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Amino sugar dynamics in forest soil exposed to increased nitrogen deposition – Composition and turnover in soil density fractions

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Anthropogenic activity increased atmospheric nitrogen (N) deposition, also in typically N-limited ecosystems such as forests. It is not clear, however, how the increased N-availability affects soil carbon, the largest carbon pool in terrestrial ecosystems. One potential response caused by chronic N-deposition is a shift from fungal- to bacterial-dominated microbial community. To differentiate between fungal- and bacterial-derived organic residues we used microbial cell-wall-constituents (i.e. amino-sugars) as reliable molecular markers. Here, we tested the effects of chronic N-deposition on amino-sugar dynamics by studying their composition and turnover in forest soil fractions.

We used soil samples from a 4-year elevated CO_2 and N-deposition experiment in model forest ecosystems, that were fumigated with ^{13}C-depleted CO_2 and treated with two levels of ^{15}N-labeled fertilizer. Bulk soil was separated into free light fraction, occluded light fraction and heavy fraction by density fractionation and ultrasonic dispersion. The heavy fraction was further particle-size fractionated with 20 μm as a cut-off. We determined carbon and nitrogen concentrations and their isotopic compositions (δ^{13}C, δ^{15}N) within bulk soil and density fractions. We extracted and quantified amino-sugars and conducted compound-specific stable-isotope-analysis using LC-c-IRMS.

N-deposition did not affect carbon allocation between soil fractions. From light to heavy, fractions were more enriched in ^{13}C and more depleted in ^{15}N. Carbon fixed during the experiment was preferentially incorporated into free light fraction material. Except for heavy fraction material smaller than 20μm, N-deposition showed no effects on distribution of new carbon in soil fractions. Besides bulk soil data we will present data on amino-sugar dynamics in forest soil fractions based on a combined ^{13}C and ^{15}N labeling experiment.