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Diurnal variations in CO_2 flux from peatland floodplains: Implications for models of ecosystem respiration

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Peatlands are important terrestrial carbon stores, and within these environments, floodplains have been identified as hotspots of carbon processing, potentially releasing substantial amounts of CO_2 into the atmosphere. Previous monitoring campaigns have shown that such CO_2 release from ecosystem respiration is linked not only to soil temperature and water table depth, but also to CO_2 sequestration via primary productivity, thought to be because the root exudates produced during photosynthesis stimulate microbial activity. This suggests that extrapolation models that are parameterised on data collected during day light hours, when vegetation is photosynthesising, may overestimate ecosystem respiration rates at night, which has important implications for estimates of annual CO_2 flux and carbon budgeting.

To investigate this hypothesis, monitoring data is collected on the CO_2 flux from UK peatland floodplains over the full diurnal cycle. This is done via ex-situ manual data collection from mesocosms using an infra-red gas analyser, and the in-situ automated collection of CO_2 concentration data from boreholes within the peat using GasClams®. Preliminary data collected during the summer months suggest that night time respiration is suppressed compared to that during the day, and that the significant predictors of respiration are different when examining day and night time data. This highlights the importance of incorporating diurnal variations into models of ecosystem respiration.