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SkyLine and SkyGas: Novel automated technologies for automatic GHG flux measurements

Philip Ineson and James Stockdale
United Kingdom (philip.ineson@york.ac.uk)

1. Concerns for the future of the Earth's climate centre around the anthropogenically-driven continuing increases in atmospheric concentrations of the major 'greenhouse gases' (GHGs) which include CO_2, CH4 and N2O. A major component of the global budgets for all three of these gases is the flux between the atmosphere and terrestrial ecosystems.
2. Currently, these fluxes are poorly quantified, largely due to technical limitations associated with making these flux measurements. Whilst eddy covariance systems have greatly improved such measurements at the ecosystem scale, flux measurements at the plot scale are commonly made using labour intensive traditional 'cover box' approaches; technical limitations have frequently been a bottle-neck in producing adequate and appropriate GHG flux data necessary for making land management decisions. For example, there are almost no night time flux data for N2O fluxes, and frequently such data are only measured over bare soil patches.
3. We have been addressing the design of novel field equipment for the automation of GHG flux measurements at the chamber and plot scale and will present here some of the technical solutions we have developed. These solutions include the development of the SkyLine and SkyGas approaches which resolve many of the common problems associated with making high frequency, sufficiently replicated GHG flux measurements under field conditions.
4. Unlike most other automated systems, these technologies 'fly' a single chamber to the measurement site, rather than have multiple replicated chambers and analysers. We will present data showing how such systems can deliver high time and spatial resolution flux data, with a minimum of operator intervention and, potentially, at relatively low per plot cost. We will also show how such measurements can be extended to monitoring fluxes from freshwater features in the landscape.