



The impact of warming on greenhouse gas fluxes: an experimental comparison which reveals the varied response of ecosystems to climate change.

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Modelled predictions of the response of terrestrial systems to climate change are highly variable, yet the response of net ecosystem exchange (NEE) is a vital ecosystem behaviour to understand due to its inherent feedback to the carbon cycle. The establishment and subsequent monitoring of replicated experimental manipulations are a direct method to reveal these responses, yet are difficult to achieve as they typically resource-heavy and labour intensive. We actively manipulated the temperature at three agricultural grasslands in southern England and deployed novel 'SkyLine' systems, recently developed at the University of York, to continuously monitor GHG fluxes. Each 'Sky-Line' is a low-cost and fully autonomous technology yet produces fluxes at a near-continuous temporal frequency and across a wide spatial area.

The results produced by 'SkyLine' enable the detail response of each system to increased temperature over diurnal and seasonal timescales. Unexpected differences in NEE are shown between superficially similar ecosystems which, upon investigation, suggest that interactions between a variety of environmental variables are key and that knowledge of pre-existing environmental conditions help to predict a systems response to future climate. For example, the prevailing hydrological conditions at each site appear to affect its response to changing temperature. The high-frequency data shown here, combined with the fully-replicated experimental design reveal complex interactions which must be understood to improve predictions of ecosystem response to a changing climate.