



## **Emission estimates and characterisation of HFCs measured over the United Kingdom**

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Due to the large horizontal (and vertical) scales on which they operate, aircraft offer a unique platform from which to measure trace gases in the atmosphere. When combined with an atmospheric transport model, these measurements may be used to infer emissions on a national scale, a useful step in the verification of 'bottom-up' greenhouse gas inventories. Here, we present two years of aircraft measurements collected as an extension of the Greenhouse gAses Uk and Global Emissions (GAUGE) airborne campaign. In total, 172 whole air samples were analysed for a suite of trace gases. We focus on seven hydrofluorocarbons (HFCs), a diverse subset of fluorinated gases with high global warming potentials. Samples collected directly above and downwind of the UK were compared to samples of inflow air mass from the Atlantic Ocean, and significant enhancements were observed for all seven species. Using the model:observation ratio, we scale UK a priori emissions of each HFC in order to estimate the 2014 flux. Our emission rates typically agree well with other top-down estimates from the literature, but less so with extrapolated inventory data. With a flux of  $3.14 \pm 1.0 \text{ Gg yr}^{-1}$ , our HFC-134a estimate was approximately half as large as the UK inventory, suggesting a systematic discrepancy between competing methodologies.