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Performance of a Novel Chemical Ionisation Reaction Time-of-Flight Mass Spectrometer during the Leicester Air Monitoring Project- Comprehensive Measurements of Volatile Organic Compounds (VOCs) in the Urban Atmosphere

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Recently a number of novel instruments designed to perform detailed atmospheric trace gas analysis have been introduced. Despite having been tested under controlled conditions, little work has been performed with such equipment in the field and often few comparisons have been made against more established techniques.

During the summer of 2007, twenty five different air monitoring instruments were deployed in the centre of Leicester (a moderately sized UK city, population $\sim$300, 000), in order to provide the first truly comprehensive overview of local air quality. This collaborative effort designated the Leicester Air Monitoring Project (LAMP), involved seven different universities from across the UK along with the local city council. Together the participants provided a comprehensive array of instrumentation capable of measuring photolysis rates, peroxy radicals, NO, NO_2, O_3, CO, CO_2, methane,

VOCs/OVOCs, aerosol number density, composition and physical properties.

The work presented here will focus on the volatile organic compound (VOC) measurements made by the University of Leicester Chemical Ionisation Reaction Time-of-Flight Mass Spectrometer (CIR-TOF-MS), a relatively new instrument designed to provide rapid measurements of the organic species within a target air matrix. LAMP presented the first opportunity to test this novel instrument design in an urban setting with the support of much other instrumentation. Results demonstrate the successful performance of the instrument, with comprehensive data displaying local VOC/OVOC profiles which include many unlooked for transient, high level local pollution episodes that are unresolved by standard VOC measuring instrumentation. VOC data provided by the CIR-TOF-MS is also utilized to provide information on OH loss rates in the contemporary urban atmosphere.

Supporting data for peroxy radical levels is also presented (provided by the University of Leicester Peroxy Radical Chemical Amplifier), along with detailed aerosol composition measurements made by the University of York 2D-GC-TOF-MS, providing a crucial link between the gas and aerosol phases.