

RESILIENCE OF TROPICAL ECOSYSTEMS – FUTURE CHALLENGES AND OPPORTUNITIES

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Editors

Chris J Kettle and Ainhoa Magrach
Ecosystem Management
Department of Environmental
System Science
Universitaetstrasse 16, CHN G75.1
ETH Zurich
8092 Zurich Switzerland

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Wendy Martin

Front cover photo

Hirzi Luqman

Back cover photo

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Concept & Layout

roman.tschirf@gmail.com

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RESPONSES TO SEVERE DROUGHT BY TROPICAL FOREST TREES

Patrick Meir^{1,2}, Lucy Rowland¹, Antonio CL da Costa³, Maurizio Mencuccini¹, Bradley Christoffersen¹, Steel Vasconcelos⁴, Bart Kruijt⁵, Leandro Ferreira⁶

¹*University of Edinburgh, Edinburgh, UK, pwmeir@gmail.com*

²*Australian National University, Canberra, AU, pwmeir@gmail.com*

³*Universidade Federal de Para, Belem, BR*

⁴*Embrapa, Belem, BR*

⁵*Alterra, Wageningen, NL*

⁶*Museu Paraense Emilio Goeldi, Belem, BR*

Tropical forests responses to drought include reductions in assimilation and growth, but under strong drought significant mortality can occur leading to substantial changes in the cycles of carbon and water, also affecting canopy structure and species composition. Understanding of the drought-mortality process is particularly limited for tropical forests, despite the risk of drought to these ecosystems during the coming decades. We present new findings from the only current long-term 'ecosystem-scale' (1 ha) rainfall manipulation experiment in tropical rainforest, the Esecaflo experiment at Caxiua National Forest, Para State, Brazil. Throughfall has been partially excluded from experimental forest at the Esecaflo experiment for more than a decade. We have previously demonstrated a capacity to model short-term physiological responses well, but longer term physiology and ecological dynamics remain challenging to understand and represent. In particular, high mortality and increased autotrophic respiration following extended drought are poorly understood phenomena, and their interaction with hydraulic responses and limitations needs to be characterised. We present initial data that combine carbon use and hydraulic metrics, comparing drought-vulnerable and non-vulnerable species that have experienced extended soil moisture deficit, as imposed in the experiment, and discuss modelling implications for this and other tropical forest regions.

