio-temporal variability of moisture regimes that make trees in tropical regions such interesting recorders of the environmental history.

The past years witnessed a rapid increase of dendroecological case studies in the Tropics around the world, questioning the aforementioned paradigm or at least leading to much less generalized conclusions about tree growth in the Tropics. With the development of more sophisticated techniques, especially in wood anatomy studies, in the documentation of cambial dynamics, and in high-resolution stable isotope techniques with intra-annual resolution, more and more insight of the growth patterns and controlling environmental factors of tree growth in tropical regions has been gained. Thus, while in many regions dendroecology is still in its infancy, basically detecting the annual nature of tree growth boundaries, it is in the state of becoming an applied science in other areas.

This special issue provides an outline of applications of new techniques and state-of-the art approaches in tree-ring research in different tropical environments. The majority of the contributions were presented in a session on 'Tropical Dendroecology' held at the first joint conference of the Germany-based GTOE (Society for Tropical Ecology) and the ATBC (Association for Tropical Biology and Conservation) held in Marburg (Germany) during 27–30 July

A. Bräuning (✉)
Institute of Geography, Friedrich-Alexander-University Erlangen-Nuremberg, Kochstr. 4/4, 91054 Erlangen, Germany
e-mail: abraeuning@geographie.uni-erlangen.de

2009. These contributions were supplemented by a review paper on the topic of tree-ring research in the Tropics and by interesting case studies on dendroecology in African agroforestry species and tree-ring detection in neotropical lianas. The variety of topics covered ranges from basic sciences like the detection of seasonal growth dynamics in different rainfall regimes, forest types, and tree life forms to applied studies in tropical forestry and dendroclimatology. Although, dendroecology in many regions of the tropical world is still in at a preliminary stage compared to temperate zones, it is evident that dendroecology is a vividly emerging field in studying the reaction of tropical ecosystems to climate variations, human-induced land-use changes and in evaluating the role of tropical ecosystems in the global carbon budget. Tropical dendroecology might offer approaches and methods to study a variety of issues related to tropical ecology in general. We hope that readers interested in such general topics might profit from the present special issue of *Trees*.

Achim Bräuning