

Modelling the impact of lianas on the biogeochemical cycles of tropical forests



Félicien Meunier, Michael Dietze, Manfredo di Porcia e Brugnera, Marcos Longo, and Hans Verbeeck

Context & methodology

- Liana abundance increases in the Neotropics with negative impact on forest carbon sequestration capacity
- In the absence of modelling tools, it is difficult to (i) assess the importance of lianas in the biogeochemical cycles of tropical forests and (ii) forecast their impacts in a changing World.
- We developed a new Plant Functional Type (PFT) accounting for lianas in the Ecosystem Demography (ED2) model

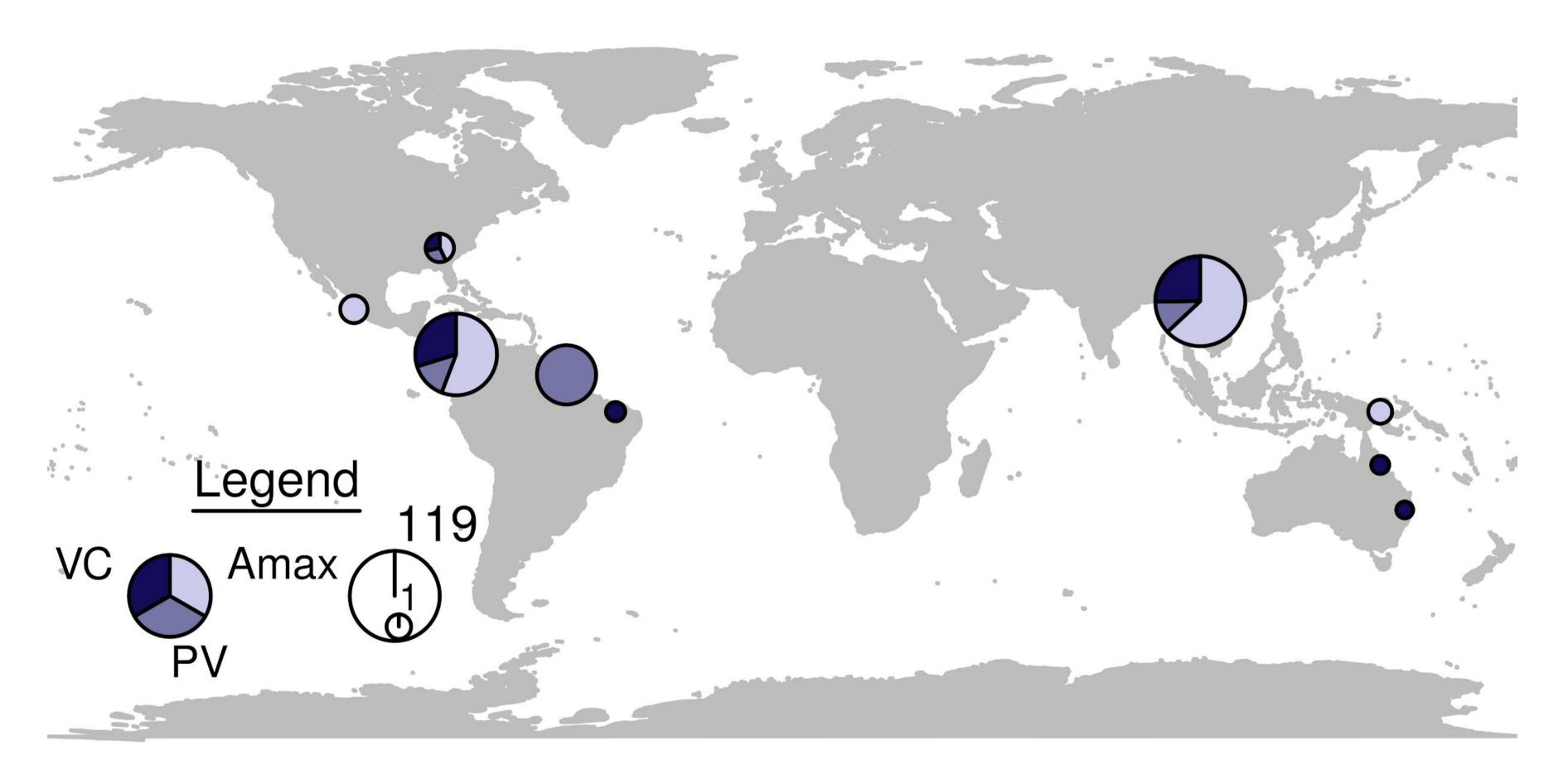
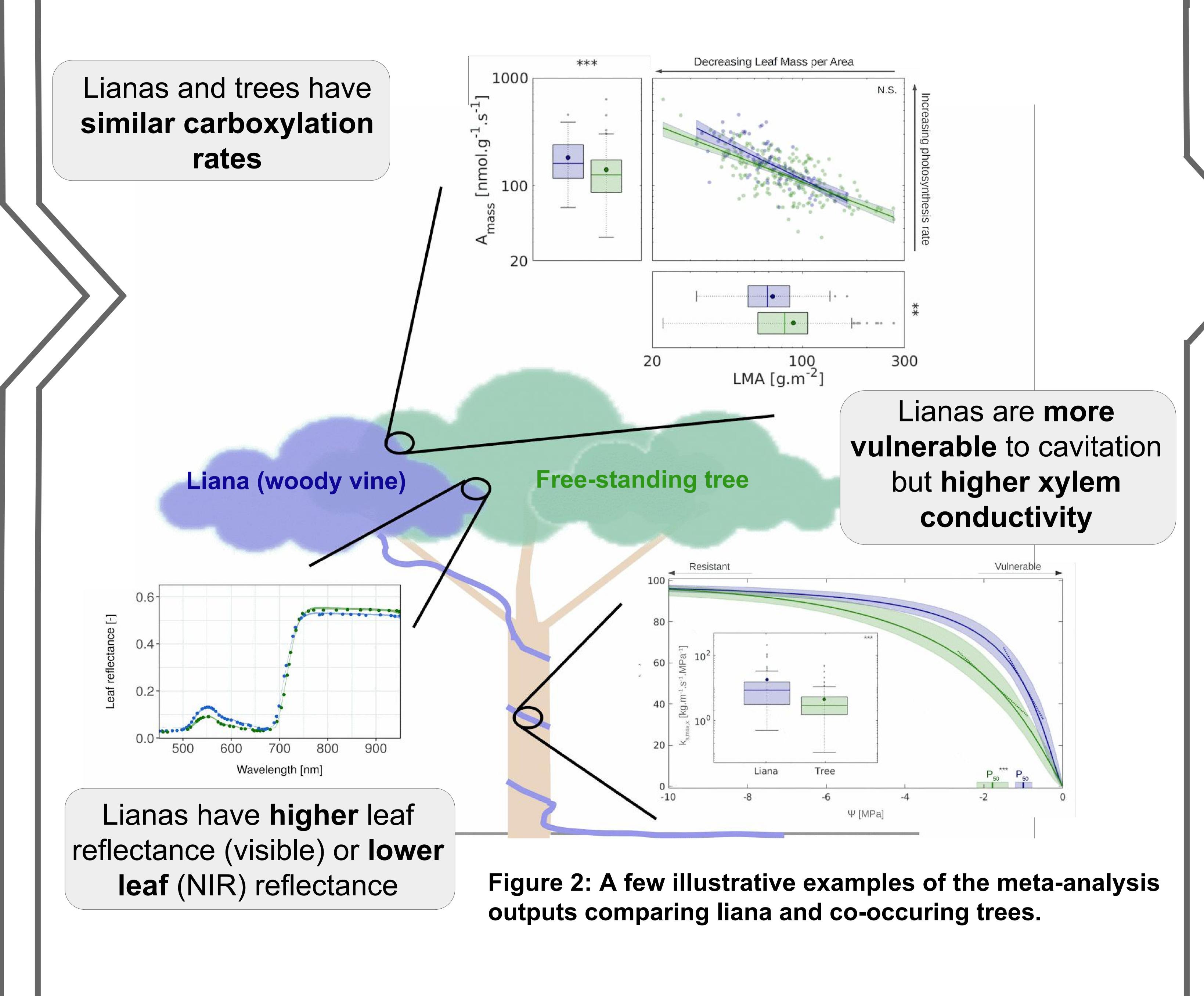


Figure 1: Example of liana meta-analysis for liana traits. The pie-charts represet the number of liana data collected for hydraulic (VC and PV) and photosynthetic traits (A_{max}).

- To constraint the liana PFT, we systematically collect liana (and co-occurring trees) published data (Figure 1) and keep doing so as soon as new data are made available
- To evaluate the impact of single (or the combination of) liana traits, we run simulations with and without those liana-specific parameterizations
- To quantify the impacts of liana loads on tropical forests, we run site simulations with and without the liana PFT ("liana synthetical removal experiment")

Meta-analysis and modelling

• Liana trait meta-analyses reveal either structural differences between lianas and trees (e.g. lianas have hydraulically more efficient vascular systems) or similar functioning between growth forms (e.g. photosynthesis), **Figure 2**.



• These traits are then used to calibrate the vegetation model (ED2) and evaluate the impact of lianas on the forest biogeochemical cycles (**Figure 3**).

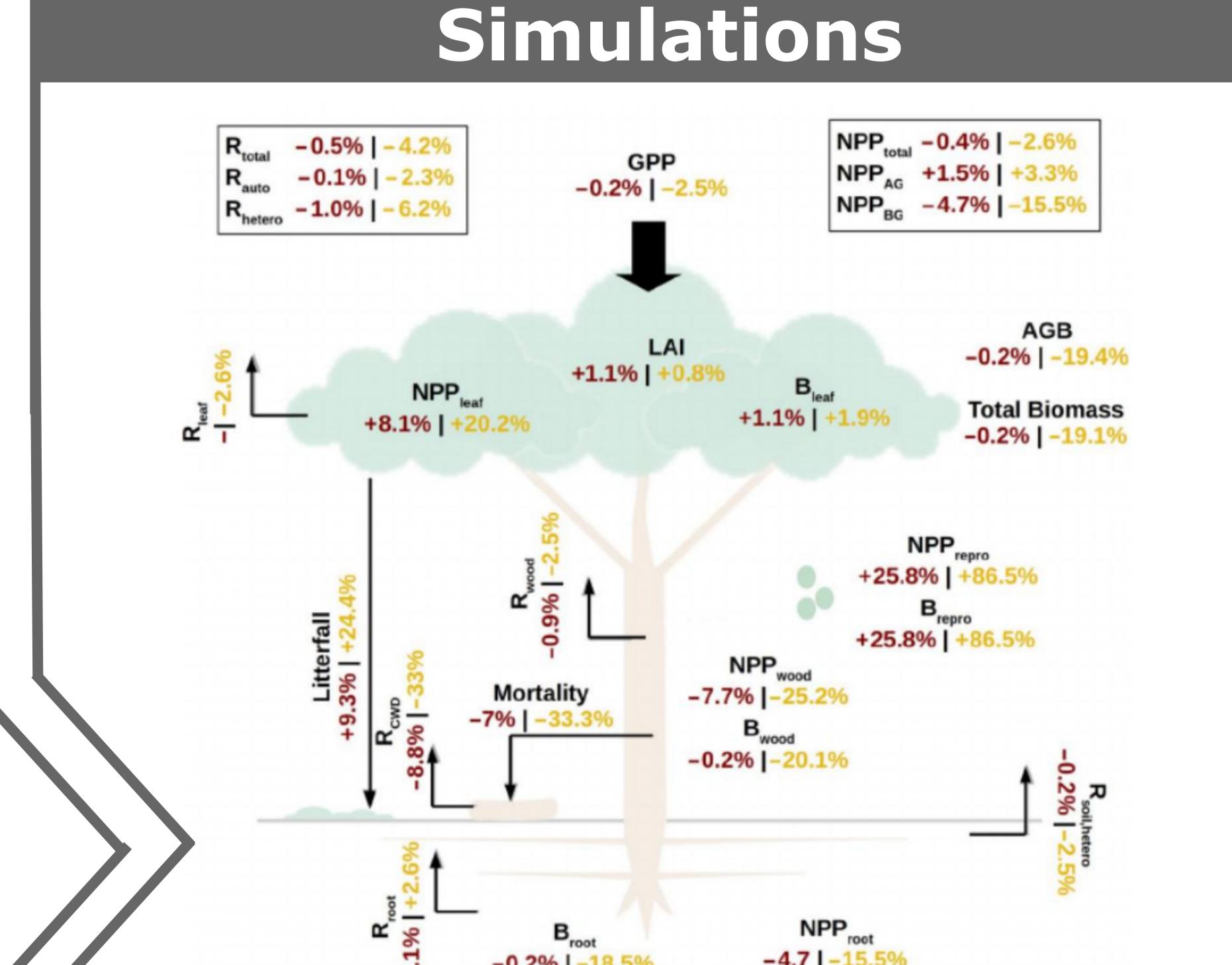


Figure 3: Example of the impact of lianas on two tropical sites: an old growth forest (Paracou, French Guiana) and a secondary forest (Giganta, Panama)

- We have a fully functioning model that account for lianas and that was validated for several sites and several processes (not shown)
- This model can now be (and is) used to answer ecological questions, such as what are the drivers of the increase of liana abundance? or What are the most important factors of competition between liana and trees?

Conclusion & Perspectives

More about this work

Computational & Applied Vegetation Ecology - Department of Environment - Ghent University

Modeling the impact of liana infestation on the demography and carbon cycle of tropical forests







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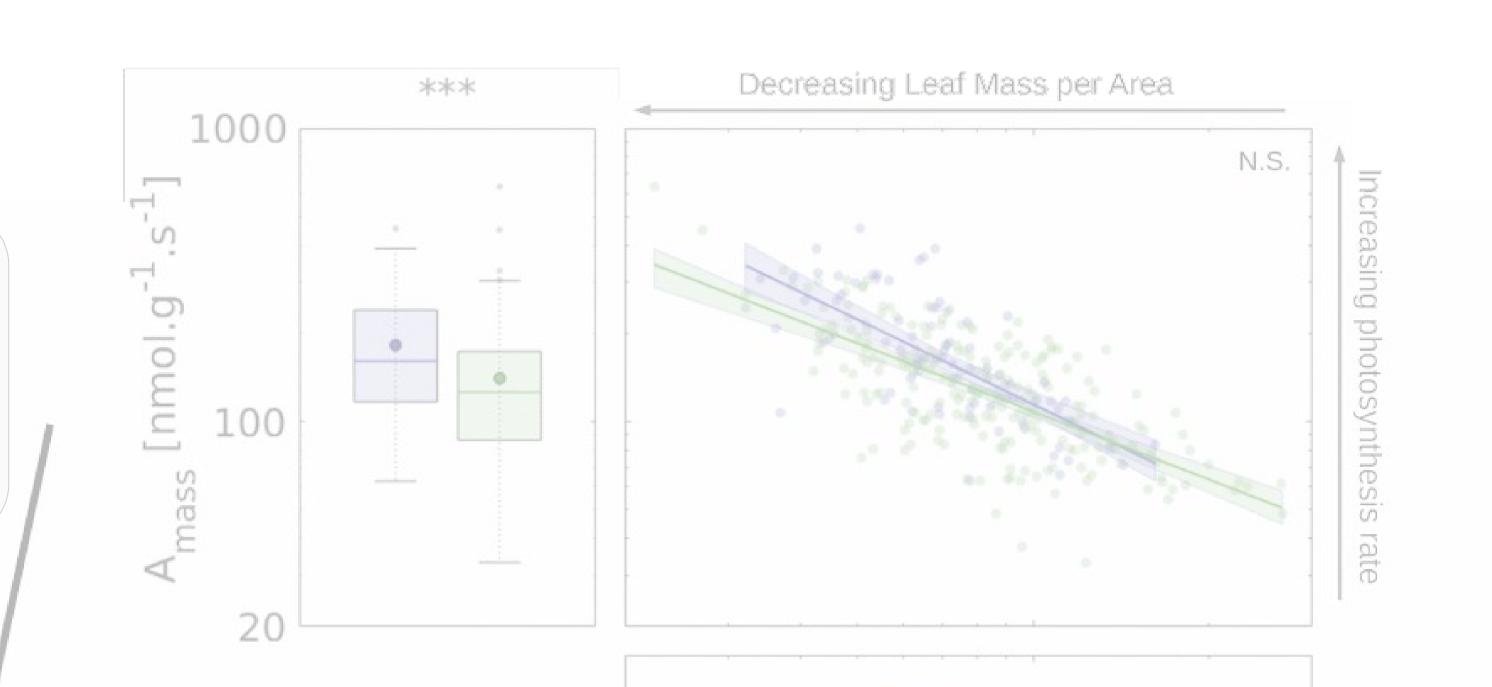
Context & methodology

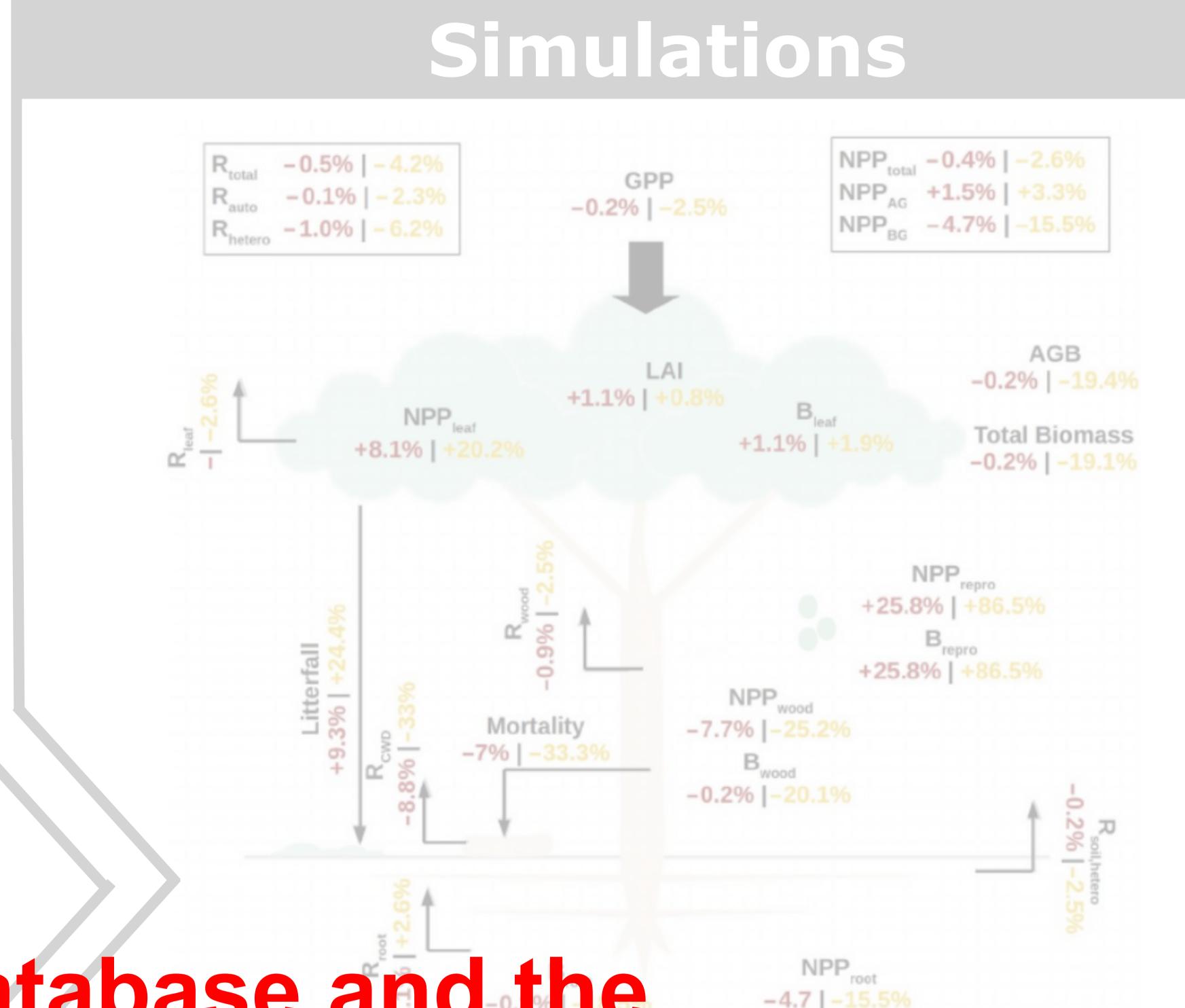
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Lianas and trees have similar carboxylation rates





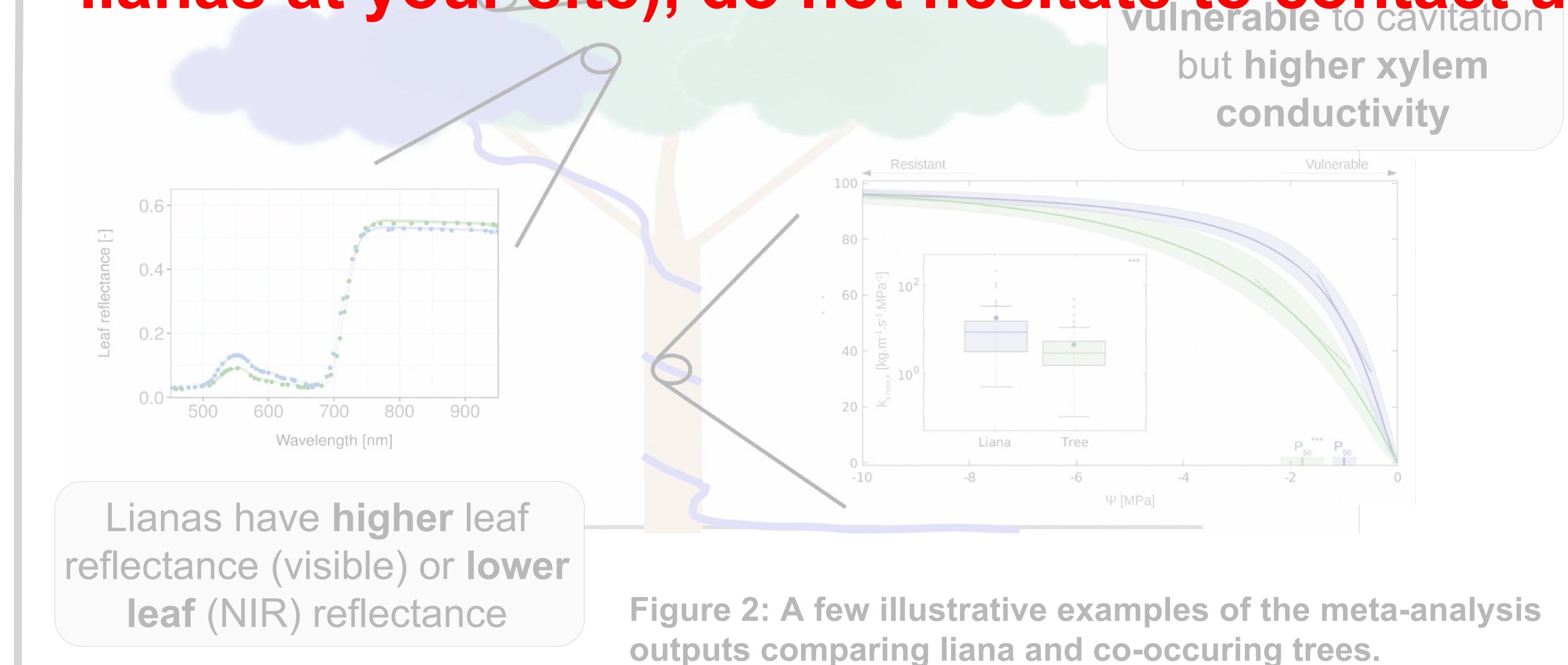
If you want to hear more about model development, the liana database and the

results of our studies or if you want to collaborate (e.g. you wantigus to mode make (Paracou, French Guiana) and lianas at your site), do not hesitate to cavitation



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