Geophysical Research Abstracts
Vol. 16, EGU2014-10460, 2014
EGU General Assembly 2014

Assessment of the Impact of Climate Change and Land Management Change on Soil Organic Carbon Content, Leached Carbon Rates and Dissolved Organic Carbon Concentrations

Maria Stergiadi (1), Ton de Nijs (2), Marcel van der Perk (1), and Luc Bonten (3)

(1) Utrecht University, Department of Physical Geography, Utrecht, The Netherlands (m.vanderperk@uu.nl), (2) National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands (ton.de.nijs@rivm.nl), (3) Alterra, Wageningen UR, Soil Science Centre, Wageningen, The Netherlands (luc.bonten@wur.nl)

Climate change is projected to significantly affect the concentrations and mobility of contaminants, such as metals and pathogens, in soil, groundwater and surface water. Climate- and land management-induced changes in soil organic carbon and dissolved organic carbon levels may promote the transport of toxic substances, such as copper and cadmium, and pathogenic microorganisms, ultimately affecting the exposure of humans and ecosystems to these contaminants. In this study, we adopted the Century model to simulate past (1900 – 2010), present, and future (2010 – 2100) SOC and DOC levels for a sandy and a loamy soil typical for Central and Western European conditions under three land use types (forest, grassland and arable land) and several future scenarios addressing climate change and land management change. The climate scenarios were based on the KNMI'06 G+ and W+ scenarios from the Royal Dutch Meteorological Institute. The simulated current SOC levels were compared to observed SOC values derived from various Dutch soil databases, taking into account the different soil depths the simulated and observed values refer to. The simulated SOC levels were generally in line with the observed values for the different kinds of soil and land use types. Climate change scenarios resulted in a decrease in both SOC and DOC for the grassland systems, whereas in the arable land (on sandy soil) and in the forest systems, SOC was found to increase and DOC to decrease. A sensitivity analysis of the individual effects of changes in temperature and precipitation showed that the effect of temperature predominates over the effect of precipitation. A reduction in the application rates of artificial fertilizers leads to a decrease in the SOC stocks and the leached carbon rates in the arable land systems, but has a negligible effect on SOC and DOC levels of the grassland systems. This study demonstrated the ability of the Century model to simulate climate change and agricultural management effects on SOC dynamics. The following step of this study will involve the translation of the soil organic matter pools as simulated with Century model, into pools of different metal binding capacity to be used for the metal partitioning and leaching modelling.