Geophysical Research Abstracts
Vol. 20, EGU2018-3743, 2018
EGU General Assembly 2018

SOM dynamics feedbacks with water, vapor and heat transfer in the model of chernozem fertility

Artem Vladimirov (1,2), Taras Vasiliev (1), and Nadezda Vasilyeva (1)

(1) Dokuchaev Soil Science Institute, Interdisciplinary laboratory for mathematical modeling of soil systems, Moscow, Russian Federation (artem.a.vladimirov@gmail.com), (2) Joint Institute for Nuclear Research, Dubna, Russian Federation (artem.a.vladimirov@gmail.com)

To study mechanisms of self-consistent soil evolution we integrate feedbacks between detailed biological and physical soil models for a soil profile:
a) local microbially-driven SOM transformations in granulo-densimetric soil fractions with turnover rates affected by SOM localization and physical factors and
b) fluid and energy transport in soil as a solution of the coupled system of equations, taking into account processes of water and vapor diffusion due to matrix potential gradient, vapor diffusion due to temperature gradient, thermal conductivity and heat transport due to evaporation and condensation.

Feedbacks include: Soil moisture and temperature directly affect microbial activity and SOM transformation in the soil, organic matter properties (content, localization and wettability) affect physical occlusion, water retention curve and hydraulic conductivity function through change in soil aggregate structure and waterstability, as well as pore size distribution.

Currently, data obtained on a typical chernozem in Kursk region of Russia are used to parameterize the model. Sensitivity analysis is performed. The models are developed together with the aim to self-consistently describe chernozem soil evolution under climatic and land use change.