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Titel
Texture controls on the size distribution and properties of nano- and small microaggreates in soil

Abstract
Soil microaggregates (SMA) with a size of <250 µm are one of the key factors influencing soil properties of ecological and structural relevance. In order to better understand their role in soil ecosystems, a quantitative understanding about the building units (BU) is necessary. The BU (divided into small SMA (<20 µm) and nanoparticles (NP, <220 nm)) where analyzed to quantify their size distribution and chemical composition. This approach will help to evaluate the properties of BU required for SMA formation.
Soils with different clay contents of a Luvisol site (Scheyern, Germany) were fractionated into SMA and NP by wet sieving and pressure filtration. The differentiation between free and occluded BU was carried out by mechanical disaggregation using ultrasonic treatment. The size distribution of small SMA was analyzed with a XPT particle analyzer, while the abundance and chemical composition of NP were analyzed by field flow fractionation (AF4) coupled to a UV detector and ICP-MS.
According to the mass distribution of the macroaggregate (8 mm-250 µm), large and small SMA fractions, the soils could be grouped into low (15, 18 and 19%) and high (28 and 30%) clay content. The proportion of occluded small and large SMA was increased with clay content. Interestingly the free small SMA proportion was constant and independent from clay content. Also the particle size distribution (PSD) of free small SMA did not correlate with clay content. The similar PSD of free and occluded small SMA was interpreted as a pool of potential BU for the formation of new aggregates. The NP showed three different size fractions. The evaluation of the elements Al, Si and Fe in these size fractions revealed different mass ratios and gave an insight into the composition of free and occluded NP.