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Monitoring CO_2 and CH_4 concentrations along an urban-rural transect in London, UK

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Cities are important sources of carbon dioxide (CO_2) and methane (CH_4). Anthropogenic CO_2 is released in the combustion of fossil fuels for heating, electricity and transport. The major sources of CH_4 in city environments are natural gas leakage, landfill sites and transport emissions. Monitoring of urban greenhouse gas concentrations is crucial for cities aiming to reduce emissions through measures such as changes to the transport infrastructure and green planning.

We present measurements of CO_2 and CH_4 concentrations using Cavity Ring-Down Spectroscopy (CRDS) at four sites located in and around London, UK. Two sites were located in the inner city, one in the suburban fringe and the fourth in a rural location close to the city. This study was funded by Astrium Services Ltd as part of a pilot scheme to monitor city-scale GHG emissions and presented a unique opportunity to study changes in greenhouse gas concentrations across an urban to rural 'transect'. The CHIMERE chemistry-transport model is used to estimate CO_2 and CH_4 concentrations throughout the four month measurement period during the summer of 2012. Comparisons are made between the measured and modelled CO_2 and CH_4 concentrations and the representativity of the study sites for future urban greenhouse gas monitoring is considered. This study also examines the ability of a variety of measurement and modelling techniques to partition anthropogenic and biogenic CO_2 sources.