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Tropical Ecology and Society
Reconciliating Conservation and Sustainable Use of Biodiversity

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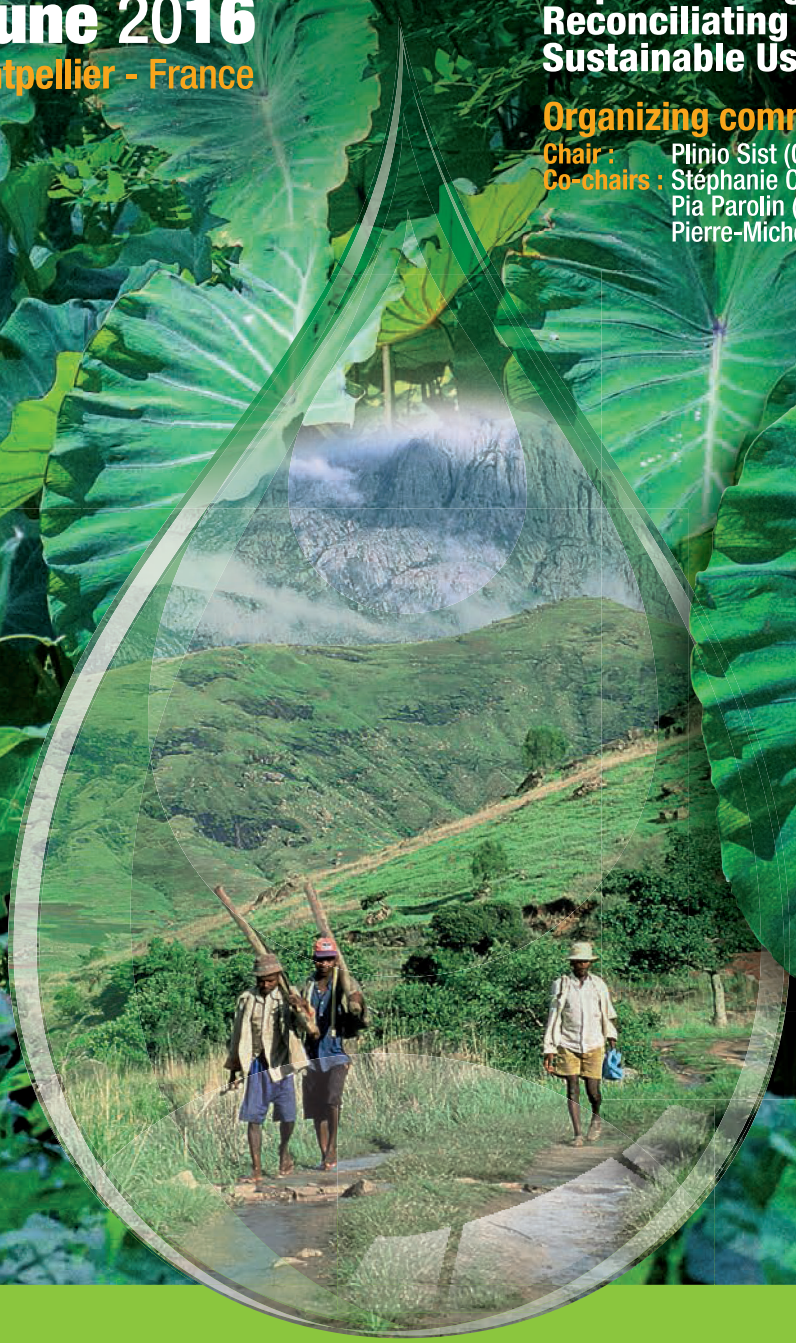

PROGRAM & ABSTRACTS

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O56-06 – S56 *Towards refined carbon budgets of managed forests*
Thursday 23 June / 14:30-17:00 – Einstein

Species richness and ecosystem stability control carbon use efficiency of tropical forests

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Tropical forests are characterized by their high photosynthetic activity; however results from pantropical studies show that only 30% of the products from photosynthesis are allocated to new biomass compared to 50% in temperate systems. Mechanisms explaining this low carbon use efficiency (CUE) in tropical forests are still missing. I present a synthesis of studies from two tropical sites with a similar methodological set up to evaluate the ecophysiological responses of tree communities to diversity effects and forest disturbance. Xylem sap flux derived gross primary productivity (GPP) was modelled using eddy covariance data. This was done for a forest plantation with plots of varying tree species diversity in Panama and an old-growth forest with a distinct disturbance gradient in an Amazonian moist lowland forest. Information on net primary productivity (NPP) was calculated from inventory data. The multiple scale analysis provides evidence that GPP increases with tree species richness, but stays relatively stable with forest disturbance intensity. However, CUE decreases with tree species richness, but increases with forest disturbance intensity. Thus, the high diversity of tropical forests and the steady state conditions of tropical old growth forests might explain their low CUE.

O56-07 – S56 *Towards refined carbon budgets of managed forests*
Thursday 23 June / 14:30-17:00 – Einstein

Seeing the woods through the saplings: using wood density to assess post-disturbance recovery of human-modified tropical forests

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Most of the world's humid tropical forests have already been modified by human activities such as selective logging, understory fires, and clear-felling. Despite the ubiquity of these human-modified forests, we have a limited knowledge of their potential to recover key traits linked to ecosystem functioning. Here we propose a novel approach to further our understanding of tropical forests recovery to human-driven impacts. We analyze the wood density of trees and saplings in 121 plots (0.25ha each) located across a disturbance gradient in the eastern Brazilian Amazon. Wood density (wd) is a key plant trait, closely linked to important ecosystem functions and services, such as carbon storage. Saplings respond faster to human impacts than large trees and effectively represent the future of a forest stand, thus allowing us to make valuable inferences about the future ecological state of a forest. We combined the analysis of 31,095 stems with a 22-year chronosequence of satellite imagery data and plot-level environmental variables, including recovery time of forest plots, distance to the nearest forest edge, density of lianas, the amount of surrounding forest cover, soil clay content and mean plot slope. We found that wood density of saplings in undisturbed primary forests (wd = 0.70; SE = ±0.004) is significantly higher than in disturbed primary forests (wd = 0.59; SE = ±0.007) and in secondary forests (wd = 0.58; SE = ±0.016), indicating that the human-modified forests of the future may present a different set of traits, and therefore perform a different set of functions, than the future undisturbed forests. We also found that forests located less than 130m away from human-made edges or with high density of lianas (≥900 stems per hectare) may be impeded in their recovery from disturbance or clear-felling. These results indicate that future human-modified tropical forests may hold less carbon than currently expected. We urge scientists, governments and the civil society alike to start addressing the cryptic but severe impacts of human disturbances in remaining areas of standing primary forests and regenerating secondary forests.