

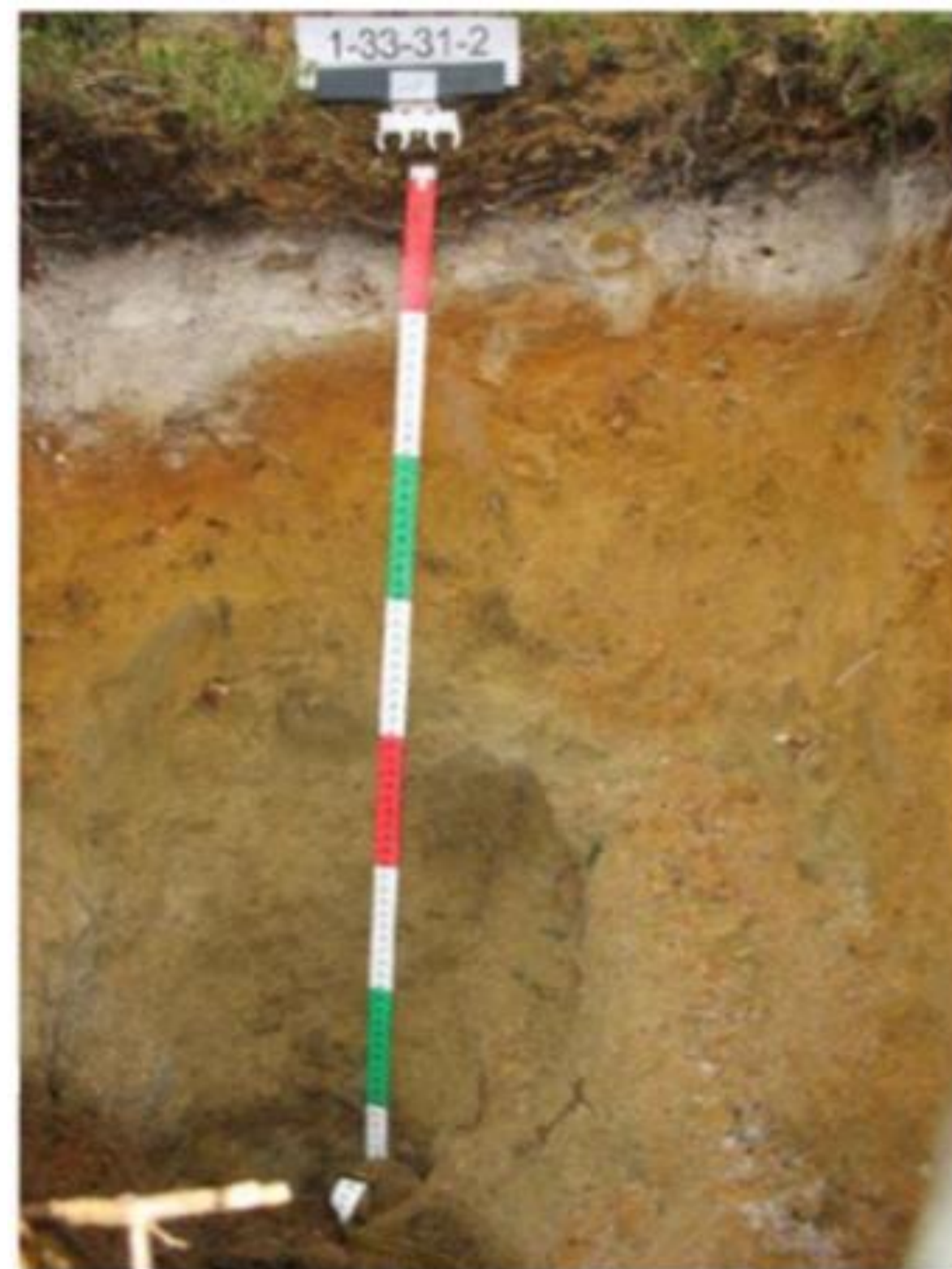
# Development of Podzols in relation to Jenny's soil formation factors

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## BACKGROUND

Podzols are the prevailing soil type in the northern latitudes and 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.

The development of Podzols is valuable to know more detailed, since the nature of the B horizon can be utilized in environmental research.



A typical Podzol profile in Finland

In this study we

- Determine the degree of podzolization using four podzolization indices: E-horizon thickness, B-horizon rubification, profile  $Al+\frac{1}{2}Fe$  oxide eluviation-illuviation, and their sum (Podzolization Development Index, PDI), and
- Analyzed how the intensity of podsolization is related to Jenny's classic five soil formation factors: climate, parent material, topography, biotic and time

## STUDY MATERIAL

- The climate is humid, precipitation exceeding evapotranspiration, forests dominated by boreal coniferous trees, young soil composed mostly by medium to coarse grained tills
- The data was collected in 2006-2007, as part of the ICP-Forests programme
- The soil profiles were selected out of over 600 soil profiles in a national BioSoil database
- All 86 selected soil profiles were distributed over the whole Finland and met the World Reference Base for Soil Resources (WRB) criteria for them to be classified as Podzols
- BioSoil database includes information of forest site type, topography and morphological + chemical features of the soil
- The soil age was determined separately using literature of deglaciation history

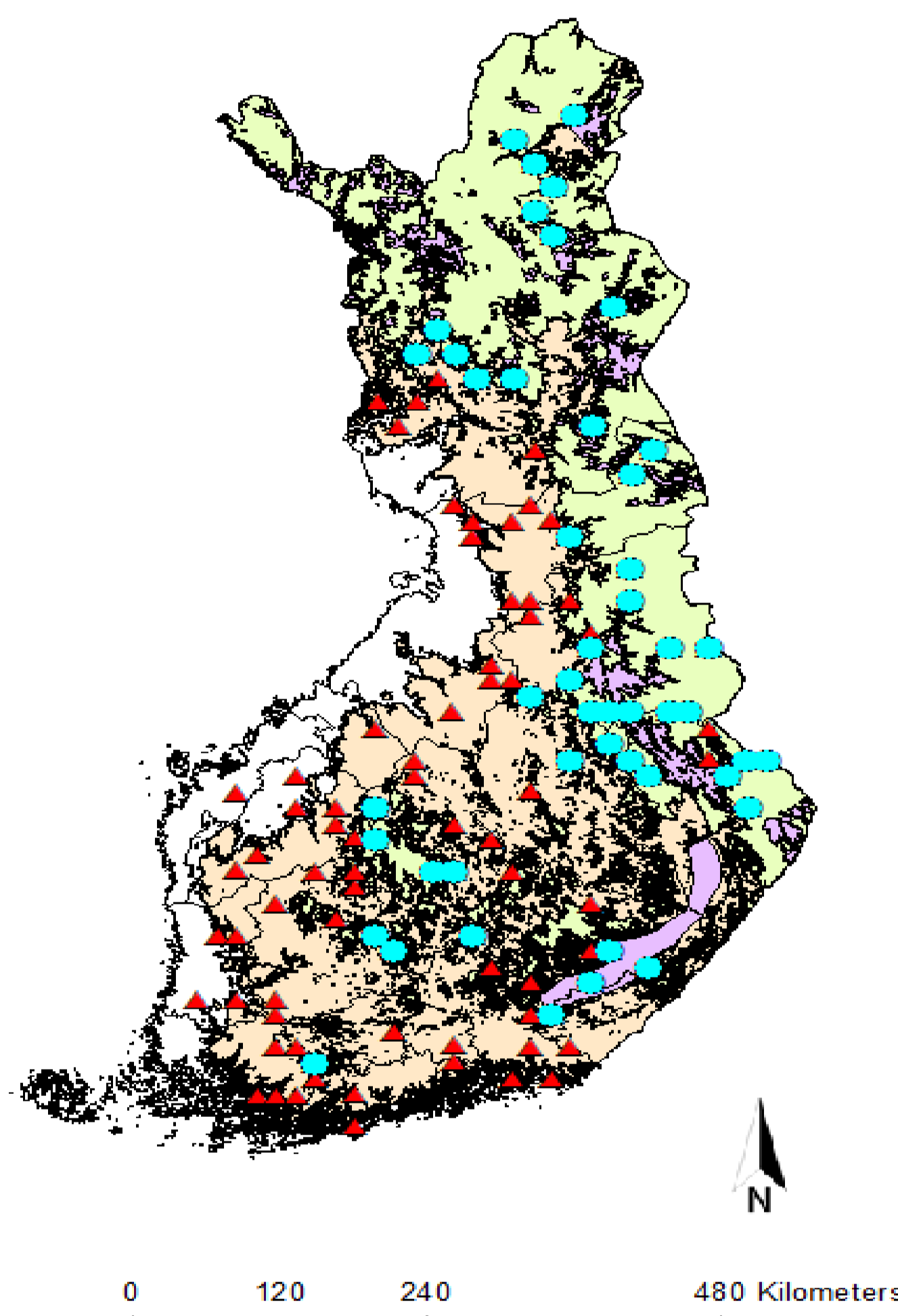


Figure 1. Locations of soil profiles. Red triangles are profiles located in sub-aquatic areas and blue circles in supra-aquatic areas. Green shaded areas indicate supra-aquatic areas, beige coloured areas indicate under the Yoldia Sea and the Ancylus Lake and white areas indicate areas under the Littorina Sea. Purple colored areas have been under local ice lakes.

Soil formation factor	BioSoil variable
Climate	Latitude
	Longitude
	Elevation
	Moisture
	Slope aspect
Topography	Topographical position
	Slope aspect
	Moisture
	Sphagnum cover % (Elevation)
Parent material	Supra-/Sub-aquatic
	Silt %
	Sand %
	Coarse fragments %
	Mean grain size
	Parent material
	Bare rock cover % (Moisture)
	(Sphagnum cover %)
	(Site type)
Biotic	Site type
	Sphagnum cover % (Moisture)
Time	Soil age
	Young/old
	(Supra-/Sub-aquatic)
	(Elevation)

Table 1. Jenny's soil formation factors and BioSoil variables (continuous and categorical) used to quantify the influence of each factor on the degree of podzolization.

## RESULTS

- 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.

References:

- Törmänen, T. 2016. Verification of field-based classification of Podzols and their development in relation to soil formation factors. Master's thesis, University of Helsinki,