EGU2020-15168
https://doi.org/10.5194/egusphere-egu2020-15168
EGU General Assembly 2020

Spatial pedocomplexity in old-growth temperate forest driven by tree-uprooting: its formation and role in forest dynamics

Andrea Román-Sánchez and Pavel Samonil
The Silva Tarouca Research Institute, Brno, Czech Republic, o92rosaa@uco.es

Soil formation is a complex process that depends on topography, biota, bedrock, climate, and time. Despite of the great effort dedicated to explore soil evolution, little is known about the role of stochastic phenomena such as soil disturbance in spatial pedocomplexity formation in old-growth temperate forests. Within this study we aim to (i) reveal spatial pattern of chemical soil properties, (ii) explain differences in spatial pedocomplexity formation in A and B soil horizons.

The issue was studied in Zofinsky Primeval Forest Reserve (hereinafter Zofin) in SW Czech Republic. The Zofin has been strictly protected since 1838 and it represented the 4th oldest forest reserve in Europe. Zofin belongs to the global network of forest research plots ForestGeo (www.forestgeo.si.edu/) as the first site in continental Europe. We sampled 309 soil profiles on an area of 74 ha. In total 34 chemical soil properties were analysed in A and B horizons, particularly those, which affect soil evolution and tree growth. We analysed concentrations of Al, Fe, Mn, Ca, Na, Sr, Si fractions, characteristics of sorption complex (CEC, EA, base content), pH etc.

We used descriptive statistics and geostatistics to spatial pedocomplexity study. The experimental variograms were modelled to fit them to the best theoretical distribution. From the theoretical distribution we calculated the spatial properties in each soil elements as the range, sill and nugget. Then, using AIC estimator, we selected the same best model for both horizons to compare the spatial parameters through parametric or not parametric statistical test depending on the normalization of the data.

The results indicate, for the first time, significantly longer ranges of spatial autocorrelation of soil properties in A horizon with comparison to B horizon, which is not common in geostatistical studies. It is most likely associated with rejuvenation of soil after tree uprooting. Neoformation of A horizon after soil disturbance proceeds quite rapidly and therefore some formerly disturbed A horizons are matured above immature B horizons. The range in both horizons for all chemical soil properties is independent (p-value <0.05), indicating that the driving factors for disturbance in horizon A and B are different. However, for rather biogenic soil properties as Mg, Ca, Na, EA, K there is dependence for horizon A and B (p-value>0.05), indicating similar effect of these elements in both horizons.