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Contribution of DOM-Al-precipitates to the stable C-pool

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The contribution of dissolved organic matter precipitated by aluminium (DOM-Al-precipitates) to the stable C-pool has not been investigated so far. The aims of our study were, first to quantify the microbial stability of DOM-Al-precipitates in dependence on (i) the source of DOM (e.g. varying content of aromatic C), (ii) Al speciation, and (iii) the Al/C ratio, and second, to relate properties of the precipitates to their stability.

Aluminium-DOM precipitates where gained by adding $AlCl_3$ in varying amounts to DOM-solutions of a spruce and beech site (Oi and Oa horizons). For precipitation we adjusted the samples to pH-values of 3.8 and 4.5 to include the effect of different Al speciation. All precipitates were incubated at pH 4.5 for 7 weeks and organic matter stabilisation quantified by CO_2 measurements. Changes in organic matter composition by precipitation and mineralisation were analysed with spectroscopic methods (UV, fluorescence, FTIR, ^{1}H and ^{13}C NMR).

DOM-Al-precipitates proofed to be very stable (0.5 – 7.5 % C mineralised) and showed much smaller mineralisation than DOM itself, e.g. C mineralisation declined from 50% for one DOM sample to 3% of the corresponding DOM-Al-precipitates. The spectroscopic measurements showed in most cases an enrichment of aromatic compounds in precipitates. Organic matter stabilization was less with increasing percentage of Al-hydroxides species. Surprisingly, the stability of DOM-Al-precipitates decreased with increasing Al content.

Multiple linear regression indicated that 76 % of the variability in C mineralisation of all samples can be explained by the C/N ratio and the aromatic C content of the precipitates. Stability of the precipitates increased with increasing C/N ratios and aromatic C contents of the precipitates. Differences in DOM properties before precipitation, Al

speciation and added Al, are leading primarily to shifts in the C/N ratio and aromatic C content of the precipitates, which are then causing differences in mineralisation.

We conclude that in acidic forest soils the precipitation of DOM should be a major driving force of organic matter stabilisation and contributes substantially to the stable C-pool.