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Carbon sequestration and persistence in Central African forests

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Forests have a potential to provide both long-lived carbon stocks and long-term carbon sinks. Investing in carbon storage and sequestration represent important climate change mitigation strategies. However, decision makers and managers need to understand the long-term behaviour of carbon within forests. Critical questions are: (i) how much carbon do forests store, (ii) how long does the carbon stay in the system, and (iii) how resilient are carbon stocks to climate change?
Here we estimate decadal-scale trends in carbon sequestration and carbon persistence using a combination of (i) growth-ring records with a unique timestamp accurately demarcating 66 years of growth in one site and (ii) diameter increment measurements from inventory plots in structurally intact closed-canopy forest from the African Tropical Rainforest Observation Network (AfriTRON), across 11 countries (244 plots).
Intact African tropical forests are a carbon sink, at 0.70 Mg C ha^{-1} yr^{-1} [95% CI, 0.55-0.84], which remained stable for three decades. Carbon is fixed in African tropical trees for about 65 years [95% CI, 61-70]. We also find that sequestration and persistence of carbon are greatest in both the understory and the canopy, while the carbon balance in the sub-canopy is neutral.
Our results suggest that the structurally intact African forest carbon sink in live biomass has been robust over the last three decades, despite steep temperature increases and other environmental changes. Furthermore, we stress that both the understory and the canopy contribute to long-term carbon storage, sequestration, and climate resilience.