

# The impact of hurricanes on the carbon stock of the juvenile stages of succession in the tropical rainforest in the Caribbean part of Nicaragua

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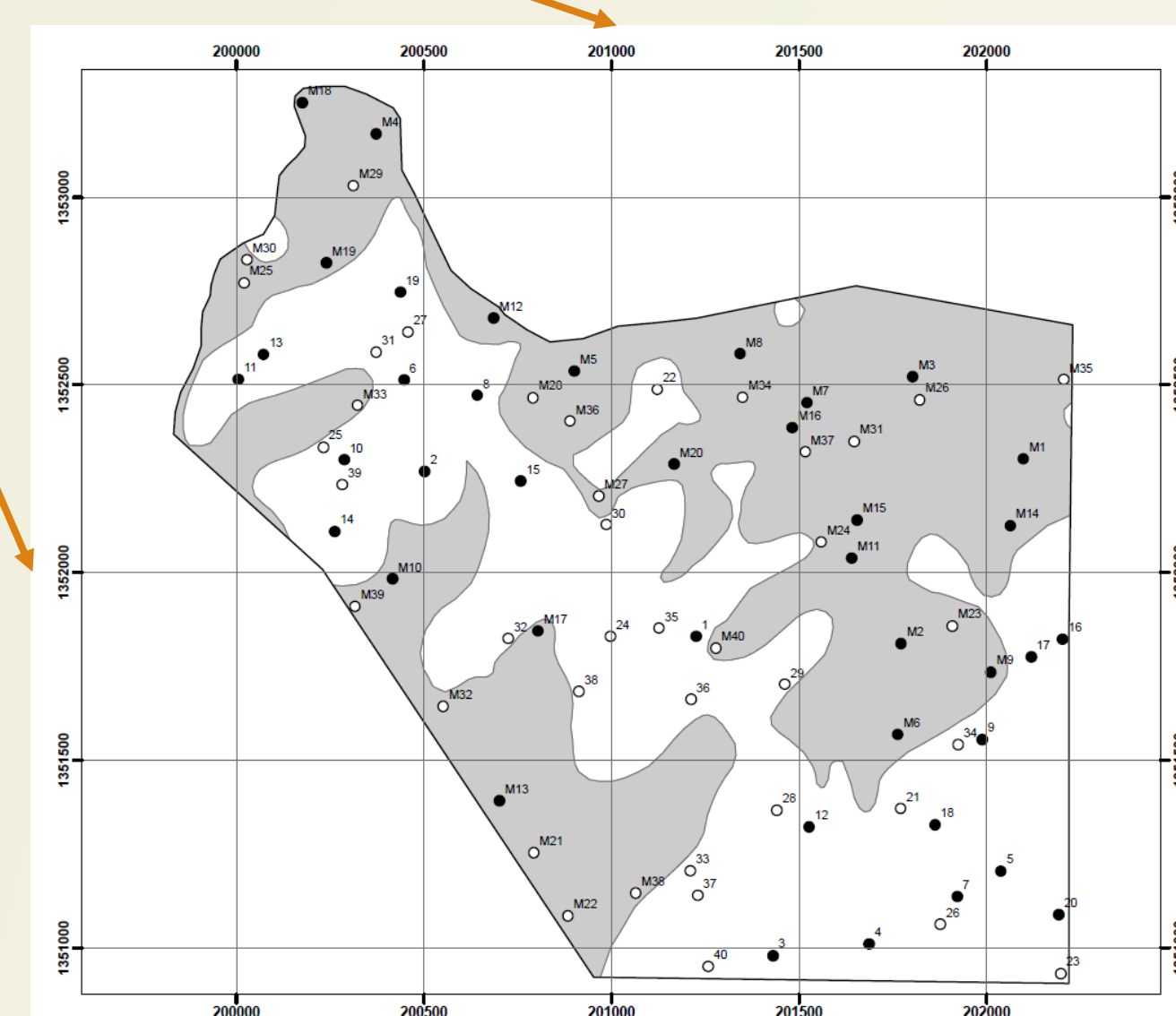
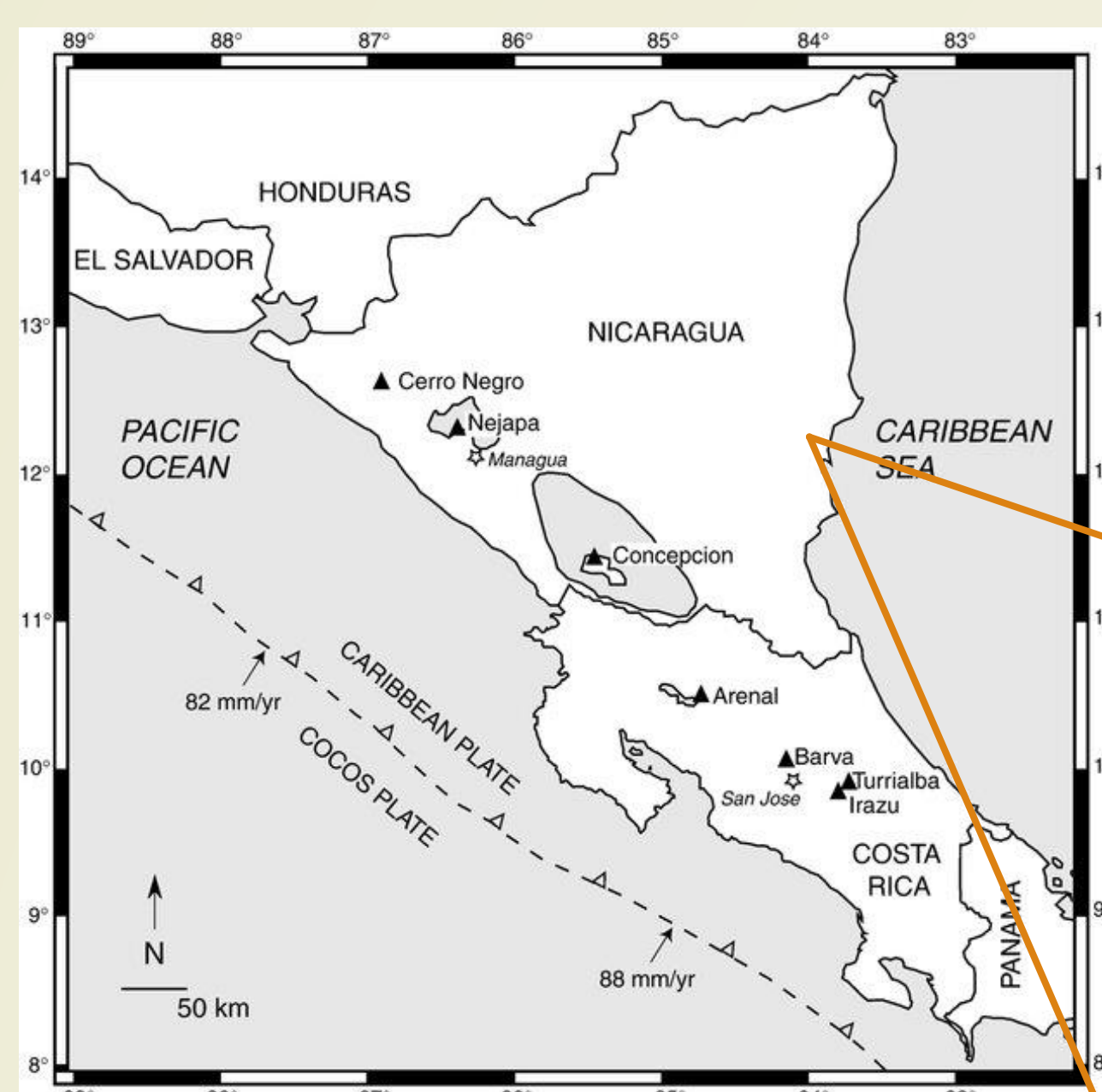
## Introduction

- Tropical rainforests significantly impact the global carbon cycle.
- In juvenile stages of succession, carbon stocks in living tree biomass rise quickly until the forests mature.
- Disturbances cause structural changes, releasing stored carbon into the atmosphere.
- Hurricanes, common in the Caribbean, greatly affect Nicaraguan forests.

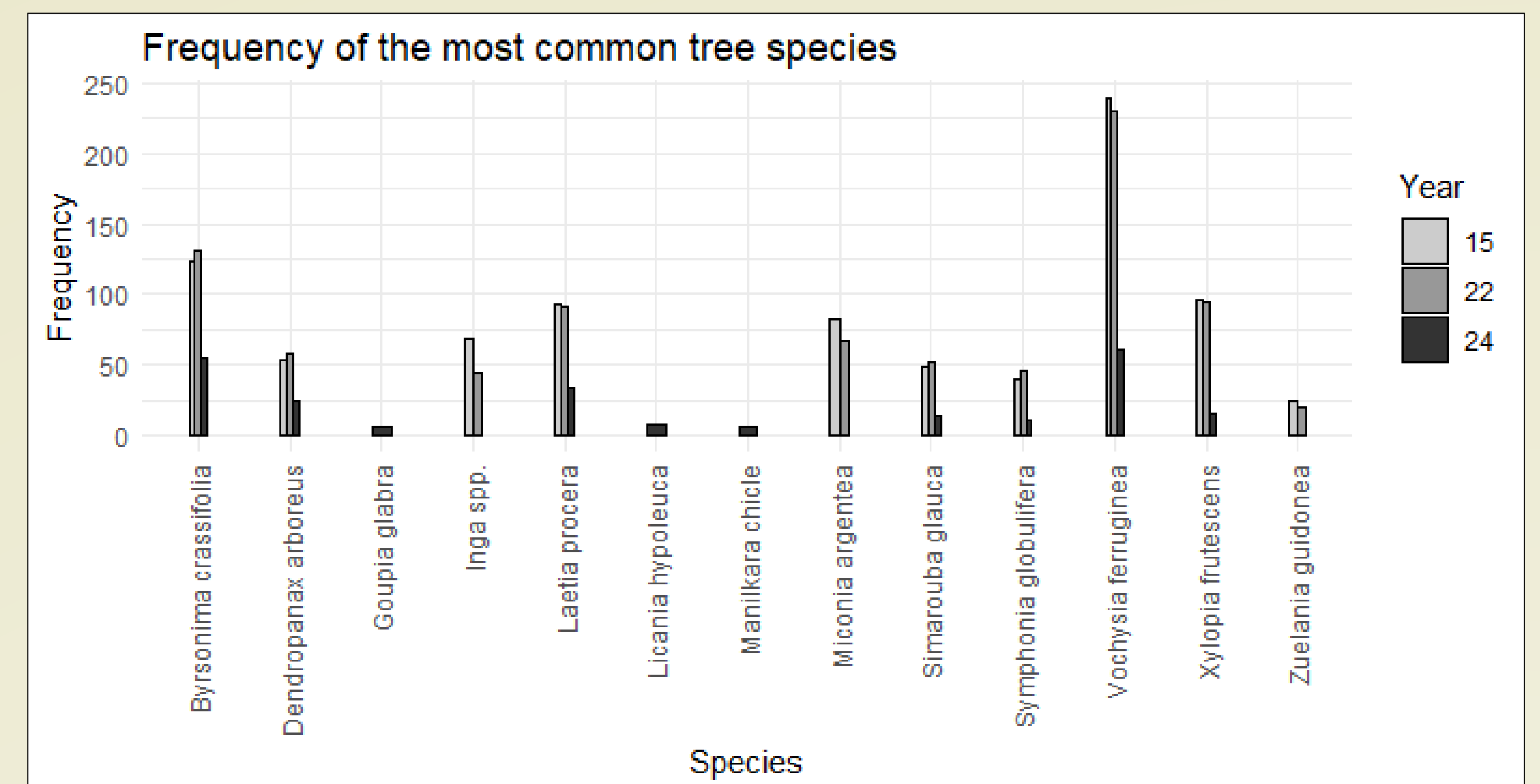


## Material and Methods

- We studied the Private Nature Reserve Greenfields, a protected lowland tropical forest ecosystem
- Hurricane Joan completely destroyed the land cover in 1988.
- Hurricane Julia further damaged vegetation there again in 2022.
- This unique forest allowed us to research:
  - A) Carbon sequestered in woody biomass 27 and 34 years post-Hurricane Joan;
  - B) The decrease in living tree biomass carbon content caused by Hurricane Julia.
- We established 41 permanent circular research plots (25 m in diameter) in 2015.
- We measured the position, DBH, and height of all trees (>10 cm DBH) and utilized three different allometric equations to calculate biomass.



## Results



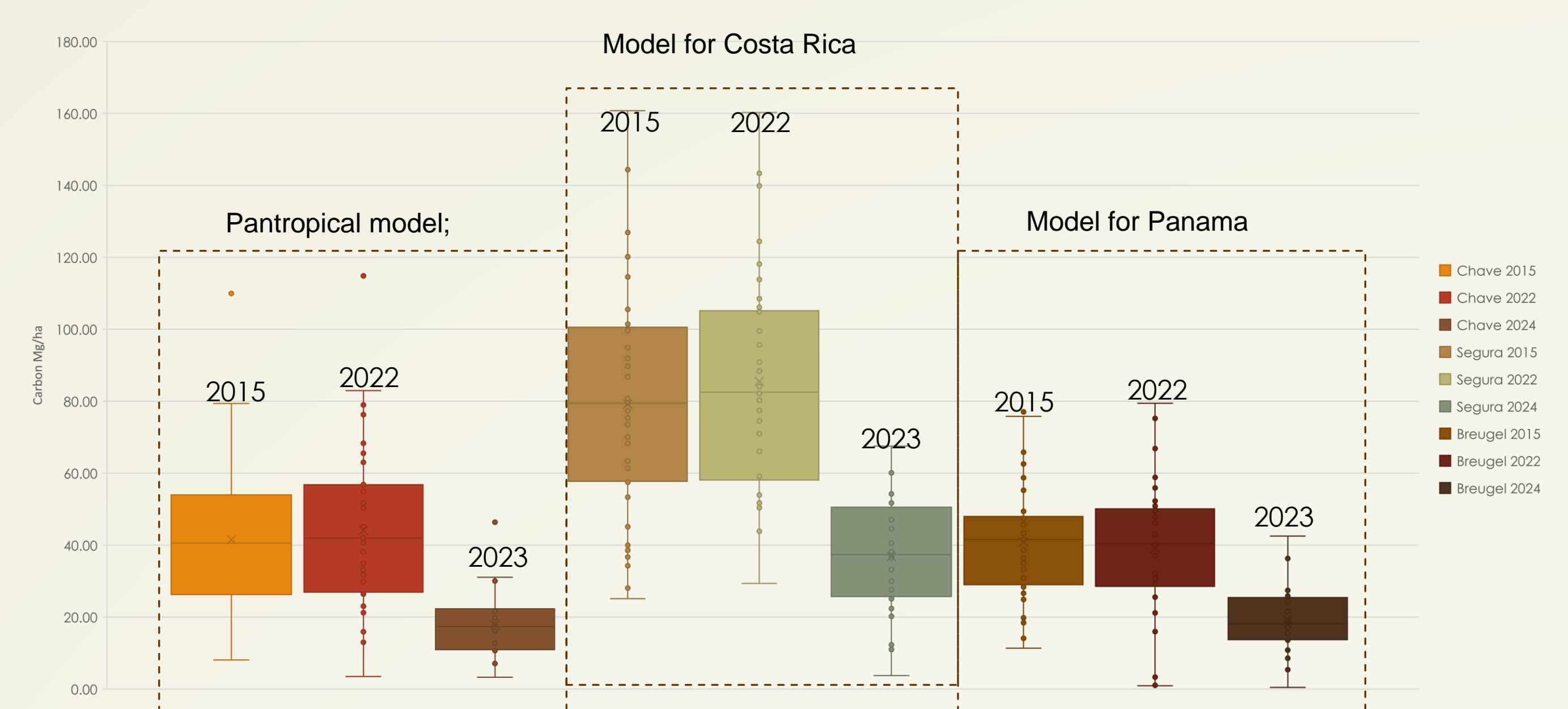
The amount of carbon in aboveground live biomass was:

Chave's pantropic equation:  $83 \pm 40$  (2015);  $90 \pm 43$  (2022);  $35 \pm 18$  t ha<sup>-1</sup> (2024);

the Breugel Panama's equation for secondary forests:  $81 \pm 33$  (2015);  $88 \pm 30.5$  (2022), and  $41 \pm 18$  t ha<sup>-1</sup> (2024),

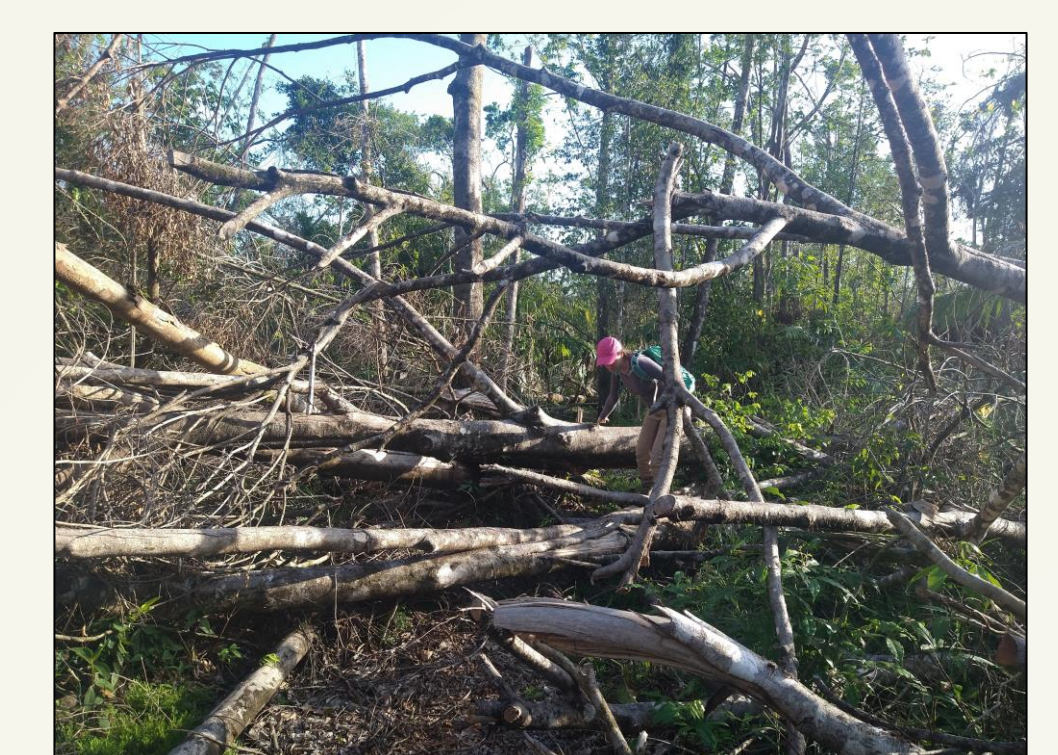
Segura Costa Rica's equation for humid rainforests:  $158 \pm 61$  (2015);  $171 \pm 62$  (2022) and  $80 \pm 35$  t ha<sup>-1</sup> (2024).

- Between 2015 and 2022, the carbon quantity in dead trees was  $10 \pm 35$  t ha<sup>-1</sup>, whereas in 2024, two years after the hurricane, it was  $45 \pm 35$  t ha<sup>-1</sup> (counted by Chave's equation).
- The findings reveal a considerable reduction in carbon stock within aboveground biomass following Hurricane Julia.
- During the succession the amount of living biomass is gradually increasing, as well as the amount of dead wood.
- Our findings suggest that hurricanes significantly influence the carbon dynamics in the forests of the Caribbean region of Nicaragua.



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