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Landscape evolution and soil hydrological change: new insights from sandy soils in the Campine area, Northern Belgium

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Hydrological properties of soils and sediments as they can be measured today may evolve according to their environmental context during landscape evolution. Linking soil profile development with hydrological changes of particular soil horizons over time scales of several hundreds to thousands of years is a typical example of emerging hydropedological research and is the subject of the current study. For this purpose, a dry podzol profile buried under younger drift sands was investigated using advanced hydrological (Beerten et al., this volume (a)) and geomorphological techniques (Beerten et al., this volume (b)).

The principal results suggest that during the last 10 000 years, geomorphological and pedological processes have induced changes in saturated hydraulic conductivity values (K_{sat}) across the podzol profile resulting in present-day differences of up to four orders of magnitude. The highest values ($K_{sat} \sim 10^{-3}$ m/s) are found in $\sim$ 250 year old uncompacted drift sand deposits, while low values are typical for the illuviation horizon (Bh) of podzol soils that developed in Weichselian cover sands ($K_{sat} \sim 10^{-7}$ m/s). Detailed investigations show that landscape stabilisation and podzolisation in such sandy substrates under pine and/or heather may lower K_{sat}-values by an order of magnitude in less than 100 years while higher order changes may take several 1 000 years.

It is concluded that soil hydrological properties display large spatial variability even within the same soil profile; this variation was shown to have a strong correlation with the development stage and thus age of the soil horizon. The established relationships may help explain past hydrological changes and improve predictions of future hydrological changes of soils in the Campine area.

References

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