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Late Pleistocene dynamics in central Pennsylvania (USA) – new findings on periglacial slope deposits, pedology and chronology

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Pleistocene dynamics are usually associated with the formation of characteristic landforms such as moraines, dunes, or kettle holes. However, cold climate processes can also shape the landscape but not result in such prominent relief features. This is especially true for slope deposits that have been formed in periglacial regions through geli-solifluction and/or cryoturbation. While the terms used to refer to such slope deposits may differ with the disciplines of soil science and/or geomorphology, such features are often still recognized by practicing scientists. In the US, geli-solifluction and/or cryoturbation features are subsumed with a very general term 'colluvium' whereas in Europe a more sophisticated number of terms is used separating sediments which formed under cold climate processes from sediments which formed due to anthropogenic induced soil erosion. Our study focuses on the stratigraphy of late Quaternary deposits and the soil formation in the northern Appalachians. The study area wasn't glaciated during the Wisconsin glaciation; hence no MIS 5 or younger glacial deposits are reported.

To advance a common terminology between geoscientist, we examined pedons representative of Holocene and periglacial dynamics that reflect the strong role that solifluction played in pre and MIS 5 landscape dynamics. Especially on foot slopes and toe slopes pedon stratigraphy is characterized by a several meter-thick par-autochthonous deposits that are rich in clasts. Clasts in deposits are aligned with the slope direction and are imbricated; on back slopes par-autochthonous deposits are also present but more shallow. Stratigraphy and OSL chronology strongly suggests that during the late Pleistocene several phases of morphodynamics shaped the landscape via solifluction followed by an eolian input of silt to the soils/sediments. Geochemistry reflects the multi-layer character of the soil profiles showing clear differences between the bedrock and deposits above. Elevated values of manganese in the surface soil indicate the importance of plant litter biocycling during the Holocene. Hence on a landscape scale, the distribution of soils and the pedogenesis is strongly related to the par-autochthonous character of the substrate rather than the bedrock.