Transformation of iron forms during soil formation after tree uprooting in a natural beech-dominated forest

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Introduction

Windthrows represent one of the most important disturbances in forest ecosystems. The parts of windthrows (pit, mound) represent ecologically unique microsites in forest stands, with specific erosion-sedimentation regime and essential impact on terrain microtopography.
Iron forms keep changing in time reflecting the soil formation.

Locality

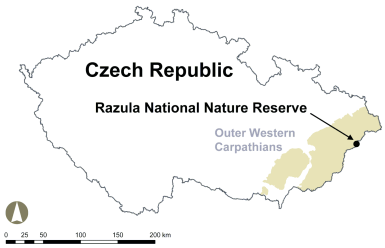
Locality: Natural fir - beech forest Razula
Soil samples were taken in five depths (3, 15, 30, 50 and 80 or 100 cm) in three positions of windthrow (Fig. 1.) - mound, pit and undisturbed part as a control (Šamonil et al. 2008a,b)
Soil types: Skeletic Cambisols and Haplic Cambisols

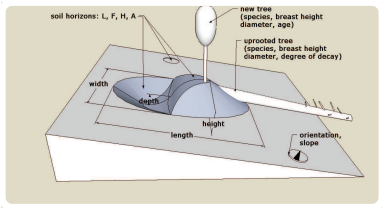
Iron forms analysis

- single extraction - exchangeable, crystalline, amorphous together with organically complexed Fe (Šamonil et al. 2010) and total content
- voltammetry of microparticles (VMP)
- diffuse reflectance spectroscopy in the near IR-Vis-UV region (DRS)
- powder X-ray diffraction

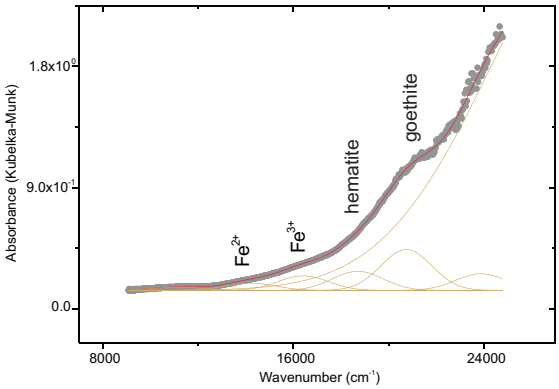
Mineralogical composition of soils

The prevailing mineral - quartz (about 57 %)
Less abundant - albite (about 26 %) and muscovite (about 11 %)
Accessory - titanite, chlorite, biotite and nimite



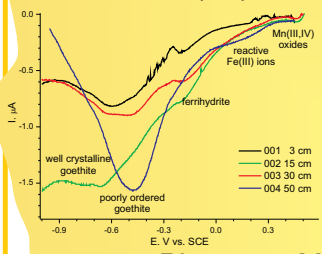


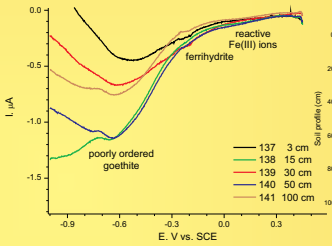
Location of the study area: National Nature Reserve Razula (Czech Republic - Western Carpathians); position of windthrow in natural forest (Šamonil et al. 2008b).



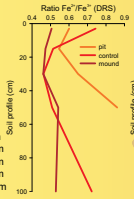
Diffuse reflectance spectra. Data points, thick line: fitted spectra, thin lines: Gaussian components.

VMP Iron forms - 20 years old windthrow
- metastable Fe(III) oxides and poorly ordered goethite

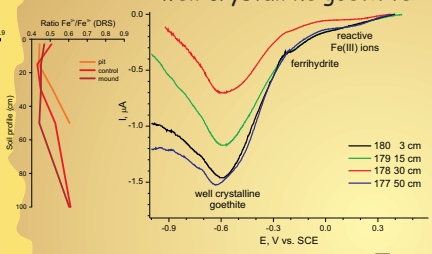


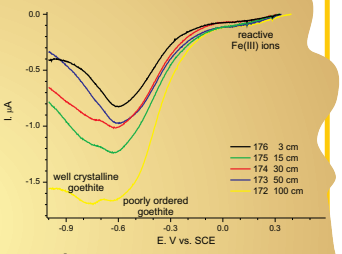


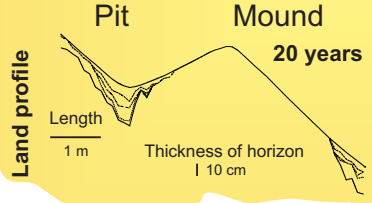
DRS - Ratio Fe^{2+}/Fe^{3+}

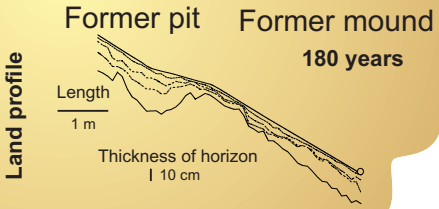


VMP Iron forms - 180 years old windthrow
- well crystalline goethite









Conclusions

These results can be used for creation of pedogenetic models describing forest soil evolution

Silicate bonded Fe^{2+} and Fe^{3+} (ratio Fe^{2+}/Fe^{3+}) exhibits almost the same distribution over the soil profile and windthrow microsites (pit and mound)

Generally, with increasing of soil profile the ratio of Fe^{2+} to Fe^{3+} increases

Acknowledgements

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