

Why do trees grow older

in the wet tropics?

Bernardo Macieira, Giuliano M. Locosselli,
and a team of 18 great collaborators!

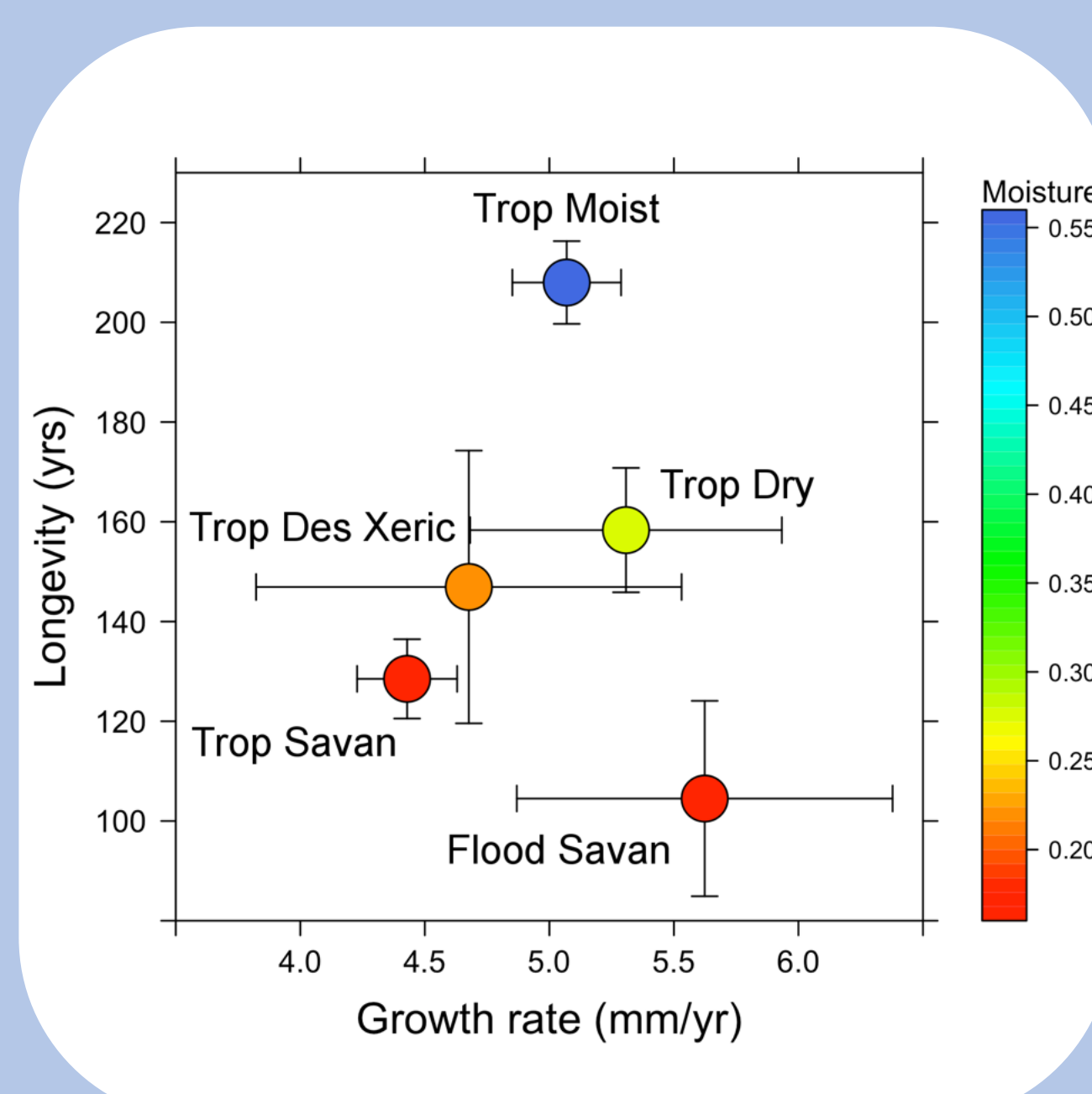


Functional
Forests



Introduction

- We showed recently that trees grow older in the wet tropics compared to the dry tropics, using a large tree-ring dataset. (Locosselli et al 2020 PNAS 117: 33358 - 33364)

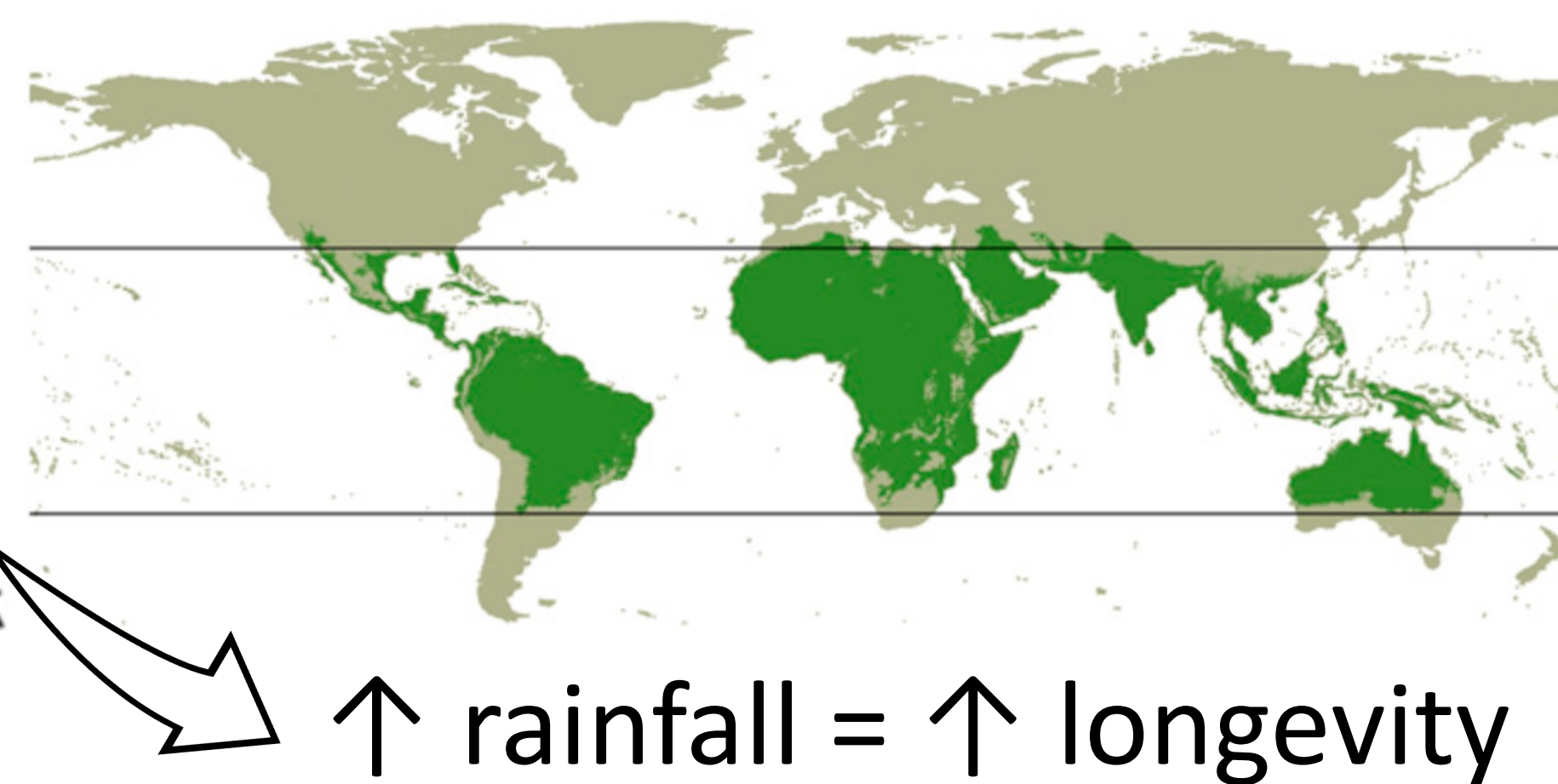
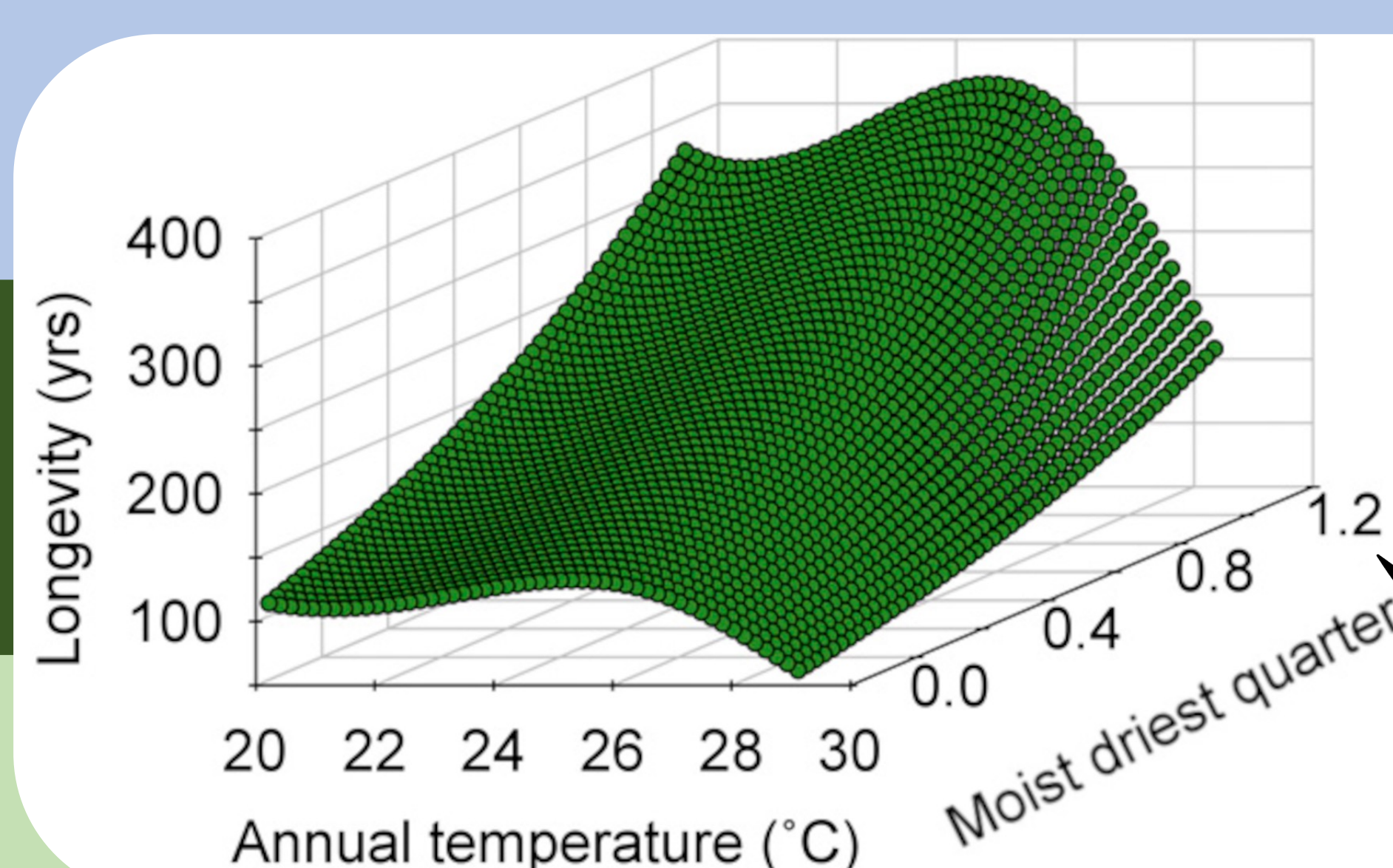


Objectives

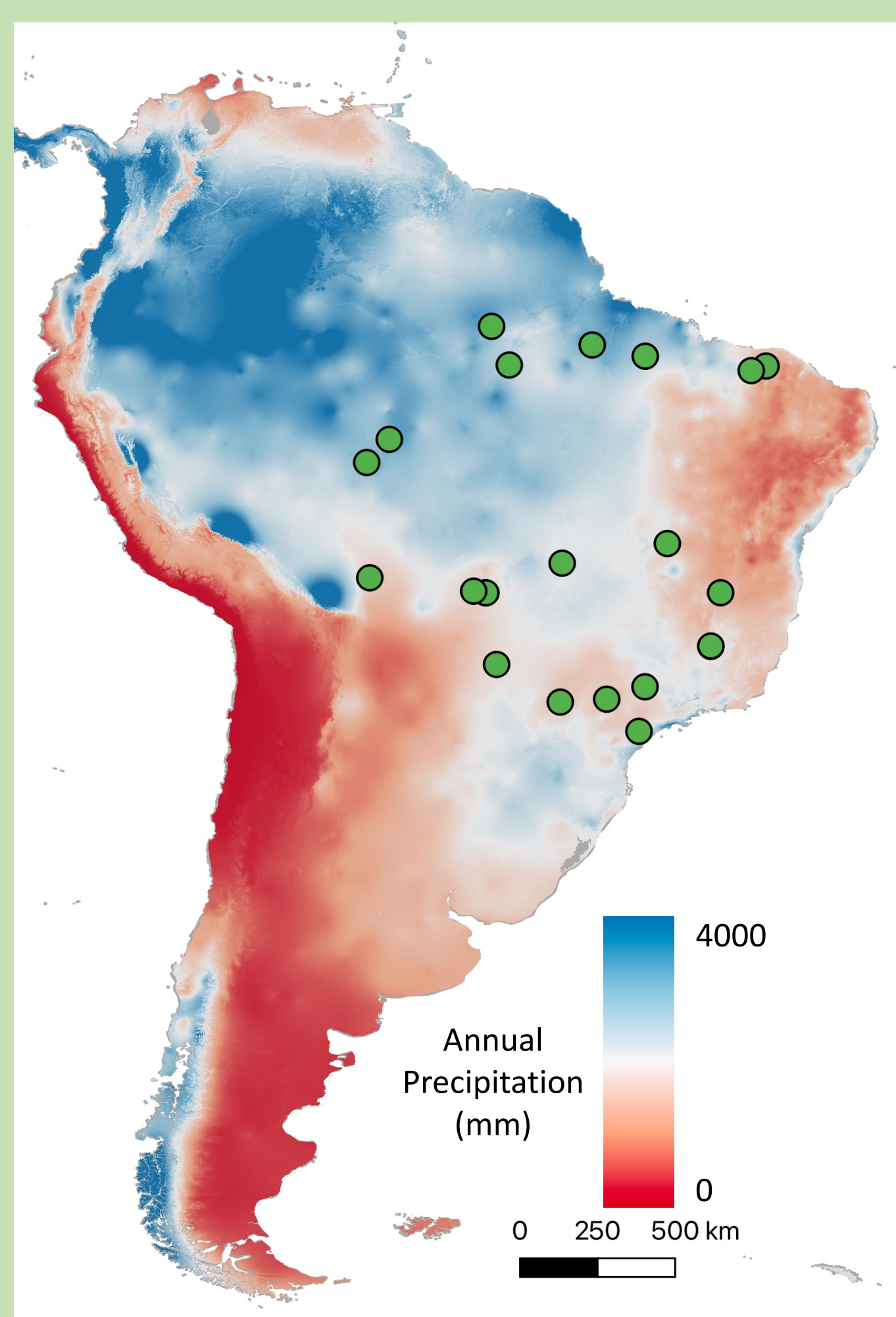
- Test 3 main hypotheses from literature:
 - 1) direct effect of precipitation on tree physiology.
 - 2) indirect effect mediated by tree size,
 - 3) indirect effect mediated by understory competition.
- We used structure equation modelling to test them together.



Methods



Results

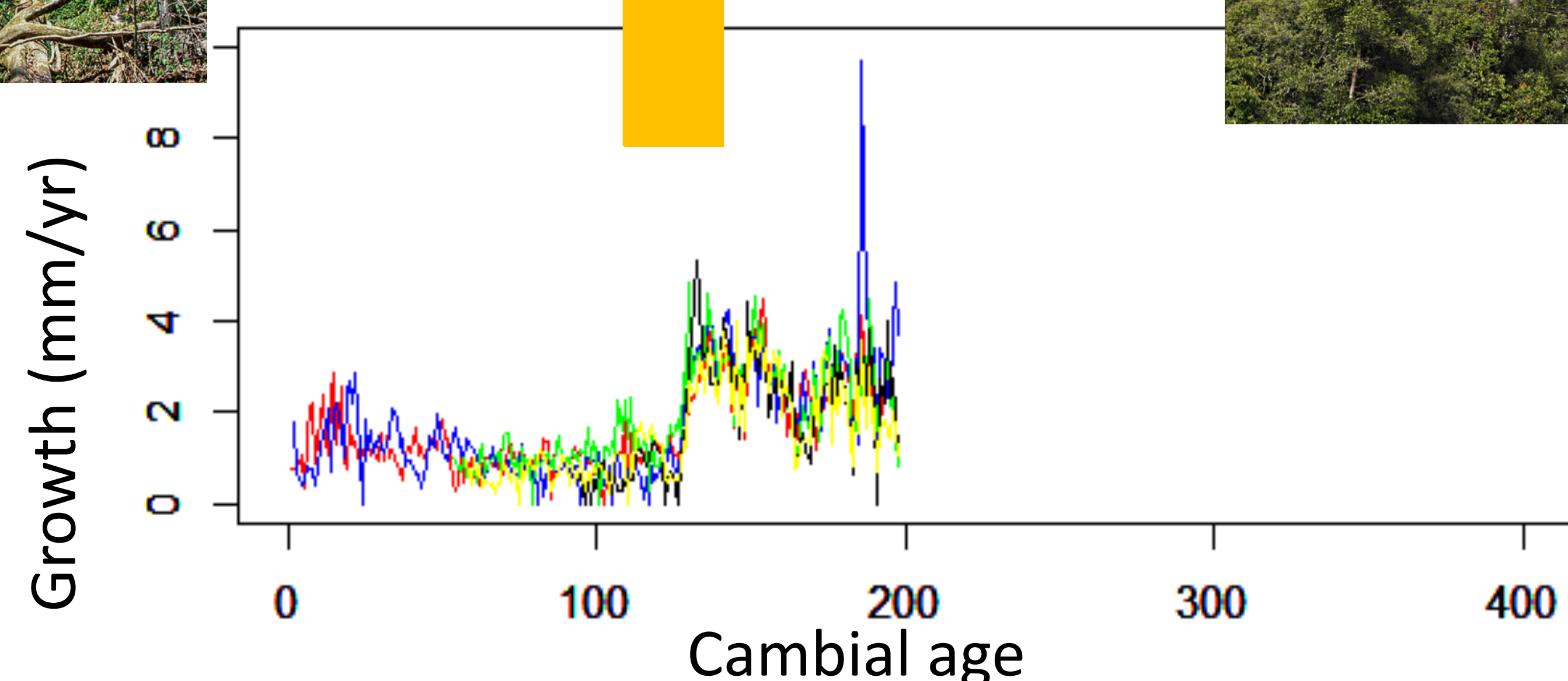


- Hymenaea* spp. produce annual growth rings and have wide geographical distribution.
- Studied species: *H. courbaril*, *H. stigonocarpa* and *H. parviflora*.
- 22 populations.
- 468 trees.
- Covering a wide range of annual precipitation.

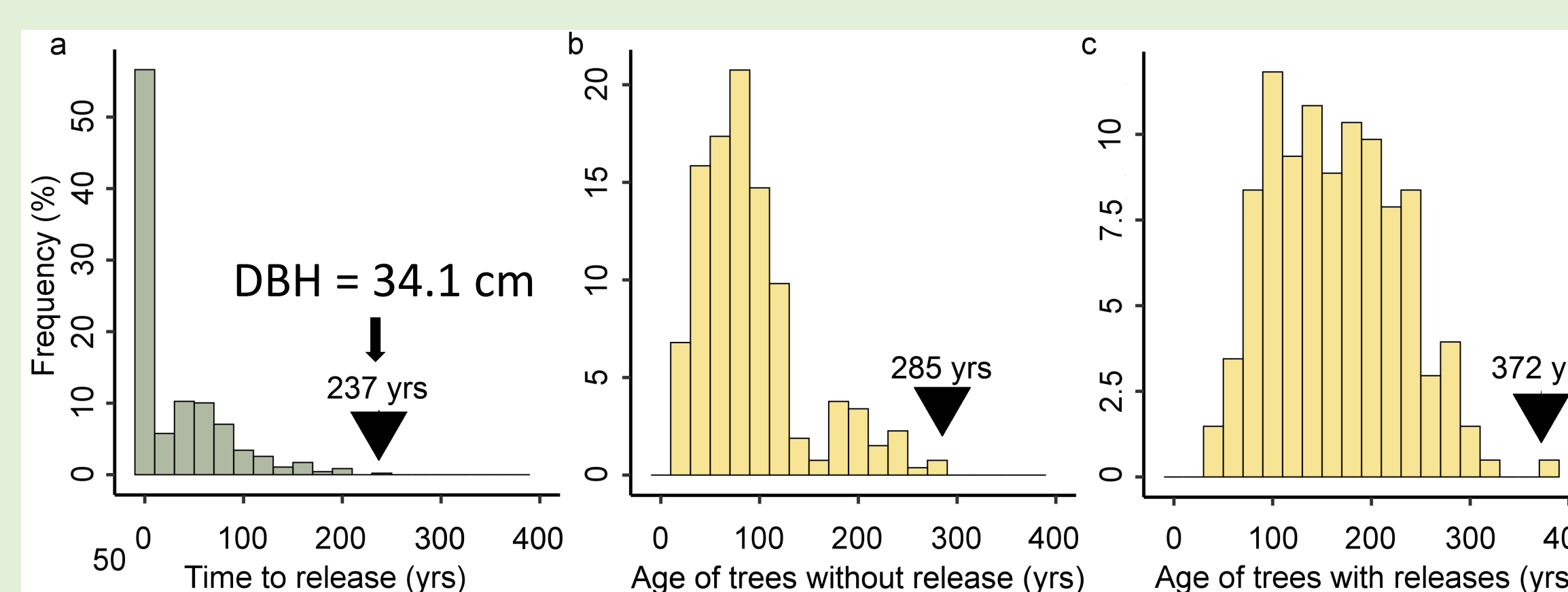


Gap release

Canopy release

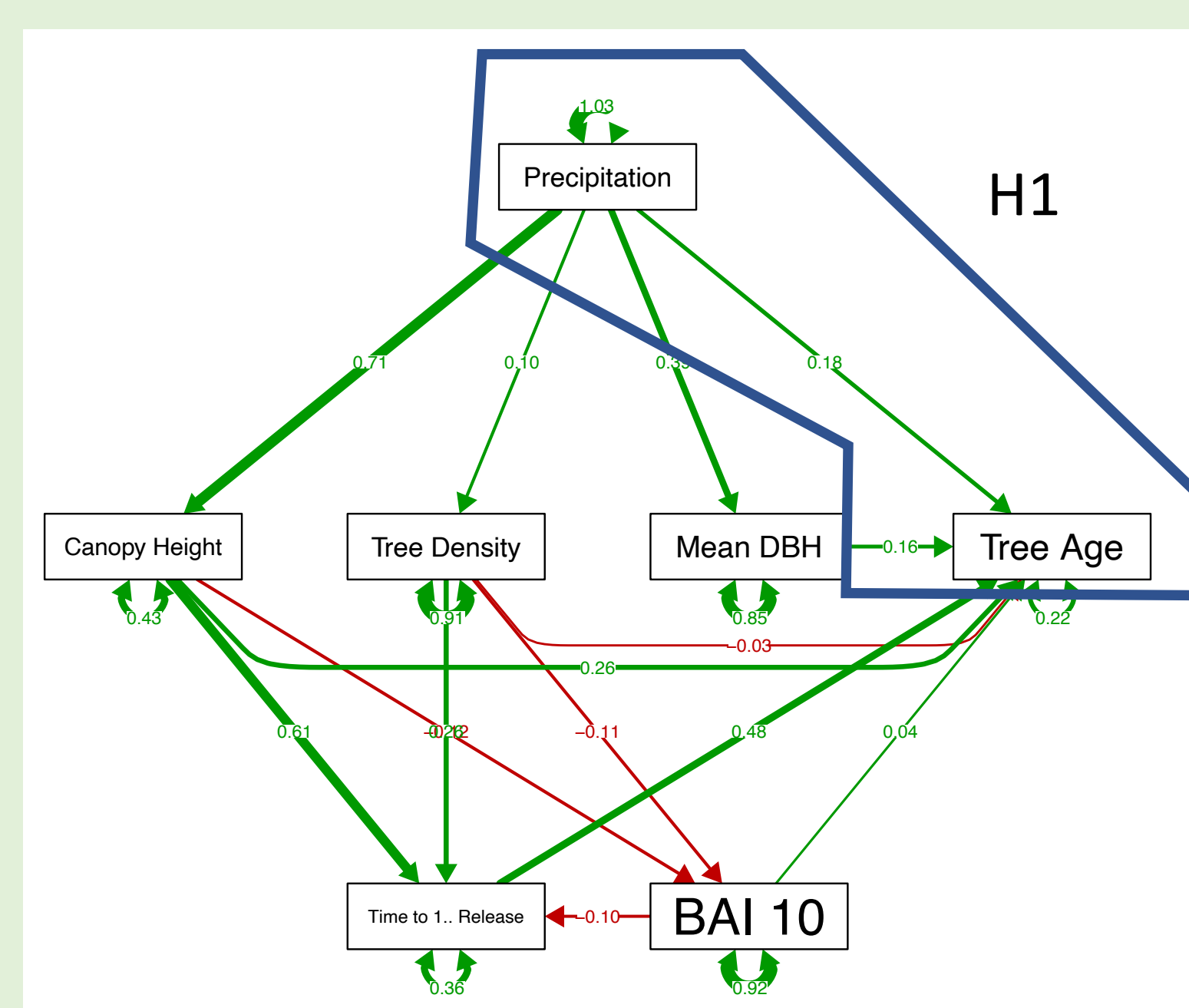


- We assessed the growth release to estimate the time spent in the forest understory. We estimated the age of the trees at the first and second major releases (100% change in growth rate)

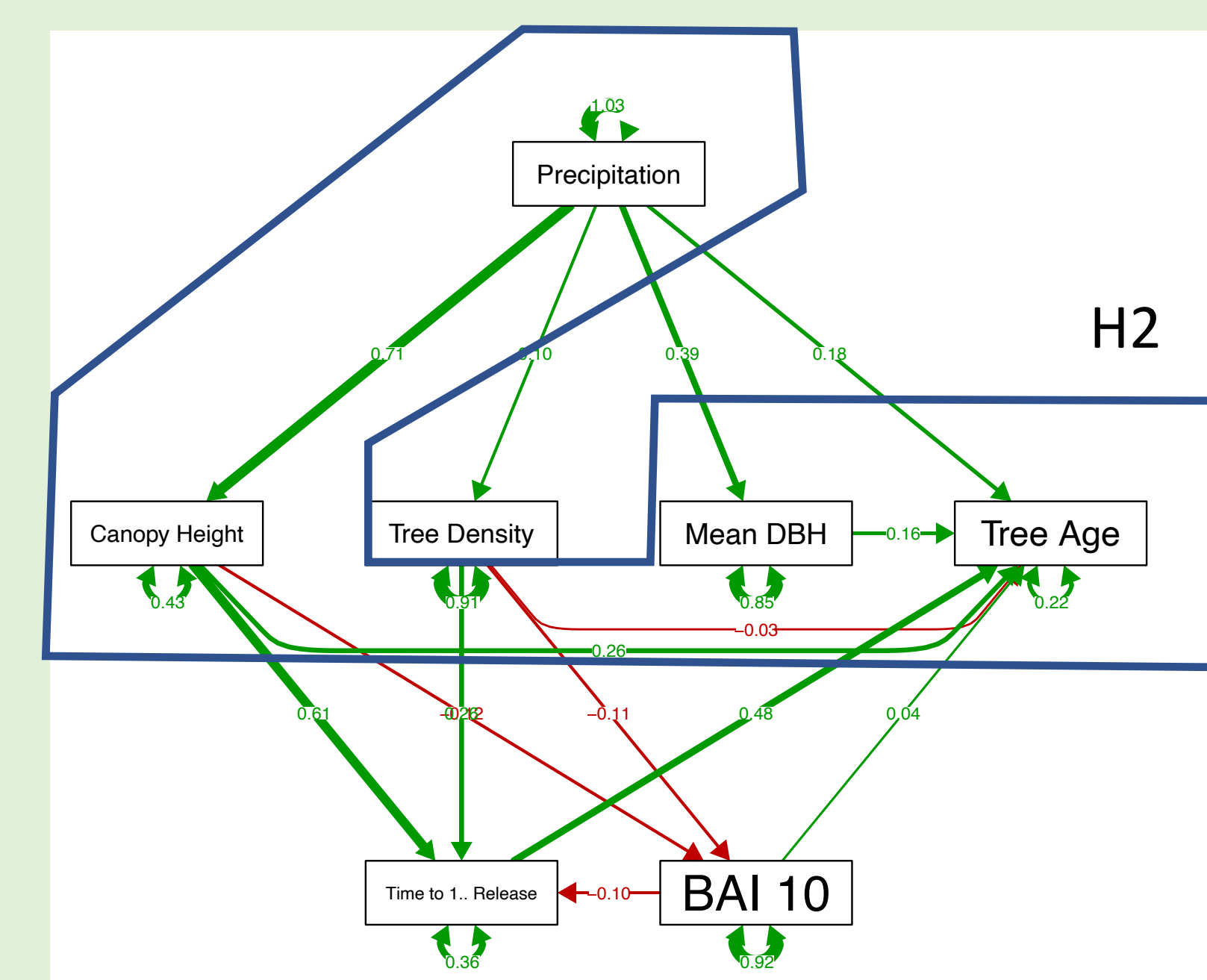


- (a) Distribution of the age at the first release.

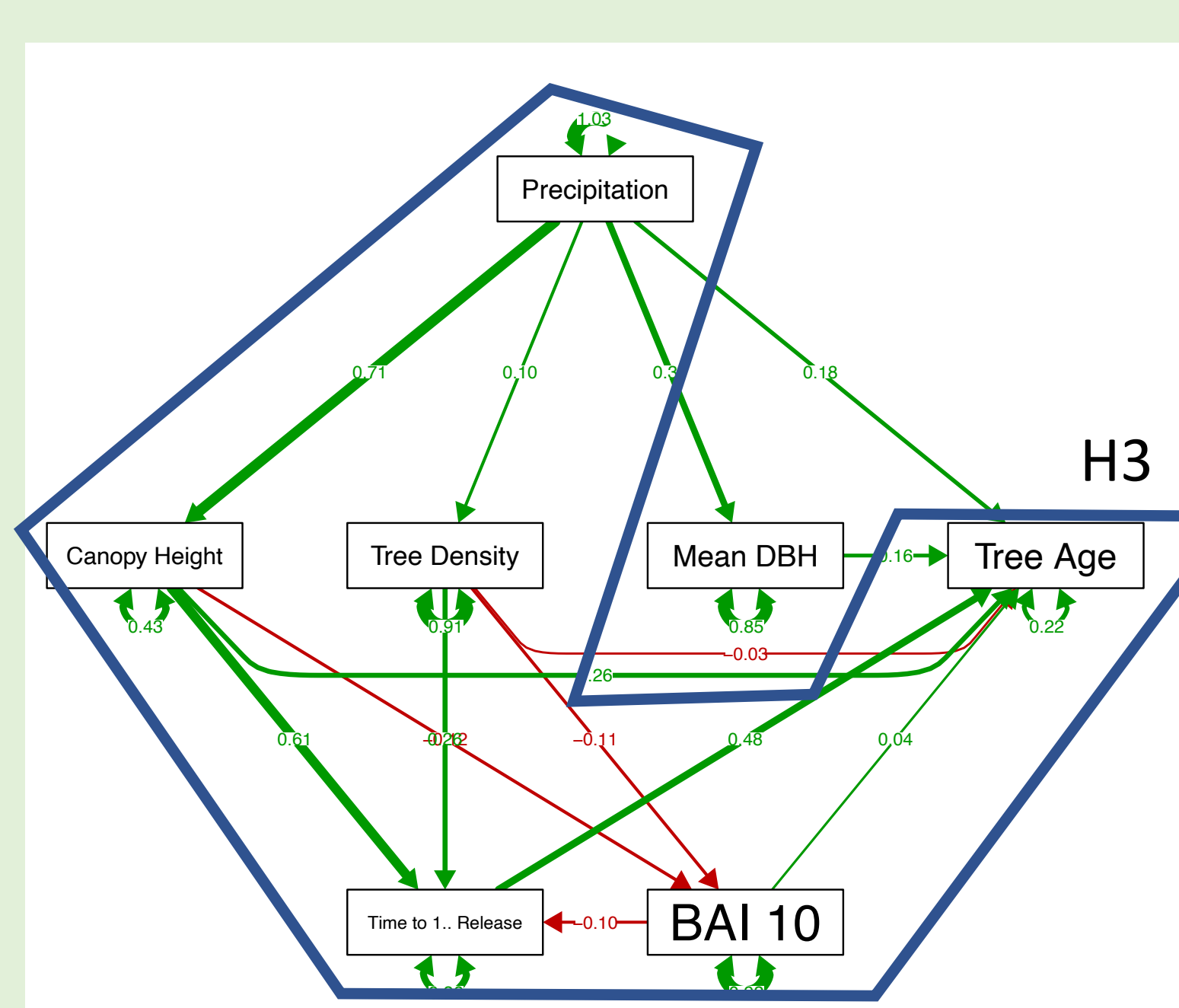
- (b) age of tree without clear release.
- (c) age of trees with a major release.



H1: Direct effect of precipitation on longevity



H2: Size-dependent effect on longevity.



H3: Indirect effect of precipitation on the longevity of trees mediated by the competition of trees in the understory. Trees spend more time in the understory of wet forests resulting in higher longevity.