EGU23-13425, updated on 24 Feb 2024
https://doi.org/10.5194/egusphere-egu23-13425
EGU General Assembly 2023

Species-specific ecophysiology within a flux tower footprint in an evergreen wet tropical forest in Costa Rica

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Tropical forests are responsible for approximately one third of the global terrestrial carbon dioxide uptake. However, the ability of tropical forests to continue to sequester carbon is threatened by climate change. Some species may adapt and become more dominant while less resilient species may not be able to adapt. These changes may ultimately impact overall ecosystem carbon gain. A better understanding of species specific traits related to leaf physiology can potentially help us predict how forest carbon uptake might change in the future. Additionally, to gain a wholistic understanding of forests carbon assimilation and tree stress it is important that we make simultaneous and complementary measurements at different temporal and spatial scales under different climatic conditions. Here we combine leaf-, canopy- and ecosystem- scale measurements to assess plant-environment interactions in the tropical forest of Costa Rica (Tower 2 of La Selva Biological Station). At the leaf scale, we evaluated seasonal and species-specific changes in chlorophyll fluorescence and reflectance-based vegetation indices [the Photochemical Reflectance Index (PRI), the Chlorophyll-Carotenoid Index (CCI) and Normalized Difference Vegetation Index (NDVI)]. We collected sun-exposed leaves from six tree species within the flux tower footprint: *Pentaclethra macroloba*, *Virola koschnyi*, *Virola sebifera*, *Goethalsia meiantha*, *Sacoglottis trichogyna,* and *Warszewiczia coccinea*. Preliminary results for the first sampled years (2022-2023) show that *P. macroloba*, the dominant species in this forest, has likely the highest photosynthetic capacity due to its higher electron transport rates (ETR), followed by *V. koschnyi*, the second most dominant. Using different metrics of photosynthetic activity, we found that most species do not show photosynthetic seasonality. However, one species, *V. koschnyi*, showed decreased reflectance in the visible part of the spectrum during the wetter season (35-45%), indicating increased pigment concentration and, likely, increased photosynthetic activity. *G. meiantha* had the lowest ETR of all species, as well as the lowest PRI, CCI and NDVI, especially during the drier season, which is coincident with a visually unhealthy colouration during this

season. Our results will help improve our understanding of how different species are responding to environmental stress, in particular to increased evaporative demand, ultimately advancing our knowledge of the tropical forest carbon cycle.