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PROGRAM & ABSTRACTS

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O12-03 – S12 *Free session: Plant physiology, and ecology*
Monday 20 June 20 / 16:00-17:30 – Rondelet

How do the photosynthetic capacity parameters Vcmax and Jmax vary along local nutrient availability gradients in the primary tropical rain forests in French Guiana?

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Nutrient availability exerts a strong effect on photosynthetic C gain across the Amazon Basin. In tropical forests plants are often more limited by P than by N and since nutrient limitation is only recently being implemented into most global vegetation models, considerable uncertainties remain in these models. Most vegetation models represent the photosynthesis process according to the Farquhar-von Caemmerer-Berry model. This model simulates photosynthesis using meteorological data and the photosynthetic capacity of leaves, which is quantified by the maximum rate of Rubisco-catalysed carboxylation (Vcmax) and the maximum rate of electron transport (Jmax). Plant carboxylation rates are limited by one of these processes. The apparent dark respiration during the day light (Rd) is also a significant part of the carbon lost by plants. Since tropical forests account for one-third of global primary production, reliable estimates of these parameters (Vcmax, Jmax and Rd) are of major importance for global C cycle models. We conducted our fieldwork in French Guiana, a country dominated by tropical rainforest covering strong soil fertility gradients. We selected two forests sites covering a gradient of soil types, ranging from tropical white sands to peaty clay. At each of these sites, 12 50x50m plots were selected along a natural soil P availability gradient induced by local differences in topography. Photosynthesis was measured in a 20x20 m subplot within each 50x50 m plot to avoid edge-effects in a future fertilisation experiment (starting in autumn 2016). We measured A-Ci curves at two height levels in the canopy for 120 trees (5/plot), resulting in over 800 measurements in total. Here we will present the results of Vcmax, Jmax and Rd in relation to soil nitrogen and phosphorus availability as well as leaf stoichiometry and other leaf characteristics such as specific leaf area and CCM, a measure for chlorophyll.

O12-04 – S12 *Free session: Plant physiology, and ecology*
Monday 20 June 20 / 16:00-17:30 – Rondelet

Plasticity in the water relations and anatomy of leaves of tropical rainforest trees in response to experimental drought

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The tropics are predicted to become warmer and drier, and understanding the sensitivity of tree species to drought is important for characterising the risk to forests of climate change. This study makes use of a long-term (12 year) through-fall exclusion (TFE) experiment in the Amazon Rainforest to evaluate the role of leaf-level water relations, leaf anatomy and their plasticity in response to drought in six tree genera. Water relations parameters, including turgor loss point, hydraulic capacitance and the elastic modulus, were compared between seasons and plots (control and TFE) enabling a comparison between short- and long-term plasticity in traits. The response to experimental drought was also analysed in leaf anatomical parameters such as the relative and absolute abundance of each tissue, vein and stomatal density, and the internal cavity volume. We found that osmotic adjustment occurred in response to the long-term drought treatment resulting in lower turgor loss points, but that taxa resistant to drought stress, based on mortality response to the experimental drought, showed less seasonal osmotic adjustment than drought-sensitive taxa. Anatomically, it was expected that trees would produce leaves of a more xeromorphic character in response to long-term soil moisture deficit. However, there was very little anatomical difference in leaves between plots. The only measured anatomical parameter that differed significantly in response to the drought treatment was the internal cavity volume which was higher in the TFE. The plasticity in leaf water relations suggests that, to some degree, tropical rainforest trees have the capacity to adapt to a long-term reduction in water availability, but the lack of anatomical response indicates that the extent of adaptation is most likely limited. Furthermore, our results show that the ability to perform seasonal osmotic adjustment is not a reliable indicator of the potential for taxa to adapt to long-term reductions in water availability.