



Modelling bare fallow SOM dynamics on a Chernozem soil in Central Germany

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The level of our process understanding about carbon and nitrogen fluxes in soils becomes visible at extreme situations like bare fallow soils. The observed dynamics of soil organic carbon (SOC) and total nitrogen (TN) in the top soil on a 28 years old fallow experiment on Haplic Chernozem in Bad Lauchstädt (Germany) was modelled using the Candy Carbon Balance (CCB) model that in its standard version was previously validated with LTFE data from Central Europe and a tillage experiment in Austria. For this study we selected two treatments of the fallow experiment in Bad Lauchstädt where the soil was kept bare with mechanical or chemical treatments. For this extreme land use (no input of fresh organic matter) the CCB model was improved to include the SOC related change of soil physical parameters and a dynamic handling of the physically stabilized soil organic matter (SOM) pool.

The results from observation and modelling reflected the increased SOM turnover due to soil tillage for carbon as well as nitrogen and thus confirmed the modelling approach for non-tillage in CCB. The added sub model for the dynamics of physically stabilized SOM was also verified. The long term stabilized SOM is very important on this site. The modelled size of the physically stabilized SOC pool was about 55% of total SOC and reduced only slowly during the nearly three decades but the implementation of this effect resulted in improved simulation results. Thus we conclude that scenarios that lead to bigger changes of SOM stocks require a modelling approach that acknowledges the interaction between SOM and soil physical properties.