EGU23-9165, updated on 25 Feb 2024
https://doi.org/10.5194/egusphere-egu23-9165
EGU General Assembly 2023

Soil fertility and drought stress episodes explain the variations in diameter growth of the hyperdominant Amazon tree species Eschweilera coriaceae

Flavia Durgante[1,2], Niro Higuchi[2], Shinta Ohashi[3], John Ethan Householder[1], Florian Wittmann[1,2], Susan Trumbore[4], and the collaborators[*]

[1]Karlsruhe Institute of Technology, KIT, Karlsruhe, Germany.
[2]National Institute for Amazon Research, INPA, Manaus, Brazil.
[3]Forestry and Forest Products Research Institute, Tsukuba, Ibaraki, Japan.
[4]Max Planck Institute Biogeochemistry, MPI- Biogeochemistry - Jena, Germany
[*]A full list of authors appears at the end of the abstract

Amazonian forest productivity is related to gradients in climate and soil fertility, and impacted by extreme climate events such as drought. However, interactions between soil fertility and drought in influencing regional and interannual variations in tree diameter growth are still poorly explored. To fill this gap, we used radiocarbon measurements to evaluate the variation in tree growth rates over the past decades for 30 individual trees from an important hyperdominant species, *Eschweilera coriacea* (Lecythidaceae). Trees were sampled from six sites in the state of Amazonas, Brazil, spanning a range of soil properties and climate. Using a linear mixed model, we show that temporal variations in mean annual diameter increment for a specific time period reflects interactions between soil fertility and SPEI drought index (Standardized Precipitation and Evapotranspiration Index). Overall differences between sites in mean tree growth, wood density and biomass production primarily reflected soil fertility, while temporal variations in growth response to drought also strongly dependence on soil fertility. Whereas drought strongly limited tree growth in fertile environments, its impact on tree growth was attenuated in poorer soils. Our results suggest that the growth response of trees to drought is strongly dependent on soil conditions, a facet of Amazon forest productivity that is still underexplored. As the *Eschweilera coriacea* is a hyperdominant species in the Amazon and is ranked second for highest biomass production in the basin, the pattern of tree growth in response to soil-climate interactions influences the carbon balance of the entire Amazon basin. This result has a large potential to improve predictions of how tropical tree growth affect the global carbon cycle in the face of climate change.

collaborators: Adriano José Nogueira Lima - INPA, Manaus, Brazil. Moriyoshi Ishizuka -FFPRI, Japan. Joaquim dos Santos - INPA, Manaus, Brazil. Vilany Matilla Colares Carneiro - INPA, Manaus, Brazil. Xiaomei Xu - UCI, Irvine, United States. Claudete Catanhede do Nascimento - INPA, Manaus, Brazil. Jochen Schongart - INPA, Manaus, Brazil. Maria Teresa Fernandez Piedade - INPA, Manaus,

Brazil. Adalberto Rodrigo Kossmann Schmitt - National Institute for Amazon Research, INPA, Manaus, Brazil. Yanka Laryssa Almeida Alves- INPA, Manaus, Brazil. Jennifer Lehman - University of Ottawa, Ottawa, Ontario, Canada. Bruno Oliva Gimenez – UC– Berkeley, USA; INPA, Manaus, Brazil. Priscilla Maia Baggio - INPA, Manaus, Brazil. Lucas Kosvoski de Ourique - INPA, Manaus, Brazil.