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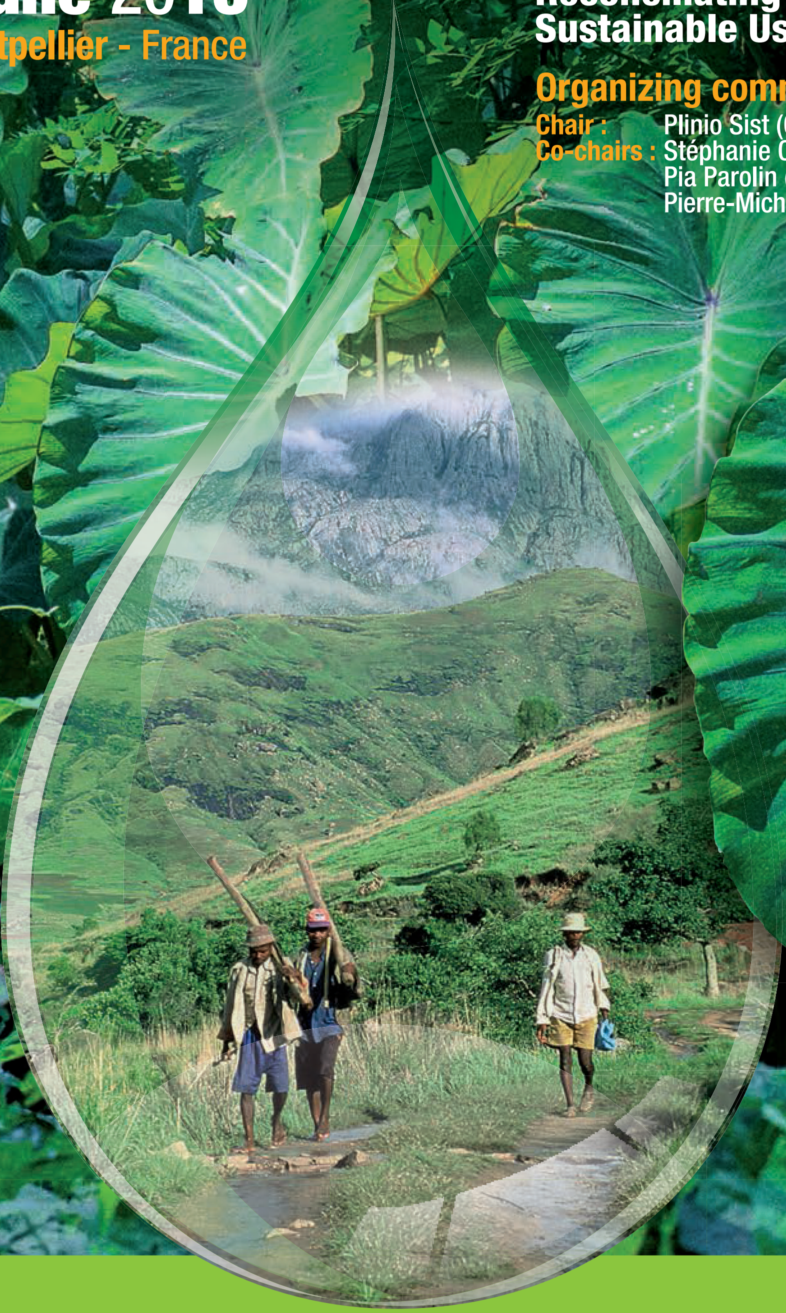

PROGRAM & ABSTRACTS

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O29-11 – S29 *Impacts of drought on tropical forests: processes and tipping points*
Tuesday 21 June / 10:00-15:30 – Barthez

Is sap flow a good indicator of drought-induced mortality risk in tropical rainforest.

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In the coming century increased drought intensity and frequency is likely to be a key driver of increasing tree mortality rates within tropical rainforest. However drought-induced mortality risk within a diverse tropical rainforest setting is complex and remains poorly understood. Our recent results, from a tropical rainforest through-fall exclusion experiment (TFE) in Amazonia showed hydraulic vulnerability to be greatest in the largest trees and in taxa which are more sensitive to drought. Here we expand upon existing findings from the TFE using sap-flow data for replicate trees from sensitive and resistant taxa and a corresponding control plot. Sap-flow data were collected continuously throughout 2015, on tree taxa known to be sensitive and resistant to drought, enabling the response to a strong El Niño event to be captured alongside the experimental drought. Our results suggest that trees on the TFE experience far greater seasonal declines in sap-flow during the El Niño, than corresponding trees from the non-droughted control plot. Hourly sap flow is strongly correlated with vapour pressure deficit and radiation on both plots, however seasonal changes in diurnal sap-flow patterns differ considerably between the TFE and control and between the tree taxa which are sensitive and resistant to drought. Our data demonstrate that trees which are already suffering from existing low soil water potentials suffer far greater restrictions in sap flow and whole tree productivity during intense dry seasons, such as that implemented by the 2015 El Niño event. These data support and extends our previous findings, that hydraulic vulnerability is likely to be the key factor determining drought-induced mortality risk.

O29-12 – S29 *Impacts of drought on tropical forests: processes and tipping points*
Tuesday 21 June / 10:00-15:30 – Barthez

Large-scale modelling of the impact of drought on the land carbon cycle

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We present model-based findings on the role of tropical ecosystems in the control of atmospheric CO2 growth rate in response to ENSO climate variability (Jung et al., 2016), and the impact of the changes in the dry season on terrestrial productivity over the recent past (Murray-Tortarolo et al., 2016). Furthermore using global models we investigate the resilience of tropical rainforests to future climate change (Booth et al., 2012; Huntingford et al., 2013). Finally, we present new approaches to model drought response suitable for inclusion in global models.
Each year a consortium of Dynamic Global Vegetation Modelling groups (TRENDY) perform a factorial set of global simulations over the historical period, 1901 – present, to investigate the temporal and spatial trends in the land sink, and to attribute to environmental drivers. Typically around 10 models are forced with reconstructed observed climate, global atmospheric CO2, gridded fields of historical land-use and land cover changes (LULCC), and nitrogen deposition. Results from the TRENDY project (Sitch et al., 2015) will be presented, in particular, how changes in dry season intensity is a key driver of regional net primary production trends (Murray-Tortarolo et al., 2016). Using the TRENDY process-based ensemble and eddy-covariance data-derived empirical models we show how moisture balances cause temperature to dominate land carbon sink interannual variability (Jung et al., 2016).
We show how a large uncertainty in future climate prediction is associated with land carbon cycle processes and their representation in global models (Booth et al., 2012). In addition, we present results from the JULES land surface scheme driven with climate patterns from 22 climate models to investigate the future resilience of tropical rainforest to climate change. Finally, we present some new ideas on how to represent plant response drought in global models with ecosystem demography.