53rd ATBC 2016

Annual Meeting of the Association for Tropical Biology and Conservation

19-23 June 2016
Le Corum, Montpellier - France

Tropical Ecology and Society
Reconciliating Conservation and Sustainable Use of Biodiversity

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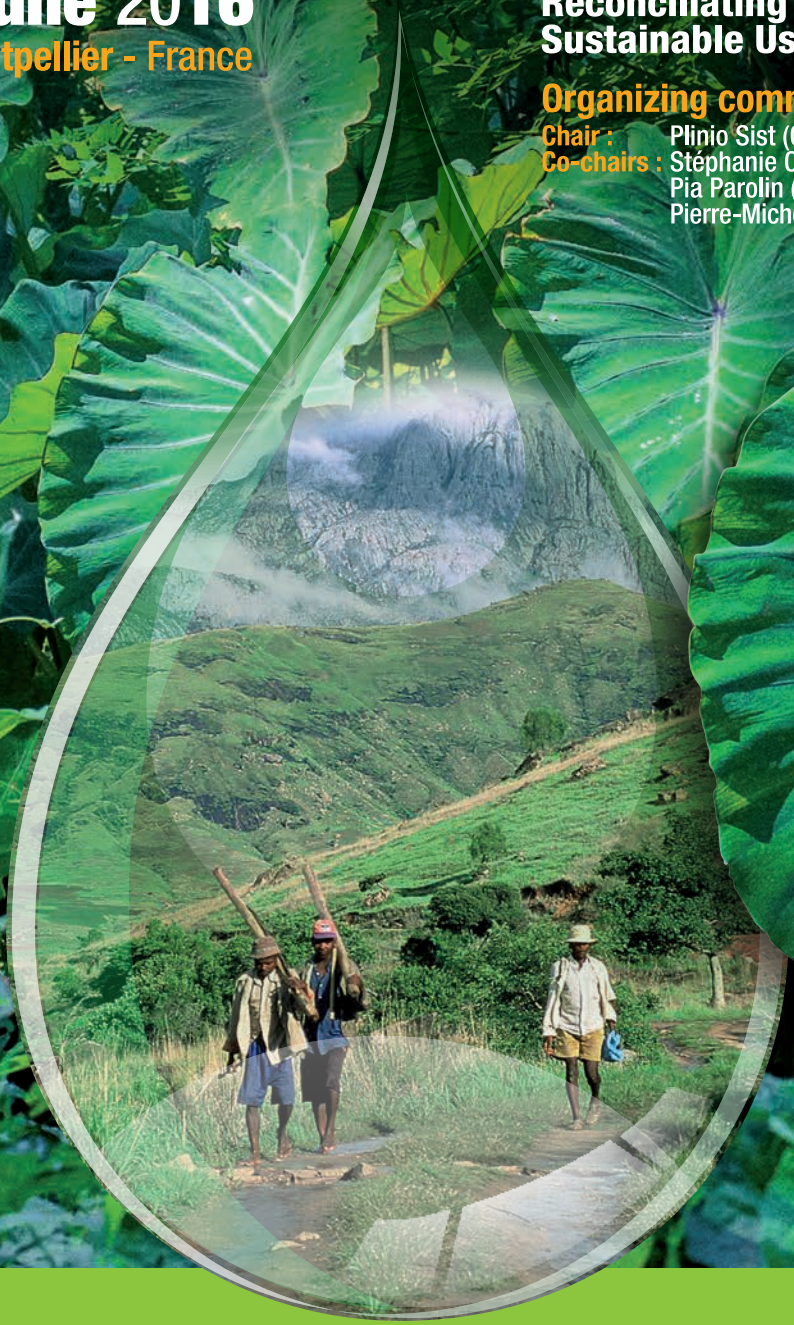

PROGRAM & ABSTRACTS

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O60-Introduction – S60 *Management impacts on biodiversity and carbon/nutrient balances in the tropics*
Thursday 23 June / 08:00-10:00 – Sully3

The role of soil characteristics on forest structure and dynamics in extremely poor tropical soils

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Tropical ecosystems in general and tropical forests in particular reembleone of the major factors in the global carbon cycl. Yet, rising atmospheric CO2 concentrations, increasing nitrogen deposition and constant to decreasing supplies of other nutrients are likely to alter tropical ecosystems in an unprecedented way. An ever increasing proportion of the tropics face direct anthropogenic impacts, be it by intensified grazing, increasing forest exploitation for timber and NTFPs, « sustainable » forest management or land conversion for temporal or permanant agricultural use. Changes in species composition and probable biodiversity loss will feedback on the functional composition and the carbon sequestration potential.
A comprensive view on tropical ecosystems needs field studies on reference ecosystems, experiments on and monitoring of management impacts in order to understand the consequences of anthropogenic influence. For assessing the global and long term impact of these changes modelling is an essential tool since it translates the identified underlying mechanisms into a framework of changing ecosystem functioning.
This becomes even more important when considering that ecosystem behavior is goverened by a multitude of nonlinearities, exhibits hysteres effects or even may develop sensitive dependence on initial conditions, i.e. become chaotic.

O60-01 – S60 *Management impacts on biodiversity and carbon/nutrient balances in the tropics*
Thursday 23 June / 08:00-10:00 – Sully3

The role of soil characteristics on forest structure and dynamics in extremely poor tropical soils

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Background: Tropical forests stock large amounts of biomass and play a key role on the global C balance. But tropical forest productivity is expected to be nutrient-limited because tropical forests generally grow on substrates with low nutrient content. However, the role of soil characteristics in the interplay of tropical forest structure and dynamics is yet poorly studied. We investigated if soil characteristics can be used: 1) to predict forest structure (tree diameter, stem density, above-ground biomass) and dynamics (growth rate, mortality rate, above-ground productivity) and 2) to explain the interplay between forest structure and dynamics in an exceptionally nutrient-poor region.
Method: We used permanent forest plots data on more than 34.000 trees to link forest structure and dynamics to soil characteristics (nutrient content, texture and litter quality) across 9 sites in French Guiana.
Results: Quadratic diameter, biomass, growth rate, mortality rate and productivity did not co-vary with site-level changes in soil nutrient availability. Nutrient content in litter co-varied positively with quadratic diameter. Growth rate was negatively correlated with stem density and biomass; mortality rate was positively correlated with growth rate but negatively correlated with biomass.
Discussion: Soil nutrient availability per se is probably not the main driver of forest structure and dynamics in these exceptionally nutrient-limited soils in French Guiana. The lack of sensitivity to site-level changes in soil fertility suggests that alternative nutrient-driven mechanisms other than the direct absorption of nutrients from soil, such as the uptake of nutrients from litter or nutrient resorption during leaf senescence may control forest structure and dynamics, together with other abiotic factors such as water availability. The role of soil characteristics on forest structure variables possibly has an indirect effect on forest dynamics. We hypothesise that the large accumulation of biomass is a crucial strategy to accumulate nutrients and reduce the dependency on soil nutrient availability. Ecosystem-level strategies and adaptations to extremely low soil nutrient availability combined with the long-term low disturbance regimes in French Guiana may help explain the low productivity and the high accumulation of biomass compared to more fertile tropical forests.