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Reconciliating Conservation and Sustainable Use of Biodiversity

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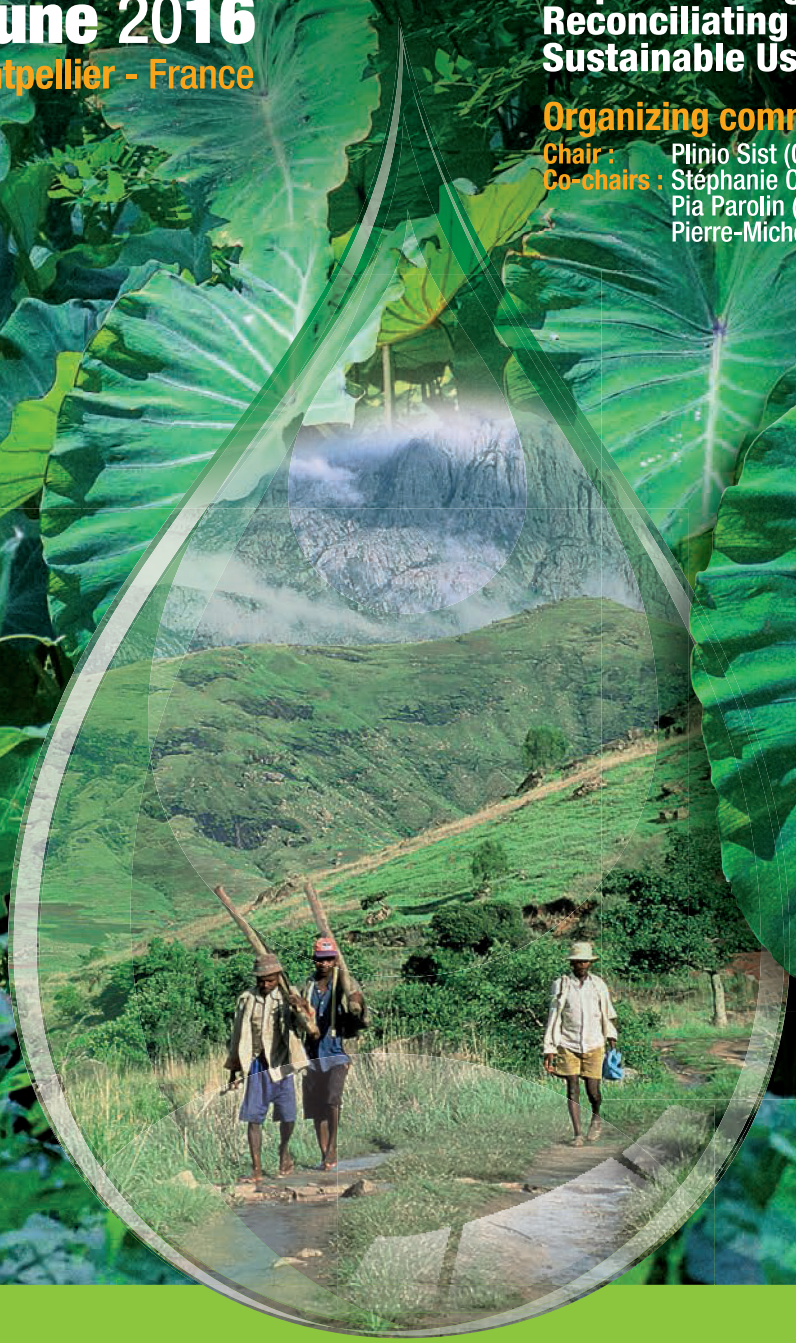

PROGRAM & ABSTRACTS

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O57-06 – S57 *Intraspecific variation in tropical trees – implications for tropical forest responses to global change*
Thursday 23 June / 08:00-10:00 – Sully I

Does intra-specific variation prevent division of tropical trees into drought sensitive and resistant groups?

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Tree diversity in tropical rainforests is higher than in any other forest in the world. Accurate simulation in dynamic global vegetation models (DGVMs) of the response to drought by these forests is of great importance because tropical forests substantially affect our climate and atmosphere. As DGVMs cannot simulate the full spectrum of variation amongst tropical trees, and research is therefore needed to test how best to simplify both intra- and inter-specific variation, but represent the key processes with sufficient accuracy. Using data from the world's longest running tropical rainforest through-fall exclusion experiment (TFE) we raise the issue of whether it is feasible to view tropical trees in the context of being either sensitive or resistant to drought-induced mortality at the scale of land-surface models used for coupling in Earth system model frameworks. Using data from taxa sorted into drought sensitive and drought resistant functional groups, we show drought responses to be mediated by key plant functional traits. However, despite a clear division in drought responses between species according to their drought sensitively, we find that tree size is a key factor introducing intra-specific variation in drought-induced mortality risk. These results suggest new tropical forest plant functional types are a useful framework for revising DGVMs, if the effect of tree size can be accounted for.

O57-07 – S57 *Intraspecific variation in tropical trees – implications for tropical forest responses to global change*
Thursday 23 June / 08:00-10:00 – Sully I

Intraspecific variation of seedling drought resistance across a strong rainfall gradient at the Isthmus of Panama

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Background: Intraspecific variation, arising from both genetic variation and phenotypic plasticity, can significantly influence ecological dynamics and species' responses to climate change. In tropical forests, which are predicted to experience pronounced changes in rainfall patterns, the existence and extent of intraspecific variation in species' environmental tolerances remains poorly understood.
Methods: We are employing an interdisciplinary approach, combining tools from plant physiology, and community ecology, to assess intraspecific variation of drought resistance in 14 focal species, using a steep natural rainfall gradient in central Panama as a model system. Specifically, common garden and reciprocal transplant experiments are combined with measurements of physiological traits directly relevant for plant drought resistance, as well as with studies of genetic structure and gene flow (see talk in session 'next generation forest science').
Results: Data from the first year indicate that intraspecific variation of seedling drought resistance across the pronounced rainfall gradient is minimal: seedlings of different origin did not vary in mortality in a common garden drought experiment, seedlings did not have a home advantage compared to foreign seedlings in a reciprocal transplant experiment across the rainfall gradient, and physiological traits related to plant drought resistance did not vary among origins in a way consistent with adaptive intraspecific variation.
Discussion/Conclusions: Intraspecific differences in drought resistance of populations of different origins across the rainfall gradient may only play out under extreme drought conditions, such as those currently experienced under El Niño conditions, and expected more frequently with climate change. The currently ongoing extreme El Niño event will allow us to evaluate this possibility. Additionally, or alternatively, high gene flow may minimize the potential for genetic and associated trait differentiation among populations. This would imply a low potential for in situ adaptation to higher frequency and intensity of drought with climate change.