



Tropentag, October 5-7, 2011, Bonn

“Development on the margin”

Climate Signals in Multiple Tree-ring Proxies (ring width, $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$) from Tropical Trees: An Example on *Tectona grandis* from Indonesia

KARINA HENNIG¹, GERHARD HELLE¹, INGO HEINRICH¹, BURKHARD NEUWIRTH², OKA KARYANTO³

¹Helmholtz-Centre Potsdam, GFZ German Research Centre for Geosciences, Climate Dynamics and Landscape Evolution, Germany

²University of Bonn, Department of Geography, Germany

³Gadjah Mada University, Faculty of Forestry, Indonesia

Abstract

Extreme climate events have profound socio-economic impacts on human population across the tropics. Climate in Indonesia is mainly dominated by the equatorial monsoon system and tends to be linked to El Niño-Southern Oscillation (ENSO) events which results often in extensive droughts and floods over the Indonesian archipelago with devastating effects on the population. Hence, high-resolution proxy climate records (e.g. tree-ring records) can improve our understanding and prediction of such events, but are extremely scarce in the tropics. This study presents tree-ring width and stable isotope ($\delta^{13}\text{C}$ and $\delta^{18}\text{O}$) records developed from Indonesian teak (*Tectona grandis*). This species is one of the few showing annual growth boundaries allowing to establish precisely dated chronologies to reconstruct climatic or environmental changes. Ring width chronologies from Indonesian teak have frequently been used for climatic reconstructions. However, the influence of other climatic or environmental parameters on Indonesian teak has not been studied yet. For testing the relevance of changes in temperature and precipitation dynamics we follow a multi-parameter approach using tree-ring width and stable isotopic composition in tree rings. To this end, tree cores of *T. grandis* were developed into a more than 200-year long tree-ring widths chronology and 100-year long $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ records, whereas the latter one are the first long-term stable isotope records from this region. Relations between tree-ring (tree-ring width, stable isotopes) and meteorological data demonstrate that the tree growth is mostly influenced by the seasonal precipitation. First results of highly resolved intra-annual $\delta^{18}\text{O}$ studies will be presented, which may provide more detailed insights into the influence of seasonally changing precipitation amounts on stable oxygen isotope distribution in tree rings and related tree growth. This may improve land-based rainfall reconstructions based in multiple tree-ring parameters.

Keywords: Climate variability, Indonesia, stable carbon and oxygen isotopes, *Tectona grandis*, tropical dendrochronology, tropics