



Drought causes step-changes in catchment-scale carbon export from peatland catchments

Nicholas Howden (1), Fred Worrall (2), and Tim Burt (3)

(1) University of Bristol, United Kingdom (nicholas.howden@bristol.ac.uk), (2) Department of Earth Sciences, Durham University, Science Laboratories, South Road, Durham, DH1 3LE, UK. , (3) Department of Geography, Durham University, Science Laboratories, South Road, Durham, DH1 3LE, UK.

Increases in fluvial DOC concentrations in world rivers, particularly those that drain areas of peatland, have been observed for some years, suggesting an increase in carbon loss from the terrestrial biosphere. But it has not been straightforward to identify what causes these increases due to a lack of long-term time series to characterise both observed DOC concentrations and potential drivers. The York Waterworks Company (York, UK) abstracted drinking water from the Yorkshire Ouse just upstream of the city from the late 1800s until 2002. During the period August 1945 to December 2002, records of monthly-average DOC concentrations were kept (using water colour as a surrogate). From January 2003 onwards, the Environment Agency of England and Wales (EA) continued the monitoring, thus providing a 68-year record of monthly-average DOC concentrations in the Yorkshire Ouse, which is the longest DOC time series ever reported for a catchment with significant peat cover.

We use the Yorkshire Ouse DOC record to develop a new method that shows how changes in DOC concentration and river flow have influenced carbon fluxes in the Ouse for the latter half of the 20th century and show that the only major changes in DOC flux are caused by step-increases in concentration following severe drought. We then use this method to identify a similar effect in other DOC records for UK rivers.

The results suggest that increases in DOC export are due more to discrete events than to the impact of continuous drivers (such as increasing temperatures or changing atmospheric deposition), and also show these increases not to be reversed for at least four decades.