Geophysical Research Abstracts
Vol. 16, EGU2014-11793, 2014
EGU General Assembly 2014

Spatial distribution of labile and protected fractions of soil organic matter as a combined effect of variable soil texture and forest tree species composition

Piotr Gruba (1), Jarosław Socha (2), Ewa Błońska (1), and Jarosław Lasota (1)

(1) Department of Forest Soil Science, University of Agriculture, Al. 29 Listopada 46; Krakow 31-425, Poland, (2) Department of Biometry and Forest Productivity, University of Agriculture, Al. 29 Listopada 46; Krakow 31-425, Poland

In this investigations we focused on the effects of variable soil texture and forest species composition on: (1) stocks of soil organic carbon (SOC) in the organic horizon (O) and mineral soil (A and B horizons), and (2) content of carbon in physically separated fractions of samples from the A horizon: free light fraction (C_{fLF}), occluded (inside aggregates) free light fraction (C_{oLF}), and mineral associated fraction (C_{MA}). Study area was located in the Swietokrzskie mountains, central Poland. The soils were derived from Triassic claystones and sandstones and Quaternary sandy deposits. The dominant forest species were Silver fir and European beech, with minor admixture of common hornbeam and Scots pine. We set up 275 plots in regular 200x200 m grid. Spatial dependence and correlations were analyzed using multiple regression and geostatistical tools: variogram and cross-variogram. The results demonstrated that the proportion between carbon stored in above ground tree biomass, soil organic horizon and mineral soil is roughly 10:5:5 (kg m^{-2}). A key factor regulating retention of organic matter in soils was the content of fine fractions (FF). The content of FF positively affected the content of SOM in mineral soil and negatively the content of SOM accumulated in the organic horizon. Regarding the fraction of SOC in the A horizons, the content of FF had strong positive effect on the content of C_{MA} (C_{MA} [g kg^{-1}]= 1.4 + 0.40 $\times$ FF[%], n=275, R^2=0.70), weak positive influence on the C_{fLF}, and no effect on C_{oLF}. The content of labile fraction accumulated as the O horizon and C_{fLF} fraction in the A horizon were negatively correlated.

Results of statistical and geostatistical analysis suggest that the increasing share of beech and hornbeam had a positive effect on carbon stores in mineral soil and the opposite was true for the relationship between the FF content and carbon stores in the O horizon. Fir, in the other hand, positively influenced the content of carbon occluded inside soil aggregates (C_{oLF}).