Geophysical Research Abstracts
Vol. 13, EGU2011-13913, 2011
EGU General Assembly 2011

Initializing the RothC carbon model: Equilibrium run, physical fractionation, or pedotransferfunctions?

Lutz Weihermüller and Alexander Graf
Forschungszentrum Jülich GmbH, Agrosphere Institute, IBG-3

Knowledge of the soil carbon turnover is essential to predict global climate change impact on terrestrial carbon stocks. For the prediction of carbon turnover and the calculation of carbon dioxide efflux from the soil to the atmosphere various models are available. The widely used RothC model is based on the turnover of different carbon pools, which have to be initialized for the model run. In general, different approaches are used for the initialization, depending on the availability on soil samples or the aim of the study. For the simulation of historical data or large scale approaches equilibrium runs are often preferred because they are independent of the availability of soil samples. On the other hand, short term modeling will be often initialized by physical fractionated carbon pools as suggested by Skjemstad et al. (2004). Finally, various studies reported pedotransferfunctions (pdfs) or regressions to estimate carbon pools from easier measureable parameters (commonly total Corg), whereby these pdfs are restricted to the inert carbon pool (IOM) as reported by Falloon et al. 1998 or to estimate the ratio between microbial biomass (BIO) and humified organic matter (HUM) fraction as proposed by Zimmermann et al. (2007). Unfortunately, there is no pdf or regression reported for the most active carbon pool RPM. In our study we present a pdf for this RPM ration based on the Corg content only. Additionally, we used total combustion curves to estimate the RPM ratio from the temperature dependent CO_2 release. In a last step, we compared the different approaches in terms of CO_2 release for a wide range of conditions using the coupled physically based water, heat, and gas transport model SOILCO2/RothC (Herbst et al. 2008).

References:

Falloon, P.D., P. Smith, et al. 1998. Estimating the size of the inert organic matter pool from total soil organic carbon content for use in the rothamsted carbon model. Soil Biol Biochem 30:1207-1211.

Herbst, M, Hellebrand, HJ, et al. (2008). Multiyear heterotrophic soil respiration: Evaluation 625 of a coupled CO2 transport and carbon turnover model. Ecol Model 214(2-4): 271-283.

Skjemstad, J.O., L.R. Spouncer, et al. 2004. Calibration of the rothamsted organic carbon turnover model (rothc ver. 26.3), using measurable soil organic carbon pools. Australian Journal of Soil Research 42:79-88.

Zimmermann, M, Leifeld, J, et al. (2007). Measured soil organic matter fractions can be related to pools in the RothC model. Eur J Soil Sci 58(3): 658-667.