The flux of organic matter through a peatland ecosystem – evidence from thermogravimetric analysis

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Carbon budgets of peatlands are now common and studies have considered nitrogen, oxygen and energy budgets, but no study has considered the whole composition of the organic matter as it transfers through and into a peatland. Organic matter samples were taken from each organic matter reservoir found in and each fluvial flux from a peatland and analysed the samples by thermogravimetric analysis. The samples analysed were: aboveground, belowground, heather, mosses and sedges, litter layer, a peat core, and monthly samples of particulate and dissolved organic matter. All organic matter samples were taken from a 100% peat catchment within Moor House National Nature Reserve in the North Pennines, UK, and collected samples were compared to standards of lignin, cellulose, humic acid and plant protein.

Results showed that the thermogravimetric trace of the sampled organic matter were distinctive with the DOM traces being marked out by very low thermal stability relative other organic matter types. The peat profile shows a significant trend with depth from vegetation- to lignin-like composition. When all traces are weighted according to the observed dry matter and carbon budgets for the catchment then it is possible to judge what has been lost in the transition through and into the ecosystem. By plotting this "lost" trace it possible to assess its composition which is either 97% cellulose and 3% humic acid or 92% and 8% lignin. This has important implications for what controls the organic matter balance of peatlands and it suggests that the oxidation state (OR) of peatland is less than 1.