

The use of mobile measurements to track regional sources of Methane Emissions in the UK

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Methane emissions from major sources in the UK, such as landfills, gas leaks, sewage works and coal mines have been identified by measurement of the atmospheric mole fraction using a mobile Picarro G2301 CRDS analyser. This was installed in a vehicle, together with anemometer and GPS receiver. When methane plumes were located, they were sampled on the return pass at regular intervals into Tedlar bags, for offline analysis in the lab of $\delta^{13}\text{C-CH}_4$ by CF-GC-IRMS (Continuous Flow-Gas Chromatography-Isotopic Ratio Mass Spectroscopy). This method provides high precision isotopic values, determining $\delta^{13}\text{C-CH}_4$ to ± 0.05 per mil. Keeling plot methods were used to obtain the bulk isotopic signature of the methane plume into the atmosphere from the whole source plume,

A Picarro G2301 analyser was installed also on the roof of King's College London, located in the centre of the city, and connected to an air inlet located 7 meters above roof height. An auto-sampler was connected to the same air inlet and launched remotely when a high nocturnal build up was expected, allowing up to twenty air bags to be collected for methane isotopic analysis over a 24 hour period.

A bulk $\delta^{13}\text{C-CH}_4$ signature, with its relative uncertainty, was allocated to each methane source investigated. The contribution to the methane budget and the local distribution of methane sources given in inventories for London was then validated using the isotopic characterisation of methane sources and of the source mix.

Comparison has been made between the isotopic signatures of UK sources and those assessed during RHUL overseas campaigns with the mobile Picarro in Australia and Kuwait. Australian coal mines and urban methane sources, and Kuwaiti landfill sites and sewage works, were the main methane sources investigated.