Geophysical Research Abstracts
Vol. 19, EGU2017-3227-1, 2017
EGU General Assembly 2017

Multi-scale indicators for carbon storage as a key function of agricultural soils

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Soil organic carbon (SOC) represents the largest carbon pool in terrestrial ecosystems and is a key constituent of soils that controls many soil functions, such as nutrient storage and supply, water storage and agricultural productivity. However, a comprehensive analysis of measureable indicators for the capacity of soils to store SOC at different spatial scales is missing so far. We performed a review of proposed indicators and proxies for the SOC storage capacity of agricultural soils with a focus on temperate agroecosystems. Several potential indicators for total SOC as well as labile and stable OC storage were identified and related to different spatial scales (global, landscape and field/plot scale). The silt- and clay-sized fraction is a promising indicator that enables a reliable estimation of stable SOC storage and the C sequestration potential in a site-specific context. In order to determine potential indicator parameters more efficiently, methodological advances such as adapted field tests, spectroscopic approaches and simplified fractionation methods are needed.