EGU2020-5661
https://doi.org/10.5194/egusphere-egu2020-5661
EGU General Assembly 2020

The presence of silty mantles in Northcentral Appalachian, USA soils and their relevance to pedology

Patrick Drohan[1], Thomas Raab[2], and Florian Hirsch[2]
[1]Penn State, Ecosystem Science & Management, University Park, United States of America (pjd7@psu.edu)
[2]Geopedology and Landscape Development, Brandenburg University of Technology Cottbus□Senftenberg, Cottbus, Brandenburg, Germany.

Across the northcentral Appalachians, USA, high silt content soils are found as silty mantles or deep, high silt content pedons. The origin of such soils can be attributed to additions of wind-blown dust deposits (WBD) or local parent materials (i.e. shales or siltstone lithology). Previous research on silt soils originating specifically from WBD attributed to late marine isotope stage (MIS) 2 loess has often been isolated to drainageways receiving outwash from deglaciation. We hypothesize that thin (<25-50 cm) silty mantles, and some deep silt soils occurring farther from outwash systems, are also indicative of post MIS 2 WBD and their extent is widespread. To test this hypothesis, we evaluated over 900 pedons from an ~119,280 km^2 area of the northcentral Appalachians, USA to: (i) develop a particle size signature indicative of soils largely derived from WBD versus local parent materials, (ii) determine the potential depth of WBD additions to soils, and (iii) document the spatial extent of WBD versus deep, high-silt content soils across part of the region. Results suggest that silty mantles are prevalent across the study area and have a particle size signature indicative of loess and the mean depth of WBD additions to soils is ~50 cm. Below 50 cm, local lithology or pedogenesis more influences particle size trends. Pedon results were applied in a spatial modeling effort using the USA Soil Survey Geographic Database (SSURGO) to document the extent of silty mantles (over non-silt sourced parent materials) and deep, high silt content soils. Model results indicate silty mantles are common on stable landscape positions or positions that accumulate sediments (depressions or valleys). Aspect dependent deposition appears tied to sources of WBD deposits, and deposits correspond strongly to regional studies of WBD deposits derived from loess. Last, proximity to topography, which can act as a trap for WBD, appears to be a key variable explaining silty mantle and deep, high-silt content soil occurrence.