



## **Tracing dissolved organic matter (DOM) sources within the unsaturated zone using fluorescence spectroscopy, an example from the glacial till in the Eden valley, Northwest England**

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The Penrith Sandstone aquifer is a regionally important source of public water supply and is locally impacted by anthropogenic pollution. Livestock rearing is the main agricultural activity in the Eden valley, Northwest England. The spreading of slurry wastes on grassland to improve pasture is common place and has increased in recent years. Both the timing and quantities applied are more dictated by the need to dispose of the slurry than to meet the crops nutrient needs. This leads to nutrient loss to runoff, posing a threat to surface water quality, and loss to the unsaturated zone due to recharge which can lead to increased groundwater nutrient concentrations. This study shows the novel use of excitation-emission matrix (EEM) fluorescence spectroscopy to rapidly trace the source and quality of dissolved organic matter within the unsaturated zone. Changes in dissolved organic carbon (DOC), fulvic-like (FA) and tryptophan-like (TRP) intensities and TRP: FA ratios (1.6-0.4) within the unsaturated zone are strongly suggestive a farm waste source of organic carbon. The preferential removal of the more labile TRP within the shallow unsaturated zone compared to the FA is likely due to microbial degradation. Fluorescence analysis allowed the rapid assessment of different types and relative abundances of dissolved organic matter (DOM), and fingerprinting of different sources of organic carbon within the unsaturated zone.