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Flux and Removal of Terrigenous Peatland DOM to the Oceans with respect to Global Climate Change

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Our study focused on the behaviour of dissolved organic matter (DOM) in two North Sea estuaries (Tyne and Tweed, N.E. England), which receive freshwater inputs from catchments dominated by peatland. Eleven estuarine transects were conducted over a period ranging from July 2002 to December 2003. In both estuaries increased export of terrigenous DOC with low DOC:DON ratios was observed with increasing river flow. Particularly in the R. Tyne at high flow exceptionally high DOC export was observed with very low DOC:DON ratios in comparison to other global rivers. Axial estuarine transects provided evidence for the removal (42.3–78.2 %) of predominantly high molecular weight (HMW) DOC at low salinities, coincident with estuarine turbidity maxima in both studied estuaries. The composition of total hydrolysable amino acids (THAA's) suggests that Tyne DOM is highly degraded and thus refractory due to its comparatively low percentage of amino acid nitrogen (7.4–15.2 %), high proportion of nonprotein amino acids and refractory amino acids such as glycine. Previous studies have shown bacterial utilisation of DOM with a similar peatland source to be relatively resistant to microbial degradation, but to be highly photochemically reactive.

Recent studies in the U.K. have shown increases in DOM concentrations in freshwater draining from upland predominantly peatland catchments, which has been attributed by many to global climate change. Because peatland soils (histosols) are estimated to

store approximately one third of the Earth's soil carbon, these findings raise important questions about the fate of terrestrial DOM inputs. We discuss the implications of estuarine modifications and mixing behaviour with regard to the fate of peatland-derived DOM exports into the coastal ocean and how these processes may change due to current predicted global climate change.