



## **Soil formation on hard rock with and without cover of Pleistocene periglacial slope deposits in humid-temperate climate of Europe**

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Until the 1960s pedologists in Germany assumed that soils on hard rock in the mountainous regions of Germany developed directly from the underlying hard rock. Then, especially Schilling and Wiefel (1962) in eastern Germany and Semmel (1964, 1968) in western Germany developed, independently from each other, the concept of Pleistocene periglacial slope deposits (PPSD). However, it took several decades until this concept became largely accepted and was also introduced in textbooks and in the German soil and substrate taxonomy. This paper compares soil development on hard rock covered by PPSD in the eastern Rhenish Massif (Germany) to soil development that took place indeed directly on hard rock, in southern Norway, where glaciers removed all loose, weathered material from the rock during the last glacial period.

Eight soil profiles developed in PPSD on quartzite and 12 soil profiles developed in PPSD on diabase are compared to four profiles in the Oslofjord region developed from hard rock. Soils were described in the field and analysed with regard to particle size analysis, pH in water, total element composition, Fed, Feo, CEC and base saturation.

### 1) Podzol developed from medium-grained granite

This soil has an age of ca. 10,000 years. An 18 cm thick organic surface layer has accumulated on top of the mineral soil consisting of an E (14 cm) and BCs (14 cm) horizon. Vegetation at the site consists mainly of pine, birch, fir, and blueberry, heather and mosses.

### 2) Podzol developed from coarse-grained granite

This soil has an age of above 11,000 years. The organic surface layer has a thickness of 7 cm; the mineral soil comprises an E (7 cm) and Bs (7 cm) horizon. Vegetation consists mainly of pine, fir, birch, and blueberry, heather, ferns and mosses.

### 3) Cambic Leptosol developed from Latite

This soil has an age of ca. 10,000 years. The thickness of the organic surface layer is 5 cm; the mineral soil comprises an Ah (4 cm) and AB (20 cm) horizon. Vegetation consists mainly of beech, birch, fir, pine, and sorb, blueberry and hair-grass (*Deschampsia flexuosa*).

### 4) Cambisol developed from Monzonite

This soil has an age of ca. 9,500 years. The thickness of the organic surface layer is 6 cm; the mineral soil comprises an Ah (9 cm), Bw (17 cm) and BC (9 cm) horizon. Vegetation consists mainly of fir, oak, beech, and sorb, blueberry, ferns, grasses and mosses. Geochemical data suggest that the soil has not entirely developed from Monzonite but that the Ah and Bw horizon are mainly composed of a thin layer of beach sediments.

The comparison demonstrates the importance of physical weathering under periglacial conditions and formation of PPSD for Holocene soil development on hard rock in central Europe.

### References:

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