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Are peatland water-table reconstructions reliable proxies of past climate?

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Over the last two decades there has been a proliferation of Holocene climate studies based on palaeohydrological proxies from peatlands. Despite this, the relationships between peatland water tables, climate and long term peatland development is poorly understood. As this is a rapidly developing area of Holocene palaeoclimate science, a critical examination of the processes that influence peatland palaeo-water tables including autogenic (internal – e.g. peat growth and decay) and allogenic (external – e.g. climate) factors is now critical. Here we use a novel combination of high-resolution multiproxy climate data from a peatland in Northern England and an ecohydrological peatland development model to examine the relationship between rapid hydrological fluctuations in peatlands and climate forcing. Our analysis shows that although peatland water-tables do respond to climate, the peatland archive can be contaminated by complex internal responses that are non-linear. A degree of homeostatis can result from ecohydrological feedbacks inherent in peatland development which partially disconnects peatland water-table behaviour from external climatic influences.