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Estimating denitrification potential in natural wetlands: Mapping major flow path ways with near-surface geophysics and thermal infrared remote sensing.

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The hydrology of peatlands, wetlands, and riparian lowlands can be summarized by a single term: Tricky! The ground water-surface water interaction is crucial and may be highly temorally and spatially variable where features such as infiltration rate, seepage, hydrological conductivity, groundwater flow velocity, and flow path distribution are continuously coupled and de-coupled as a function of season, precipitation, (micro)topography, gradient, and stream flow. When evaluating the effect of denitrification of nutrient rich groundwater by organic sediments in natural wetlands, the determination of dominant flow paths is extremely important. At present, the exact denitrification potential of natural wetlands are of great interest with respect to the efforts made for complying with the European Water Framework Directive and resulting in a quality increase for marine and fresh water bodies.
This study focuses on a riparian lowland (26 ha) in Easter Jutland, Denmark with 0-15 meter deposits of peat and gyttja on a basis of Weichselian sandy clayey till. The catchment is predominantly agriculture and the input water is a mixture of precipitation, ground water and water from tile drains. Covering the entire riparian lowland with traditional geophysics and hydrological monitoring is time-consuming. Therefore an approach combining 1) spatially fast geophysics (DualEM421, Dualem.inc, Canada) for determining near-surface geology, and 2) thermal infrared remote sensing (ThermoMap, senseFly, Switzerland) for mapping surface water distribution. The results show that with limited field work, we are able to map 1) presence of near-surface peat, sand, and till, 2) map tile drainage water input zones, and 3) map infiltration zones for tile drainage water. This gives us valuable input to where we should focus our efforts with respect to water sampling and chemical analyses and ultimately estimate the denitrification potential of the area.

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