2.087 Measurement of isoprene emissions from UK woodland using an airborne platform. .

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Abstract:

Ozone (O_3) is an oxidising agent that is both harmful to human health and damaging to crops and natural vegetation. It is produced by the photochemical oxidation of volatile organic compounds (VOCs) in the presence of nitrogen oxides (NO_x). Although precursor emissions have decreased over time in the UK, these reductions have not uniformly resulted in the anticipated decreases in background and peak O_3 concentrations, leaving critical questions about the relative importance of the various sources. Biogenic VOC emissions are one area of particular uncertainty. Canopy or landscape scale emission rates may be obtained by extrapolated leaf-level or whole plant measurements of emission rates, accounting for biomass, light and temperature distributions, however, since there are both hugely varying emission factors for different plant species and highly complicated "activity factors" driven by light, temperature, soil moisture, biomass etc., "bottom up" emission inventories for biogenic VOCs have very great uncertainties associated with them.
Airborne flux measurements offer the possibility of obtaining large scale emission estimates, but at the spatial and temporal resolution necessary for understanding ground-level pollutant formation and exposure. Measurements of isoprene fluxes using *virtual disjunct* eddy covariance were made in summer 2013 and 2014 over rural areas of southern United Kingdom from a low flying aircraft. Fluxes of up to 2 mg m^{-2} hr^{-1} were measured, with the highest measurements observed over areas dominated by broadleaf woodland. Measured isoprene emissions were compared to those used in the EMEP4UK regional atmospheric chemistry transport model and whilst good agreement was seen in places, the model showed a significant underestimation in the areas of the highest measured emissions. The potential effect of this underestimation on the prediction of O_3 in the EMEP4UK model was also investigated.