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A Pedagogical Simulation of the Spatial Distribution of Carbon Flux Dynamics in Peat Soils

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A pedagogical simulation of the spatial distribution of carbon flux dynamics in peat soils

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Soils have been widely recognised as holding one of Earth's great reservoirs of readily accessible carbon (Jobbágy & Jackson 2000). Peatland soils represent one of the greatest categories of soil carbon storage. Indeed, during the period since the last glaciation 300-455 Pg carbon have accumulated in Northern peatlands (Gorham 1991). Consequently, these peatlands have acted as large net sinks of atmospheric carbon. Understanding the dynamics of this important biome is a necessary prerequisite to its effective management. However, there has been only limited development of simplistic models of peatland soils and peat growth for use in education. Complex simulations add detail to the analysis but risk losing wider utility and insight as the simulated interaction between mechanisms becomes ever more complex. This paper describes the development and analysis of outputs from a simple model of carbon efflux for a peatland soil. The model is a two dimensional representation of the soil surface and provides spatial representation using a cell based approach (van Vliet, *et al* 2012). The model integrates the saturated state of the soil with the flow of carbon. This is implemented through the use of areas as defined by the cellular structure and by the use of the finite difference relationship to generate values for the efflux of carbon. Through the development of layers within the profile the model can accommodate variability of soil organic carbon concentrations. This model can be used as a tool to explore the dynamics of peatland carbon stores and the associated interaction with the climate system. Results suggest that the outputs aid understanding and communication of the relationship between water table depth and efflux rates for defined profiles of peatland soil.

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