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Carbon sequestration in forest soils – Results from input-output balances

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Input-output balances of 53 forest ecosystems were used to calculate the N-induced C-sequestration in forest soils. Input and output measurements were conducted in spruce, pine, beech and oak forests over an 8-years period. N-input ranged from 7-37 kg N ha-1 yr-1 and N-output from 0-27 kg ha-1 yr-1. N-retention in soils was estimated by subtracting N-leaching and N-increments in plants from total deposition assuming similar values for gaseous N-losses and N-fixation (Brumme & Khanna 2008). Soil N-changes ranged from -24 kg to 21 kg N ha-1 yr-1. Negative balances are explained by humus degradation in the mineral soil (n=9), positive values by N-accumulation in the forest floor (n=44). C-sequestration was calculated by corresponding C/N values in the forest floor and the top mineral soil (0-5 cm depth). C-losses from the mineral soil were lower than 290 kg ha-1 yr-1 and C-gain lower than 590 kg ha-1 yr-1. Since the C-losses from the mineral soil did not originate from N-deposition only positive values were used to calculate the N-induced C-sequestration in the forest floor. C-sequestration ranged from 1 kg to 590 ha-1 yr-1. The highest sink was observed for spruce forests (250 ha-1 yr-1, n=14), fallowed by pine (170 ha-1 yr-1, n=11), beech (137 ha-1 yr-1, n=13), and oak (94 ha-1 yr-1, n=6). The overall mean value for C-sequestration is 176 ha-1 yr-1 (sd 140 kg ha-1 yr-1).
Brumme R, Khanna PK (2008) Ecological and site historical aspects of N dynamics and current N status in temperate forests. Global Change Biology 14, 125-141