Introduction
Airborne particulate matter is known to have adverse effects on human health, namely contributing to cardiovascular and respiratory diseases. Air quality standards have been set in the UK for PM_{10}. However, health studies indicate that smaller particles are likely to be more dangerous. Kerbside and exposure studies confirm that exposure to particles is especially high in urban areas with dense road traffic, and that in-vehicle concentrations can exceed outside levels. A field study was carried out in Leicester, UK, to investigate personal exposure in vehicle microenvironments by taking high-frequency mass and number concentration measurements whilst in traffic. This poster outlines the study design and illustrates initial observations using time series data and novel visualisation techniques.

Field Study
An electric van was used as a mobile monitoring unit. The vehicle was equipped with two particle monitors installed at the passenger position, and an instantaneous speed logger connected to the speedometer. All data were logged at a time interval of 1 second. Recordings were also made regarding the location on the route, traffic conditions and the type of vehicle in front.

Study area and routes
Route 1
- 3.1 km
- cw/ccw
- arterial
- residential
Route 2
- 3.5 km
- cw/ccw
- dual carriageway
- ring road
Route 3
- 1.8 km
- one way system
- city centre
- street canyons

Three field study routes were devised within 2.5 km of the city centre of Leicester. The routes were chosen so that they included different road types, and were divided into individual road links, i.e. sections of road with constant physical and dynamic parameters.

Data collection was carried out during morning and evening rush hour. Over a 12 month period from mid April, a total of 133 monitoring journeys were completed.

Time Series Data
Visual inspection of time series plots of the field study data showed that particle number concentrations exhibit distinct periods of high and low concentrations while mass concentrations have a higher short-term variability. The peaks in the time series traces could generally be linked to events in the traffic stream. However, in some instances mass concentrations remained low when elevated number concentrations occurred.

Synoptic Plots
Novel plotting techniques were developed, which allowed simultaneous inspection of multiple time series and thus facilitated a first assessment of the variability in exposure values from different journeys.

Conclusions
A comprehensive field data set was acquired of driver exposure data to particulate matter in urban areas. Due to the high logging frequency, the focus on mass and number concentrations as well as the inclusion of associated road specific information, the data set provides a unique opportunity for a thorough data analysis. Investigations included analysis of the temporal dynamics, the differences between size ranges, and the potential underlying relationships between in-vehicle concentrations and external parameters.

References and acknowledgements

http://www.iesd.dmu.ac.uk