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Total above and below ground carbon stock partitioning in Cameroonian tropical rainforest

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Need for understanding the role of tropical forests in climate change mitigation

- Congo basin 2nd largest continuous area of tropical forest.
- But:
 - High uncertainty of spatial variation in carbon stocks across Congo basin (Baccini et *al.*, 2008; Mitchard et *al.*, 2011, Pan et *al.*, 2011).
 - Limited understanding of carbon in belowground biomass and dead wood

Aim: quantifying carbon in multiple pools

Question: What is the contribution of different carbon <u>pools</u> (aboveground, belowground, dead biomass) and underlying carbon <u>components</u> (adult trees, juvenile trees, sapling, palms, standing dead trees, woody debris, roots, and soil organic carbon) to total carbon?

Hypothesis: Aboveground live carbon, especially adult trees, contributes most

Site location

Moist semi-deciduous forest



Sampling design

- <u>Aboveground</u>: adult trees (DBH ≥10 cm), juveniles (10 < DBH ≥ 5 cm), saplings (5 < DBH ≥ 1 cm), palms, herbs
- <u>Dead mass</u>: standing dead trees, coarse (diameter ≥ 2.5 cm) and fine (diameter < 2.5 cm) woody debris, litter
- <u>Belowground</u>: coarse roots (allometric equation), fine roots, and soil organic carbon (20 cm depth)
- C estimates using allometric equations







Results (1) – Carbon stock of each pool and its components

Carbon pool	Carbon component	S _{within}	S _{between}	Stotal	Mean (Mg C ha ⁻¹)
Aboveground live carbon		18.57	33.60	38.39	180.99
(AGC)	Adults trees (>10cm DBH)	16.18	33.47	37.18	177.61
	Juvenile trees (5-10 cm DBH)	0.06	0.45	0.80	2.80
	Saplings (<5 cm DBH)	0.75	0.20	0.12	1.60
	Palms	NA	NA	NA	0.22
	Herbaceous vegetation (HV)	0.03	0.31	0.31	0.40
Aboveground dead carbon (ADC)		85.67	15.35	87.03	17.92
	Litter	0.09	1.09	1.10	2.93
	Fine woody debris (FWD)	0.06	0.16	0.17	1.50
	Coarse woody debris (CWD)	68.80	15.81	70.59	10.90
	Standing dead trees (SDT)	0.04	2.74	2.74	2.59
Belowground carbon (BGC)		15.86	18.65	24.48	85.06
	Fine Root trees (FRT)	0.002	0.02	0.02	0.02
	Coarse Root trees (CRT)	8.47	18.54	20.48	45.65
	Soil organic carbon (SOC)	12.50	31.7	34.07	39.39
TOTALS					
Total aboveground carbon (TAGC)		20.55	40.89	45.76	198.91
Total carbon		18.02	51.17	54.25	283.97

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Results (2) – Total carbon stock partitioning



■ Combined aboveground and belowground effect → because of correlated components?



Results (3) – Correlations among pools and components



 C in adult trees good predictor for total C, but not for other pools



Conclusion



 Carbon in adult trees is good predictor for total C, but weak predictor for other C pools.

Large trees important for short-term C storage, small trees for long-term C storage.



Thanks for your attention!

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