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Soils derived from Pieniny andesite, Wdżar hill, Outer Carpathians (Poland)

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Tertiary andesite occurs in only few places in Polish part of the Outer Carpatians. The biggest andesitic body is observed at the Wdżar hill (676 m a.s.l), SE from Kluszkowce village. To the beginning of the 1970s active quarry were located at the hill slope, and from the end of 1990s Wdżar is used as a ski resort. Because Wdżar is the culmination protruding over sandstones and shales of Magura Unit of Outer Carpatians, it gives opportunity to investigate soils derived directly from the andesite.

Primary, unaltered andesite contain mainly plagioclase (An_{28-62}), amphibole (hornblende group), clinopiroxene (pigeonite group) and Fe-Ti oxides (Michalik et al., 2004). Quartz in those type of rocks is absent. Andesites from Pieniny Mts. contain low amount of silica (ca. 52-55% wt. in fresh and about 62% wt. in hydrothermally altered rocks), and high amount of CaO (5,5-9,2% wt.) and MgO (0,8-5,5% wt.) (Nejbert et al., 2012).

Soils cover on Wdżar hill represents different stages of soil development. Shallow, ca. 15 cm deep, Eutric Leptosols and deeper, 60 cm and over 200 cm deep, Eutric Skeleti Cambisols (Colluvic, Humic) were distinguished. There are significant differences both between the soil groups as well as inside them. Investigated soils have sandy loam, loam and silt loam texture. Surface, organic horizons show acid reaction, but cambic and parent material horizons show neutral reaction. Cation exchange capacity ranges between 526.9 and 298.2 mmol(+)·kg^{-1} in humus horizons and between 451.4 and 225.8 mmol(+)·kg^{-1}in cambic and parent material horizons. The amount of exchangeable Ca^{2+} ranges between 386.8 and 175.8 mmol(+)·kg^{-1} and is about 6 times higher than sum of Mg^{2+}, Na^{+} and K^{+} in the soil horizon. Despite of the high amount of Ca^{2+}, there were no active carbonates in investigated soil.

The soils, that are developed from the andesite, usualy contain high amount of clays and very low amount of primary quartz. Andesite from Wdżar reveals minor degree of hydrothermal alteration, mainly the presence of clay minerals developed at the expense of primary plagioclases. In investigated soils it is possible to distinguish two generations of clay minerals. Coarse clays (< 2.0 μm), which were developed during hydrothermal alteration of andesite, contain mainly vermiculite. In fine clays (< 0.2 μm), derived during weathering of rocks and development of soil, smectite is the main component. Quartz, which is present in investigated soil is eolian in origin.

References

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