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Peatland hydrology and carbon release: why small-scale process matters

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Abstract

Peatlands cover over 400 million hectares of the Earth's surface and store between one-third and one-half of the world's soil carbon pool. The long-term ability of peatlands to absorb carbon dioxide from the atmosphere means that they play a major role in moderating global climate. Peatlands can also either attenuate or accentuate flooding. Changing climate or management can alter peatland hydrological processes and pathways for water movement across and below the peat surface. It is the movement of water in peats that drives carbon storage and flux. These small-scale processes can have global impacts through exacerbated terrestrial carbon release. This paper will describe advances in understanding environmental processes operating in peatlands. Recent (and future) advances in high-resolution topographic data collection and hydrological modelling provide an insight into the spatial impacts of land management and climate change in peatlands. Nevertheless, there are still some major challenges for future research. These include the problem that impacts of disturbance in peat can be irreversible, at least on human time-scales. This has implications for the perceived success and understanding of peatland restoration strategies. In some circumstances, peatland restoration may lead to exacerbated carbon loss. This will also be important if we decide to start to create peatlands in order to counter the threat from enhanced atmospheric carbon.

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