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The entropy budgets of UK peatlands – are some peatlands near equilibrium?

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The energy budget of an ecosystem must obey the 2nd law of thermodynamics even if it is an open system. Several studies have sought to use a consideration of entropy budgets to understand ecosystem energy budgets and more specifically evaporation. It has been assumed that ecosystems are far-from-equilibrium systems and as such would always seek to maximise their entropy production. Although the approach has been used to consider the behaviour of environments there are no studies that have tested the approach or its implications: maximum entropy production (MEP) is a prediction of the far-from-equilibrium assumption that could be tested. The simplest way for an ecosystem to maximise entropy production is to maximise water loss through evaporation. To test whether a system is acting to maximise entropy production this study chose to consider how the energy budget of a peatland system responded to changes in incoming energy, specifically how a change in net radiation was transferred to changes in latent heat flux (E/Rn). An ecosystem maximising its entropy production would transfer the majority of change in net radiation to change in latent heat flux. Previously using this approach we have been able to show that for nine UK peatlands the average proportion of a change in net radiation that was transferred to change in latent heat flux varied from 24 to 63%. That is for some sites where the majority of change in input was transferred to latent heat while at another site where the majority was transferred to sensible heat flux. We now show that the sites significantly divided between two groups those with [U+F044][U+F06C]E/[U+F044]Rn > 0.4 and those with E/Rn < 0.3. To understand what this results means we have now considered the entropy budget of each site to test whether high values E/Rn are actually reflected in greater entropy production and how these approaches relate to the Bowen ratio.