

## Carbon cycling below the streambed

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The loss of dissolved organic carbon (DOC) in streamwater is an important part of peatland carbon budgets, yet the fate of DOC leaving peatlands is poorly understood and hence we cannot assess its importance to greenhouse gas emissions.

Although the fate of DOC is potentially complex and strongly influenced by environmental conditions within the aquatic system, there is evidence that degradation can occur in the water column or within the stream bed. Significant losses of DOC have been observed along the length of an upland stream (Dawson et al., 2001), and diurnal cycles in DOC characteristics in a peat stream suggest that biological degradation is occurring within headwater systems (Austnes et al., 2010). In addition, temporal trends in DOC characteristics in headwater streams in Yorkshire suggest that periods of low flow may be particularly important to DOC degradation.

The region just below streambeds – called the hyporheic zone – is where groundwater draining through mineral soil mixes with surface water that carries DOC from peatlands upstream. Compared to peaty surface waters, groundwater is typically less acidic and carries more nutrients. Hence the hyporheic zone has proved to be a biogeochemical hotspot for DOC cycling in many aquatic systems (e.g. Brunke et al., 1997; Sobczak & Findlay, 2002). Yet its role in cycling DOC derived from peats has not been explored.

The aim of this project is to investigate the role of carbon cycling in the hyporheic zone and to assess the importance of these processes to DOC export in streamwater. This approach will combine field monitoring, laboratory analyses and controlled experiments, including: i) detailed monitoring of DOC and its characteristics in streamwater and in wells installed in the hyporheic zones of contrasting streams in the north of England; ii) lab and/or field mesocosm (artificial 'ecosystems') experiments where variables (e.g. concentration and flux of DOC and nutrients; temperature) can be carefully controlled.



## Benefits

The successful candidate will benefit from inter-disciplinary training in biogeochemistry and aquatic ecology as part of the River Basin Processes and Management research cluster in the School of Geography. Training at Leeds deals fully with the elements described in the Joint Research Centre statement on skills training for research students. PhD students take modules provided by the staff development unit (e.g. starting your PhD, small group teaching) and a 15-week faculty-training course (covering elements such as planning, critical reading and writing, oral presentations, writing research papers).

Students present results and receive constructive feedback from peers in a Research Support Group, from colleagues in the River Basins research group, and at a university postgraduate research day. The student will also benefit from being part of water@leeds, the largest interdisciplinary water centre in any UK university, which runs a postgraduate forum.

The nature of the project means that the student will be trained in project specific research methods including water quality analysis, and statistical methods for analysing biogeochemical data, both internally and at external workshops. An additional important part of the training will be to attend national and international conferences (e.g. BHS, FBA, BES) to present results and gain feedback. The student will be encouraged to submit papers for publication during the project.

### **Application**

The prospective student should have (or expect to receive) a minimum of a first class BSc degree and/or a MSc with distinction in an appropriate discipline, and have interests and experience in most, if not all, of the following topics: C cycling, aquatic biogeochemistry, hydrology and the UK uplands. Successful applicants will be considered for full-time funding for 3.5 years duration from a range of sources including NERC, departmental and university sources. Self funded students are also welcome to apply for the project. Informal enquiries should be directed to Sheila Palmer at [s.m.palmer@leeds.ac.uk](mailto:s.m.palmer@leeds.ac.uk). Further details about postgraduate research degrees at the School of Geography, University of Leeds can be found on the School's webpages.

### **References**

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