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Development of Podzols in relation to Jenny's soil formation factors

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Podzols are considered to be the most common upland forest soil type in Finland. However, there have only been a few studies that have examined the degree of podsolization in Finnish soils. More detailed information about this dominating process in our soils can be utilized in other kinds of environmental research such as the impacts of climate change, carbon and nutrient cycling, and the degradation of soil and water systems.

We studied how the intensity of podsolization is related to Jenny's classic five soil formation factors: climate, parent material, topography, biotic and time. The degree of podzolization of 86 soil profiles distributed over the whole of Finland was described using four podzolization indices: E-horizon thickness, B-horizon rubification, profile Al+Fe oxide eluviation-illuviation, and their sum (Podzolization Development Index, PDI). The soil profiles, selected out of over 600 soil profiles in a national database, met the World Reference Base for Soil Resources (WRB) criteria for them to be classified as Podzols. The relationship between the podzolization indices and a number of site and soil variables (continuous and categorical) describing Jenny's soil formation factors were then evaluated. While podzolization intensity was found to be related to soil profile age, elevation, longitude, forest site type, aspect, Sphagnum moss cover and B-horizon texture, the individual relationships were weak. However, looking at the combined effect of all the variables using Partial Least Squares regression analysis, which is unaffected by multicollinearity among the predictor variables, nearly 70% of the measured PDI index could be explained.