Towards a hydrologically motivated soil texture classification

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Soil texture classification is not designed for hydrological purposes, e.g. for hydrological modelling. Hydrological model applications based on classified soil textures have revealed that different soil texture classes within the same classification system induce different uncertainties with respect to simulated water balances. As a consequence, there is a need to think about required similarity in texture classifications.

In different regions of the world, different soil texture classification systems have been developed. These different classification systems divide the soil texture triangle in different numbers of differently shaped soil texture classes. These texture classifications are based on pedological background and practical reasons with respect to soil mapping and analyses. In comparison, a possible soil texture classification motivated by soil hydrology should be based on similarity in hydrological fluxes or in the soil water regime.

Therefore, this presentation proposes a procedure how to evaluate the appropriateness of currently used texture classifications and how to derive a new soil texture classification based on a similar behaviour of soils with respect to hydrological processes. Long-term hydrological modelling of water balance terms using the 1-D SVAT scheme SIMULAT serve as the basis of a similarity analysis of 5050 possible realisations of the soil texture triangle (1% grid). Cluster analysis is used for analysing similar hydrological behaviour of theoretical soil columns. Spatial patterns of similar realisations (=clusters) in the soil texture triangle based on annual water balance terms are compared to those based on soil hydraulic parameters and current soil texture classes.

The results show that clusters based on soil hydraulic parameterisation are relatively similar to current soil texture classification schemes while hydrological model simulations suggest differing spatial patterns of similar behaviour over the soil texture triangle. A hydrologically motivated soil texture classification therefore could improve the general applicability of classified soil texture data for hydrological modelling purposes but would require a restructuring of existing soil texture classifications.