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Angaben zur Veröffentlichung / Publication details:

Bauters, M., Pascal Boeckx, E. Ampoorter, Hans Verbeeck, Sebastian Doetterl, Geert Baert, and K. Verheyen. 2016. "Tree species effects on topsoil properties in an old tropical plantation." Geophysical Union Abstracts 18: EGU2016-13529. <https://ui.adsabs.harvard.edu/abs/2016EGUGA..1813529B/abstract>.



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Forest biogeochemistry is strongly linked to the functional strategies of the tree community and the topsoil. Research has long documented that tree species affect soil properties in forests. Our current understanding on this interaction is mainly based on common garden experiments in temperate forest and needs to be extended to other ecosystems if we want to understand this interaction in natural forests worldwide. Using a 77-year-old tropical experimental plantation from central Africa, we examined the relationship between canopy and litter chemical traits and topsoil properties. By the current diversity in this site, the unique setup allowed us to extend the current knowledge from temperate and simplified systems to near-natural tropical forests, and thus bridge the gap between planted monocultures in common gardens, and correlative studies in natural systems. We linked the species-specific leaf and litter chemical traits to the topsoil cation composition, acidity, pH and soil organic matter. We found that average canopy trait values were a better predictor for the topsoil than the litter chemistry. Canopy base cation content positively affected topsoil pH and negatively affected acidity. These, in turn strongly determined the soil organic carbon contents of the topsoil, which ranged a tree-fold in the experiment.