



Small is beautiful: why microtopography should be included in bog hydrology

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Microtopography can have a large effect on flow processes at the soil surface and the composition of soil water. In peat areas, microtopography is shaped by differences in species, the growth rate and transpiration of the vegetation, and the amount of water flowing from higher areas. Microtopography is often represented by a roughness parameter in hillslope hydrological models. In areas without a strong topographical gradient however, microtopography may be underestimated when accumulated in a single parameter, especially in the presence of shallow groundwater systems. In this study, we review the intricate relationships between microtopography, surface runoff, and ecohydrology in systems featuring shallow water tables.

In an analogy to surface runoff, the hydrology of a raised bog can be described as a combination of open water flow on a saturated medium, instead of the traditional acrotelm-catotelm concept that only acknowledges the saturated medium. We explored water flow through the microtopography of a raised bog with a simple conceptual model that accounts explicitly for microtopographic features and the changing flow directions these may cause. With this approach we were able to investigate the activation of fast flow paths on different areas of the bog as a function of their wetness level and bog-specific morphological features, such as hummocks and hollows.

Our type of approach could be used to improve the understanding of the spatial and temporal variability of rainfall-runoff responses on raised bogs. In addition, similar approaches could be used to investigate how various runoff regimes affect the mixing of water with different chemical signatures, another driver of variations of the occurrence of plant species.