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# Regional variation of natural peatland pool biogeochemistry and carbon concentrations

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Natural open-water pools are a common feature of northern peatlands. They are characterised by low primary production, low pH, and often high concentrations of dissolved organic carbon (DOC). Peatland pools are also sources of atmospheric $CH_4$, and thus have the potential to play an important role in global radiative forcing. Pool environmental variables, particularly water chemistry, vegetation community and physical characteristics, have the potential to exert strong controls on C cycling in pools; however, to our knowledge, no existing studies have addressed the potential variation in pool biogeochemistry and physical characteristics on a regional basis.

A total of 66 peatland pools were studied across three regions of the UK (northern Scotland, south-west Scotland, and Northern Ireland) over the period September – October 2013. Vegetation communities, mean depth and basic water chemistry (pH, electrical conductivity and dissolved oxygen) were measured *in situ*. Water samples were taken for analysis of DOC, POC, DIC, $CH_{4diss}$, $CO_{2diss}$(dissolved $CO_2$ and $CH_4$),total N and P, and $Cl^-$, $SO_4^{2-}$ and $NO_3^-$. To evaluate the composition of DOC, UV absorption was measured at 665, 470, 465, 436, 400, 360, 265, 254 nm.

We show that many pool variables are significantly different between regions, including DOC, POC and $CH_{4diss}$. The higher ratio of absorbance at 465 to absorbance at 665nm ($E_4/E_6$) for pools in Northern Ireland indicates DOC was sourced from less humified peat, which has implications for the bioavailability and mineralisation of organic carbon. Anion concentrations were significantly higher in the pools in northern Scotland than elsewhere, most likely due to a marine influence. $SO_4^{2-}$ is a $CH_4$ electron acceptor and thus concentrations may influence methanogenesis. Hierarchical cluster analysis shows clear grouping of the individual pools within each region. PCA analysis showed that pools in SW Scotland were strongly associated with greater vegetative cover (*Sphagnum, Eriophorum,* algae) and shallower water depth, whereas pools in N Scotland were more open and deeper, with *Menyanthes trifoliata* occurring more frequently.

We discuss the implications of these results in the context of the role that pools play in peatland carbon cycling.