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Constraining the carbon budget of peat ecosystems: application of stoichiometry and enthalpy balances.

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This study considers how the stoichiometry and energy content of organic matter reservoirs and fluxes through and from a peatland enable the carbon fluxes and storage within a peatland to be constrained. The study considers the elemental composition of the above- and below-ground biomass, litter, the peat profile, dissolved and particulate organic matter within a blanket bog in northern England for which only the C budget had been measured. The study shows, based only the elemental composition and calculation of oxidation and energy contents, that:

- DOC in first-order streams is significantly more oxidised than that in peat pore water but that there is no significant difference in organic carbon oxidation state down the peat profile.
- The approach predicts the occurrence and speciation of N uptake and release in the peatland with N used and recycled.

- The relatively high oxidation state of DOC in stream water means that acts as an end point for reaction.
- Methanogenesis does not develop in deep peat as it requires too much energy to form.
- Sulphate reduction did result in the formation of deep peat but in this catchment this was inadequate to account for the rate of peat formation.

The formation of deep peat in this catchment could only be achieved if the DOM in the peat pore water was acting as an electron acceptor and energy source; however, it is unclear as to the flux of DOM up or down the peat profile.