

# The Smogmobile





# Introducing the Smogmobile

*Meet the Smogmobile, a sophisticated mobile air quality laboratory in an all-electric van. Using state-of-the-art, next generation monitoring equipment, the Smogmobile is capable of measuring key pollutants and greenhouse gases with extreme accuracy, both at static locations and on the move. It is also able to switch between monitoring outside air and air inside the driver's cab all without contributing any emissions itself.*

*It is available for client studies, surveys and academic collaboration opportunities etc. Contact ET for further details.*

## Background

ET has built an innovative and state-of-the art mobile air quality monitoring laboratory based upon a Nissan eNV-200 BEV (battery electric vehicle) panel van.

The eNV-200 is powered only by electricity and features both slow and rapid charging capabilities. It has a range of approximately 100 miles between charges. As it does not have an internal combustion engine (ICE) it therefore emits no exhaust emissions whatsoever.



# Zero Emission

# What does it measure?

$\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{H}_2\text{O}$  ► greenhouse gases measured with a LGR ultraportable greenhouse gas analyser (UGGA)



$\text{NO}_2$  ► direct  $\text{NO}_2$  using our Teledyne API T500U CAPS  $\text{NO}_2$  analyser



$\text{O}_3$  ► using a Teledyne API T400  $\text{O}_3$  analyser



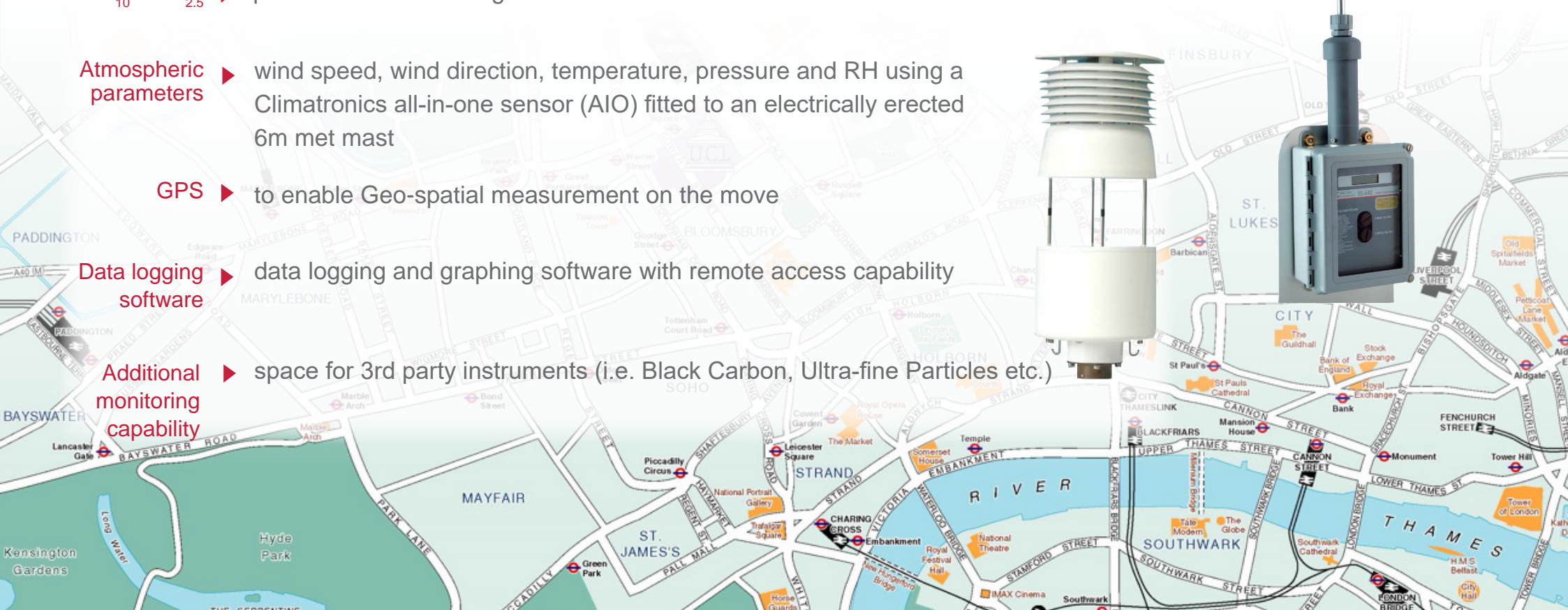
$\text{PM}_{10}$  &  $\text{PM}_{2.5}$  ► particulate matter using a Met One ES642 laser PM monitor

Atmospheric parameters ► wind speed, wind direction, temperature, pressure and RH using a Climatronics all-in-one sensor (AIO) fitted to an electrically erected 6m met mast

GPS ► to enable Geo-spatial measurement on the move

Data logging software ► data logging and graphing software with remote access capability

Additional monitoring capability ► space for 3rd party instruments (i.e. Black Carbon, Ultra-fine Particles etc.)







## Case Studies



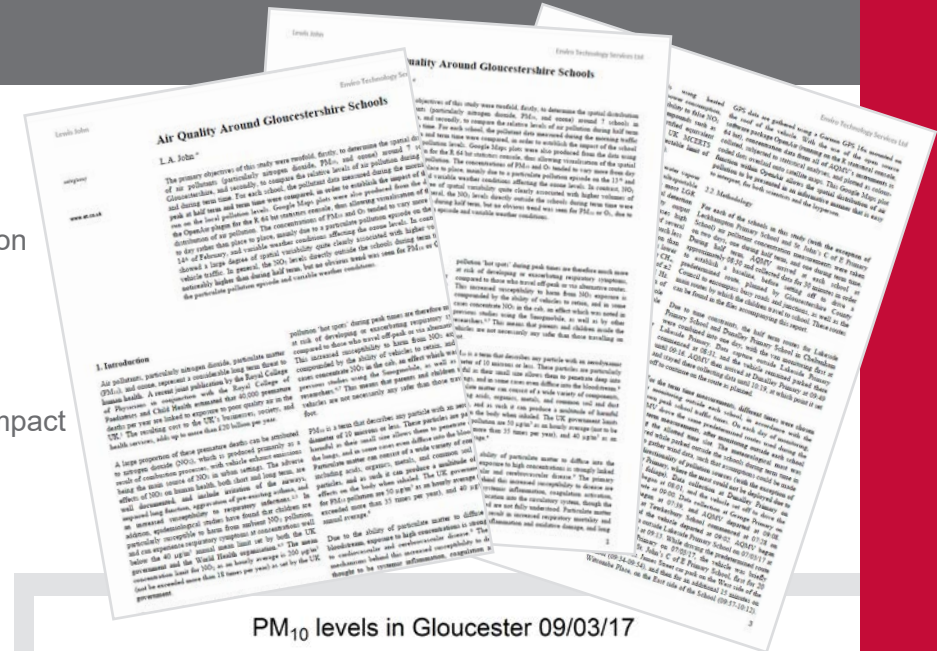


# NO<sub>2</sub>, PM<sub>10</sub> & O<sub>3</sub> Levels around Gloucestershire Schools

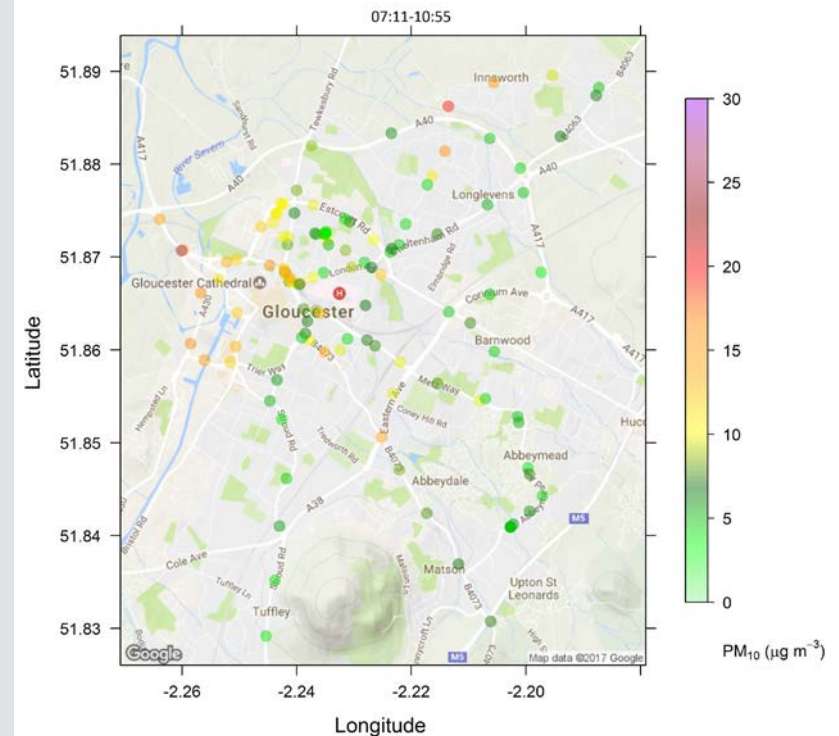
## Client: Gloucestershire County Council

The primary objectives of this study were twofold, firstly, to determine the spatial distribution of air pollutants (particularly nitrogen dioxide, PM<sub>10</sub>, and ozone) around 7 schools in Gloucestershire, and secondly, to compare the relative levels of air pollution during half term and during term time. For each school, the pollutant data measured during the morning traffic peak at half term and term time were compared, in order to establish the impact of the school run on the local pollution levels.

Findings determined the concentrations of PM<sub>10</sub> and O<sub>3</sub> tended to vary more from day to day rather than place to place, mainly due to a particulate pollution episode around this time, and variable weather conditions affecting the ozone levels. In contrast, NO<sub>2</sub> showed a large degree of spatial variability quite clearly associated with higher volumes of vehicle traffic. In general, the NO<sub>2</sub> levels directly outside the schools during term time were noticeably higher than during half term, but no obvious trend was seen for PM<sub>10</sub> or O<sub>3</sub>, due to the particulate pollution episode and variable weather conditions.



PM<sub>10</sub> levels in Gloucester 09/03/17



# Air pollution in the City of London

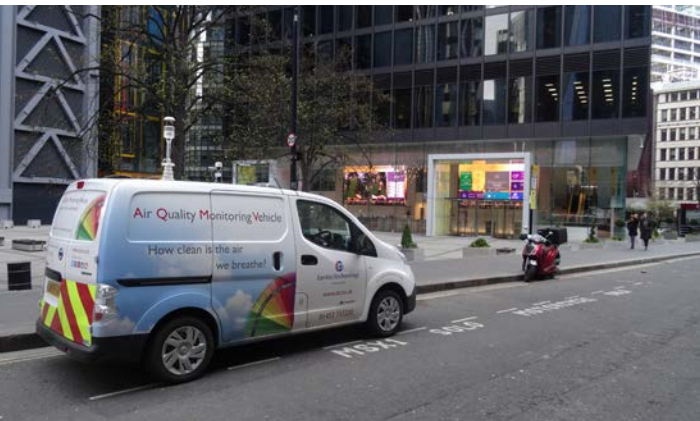
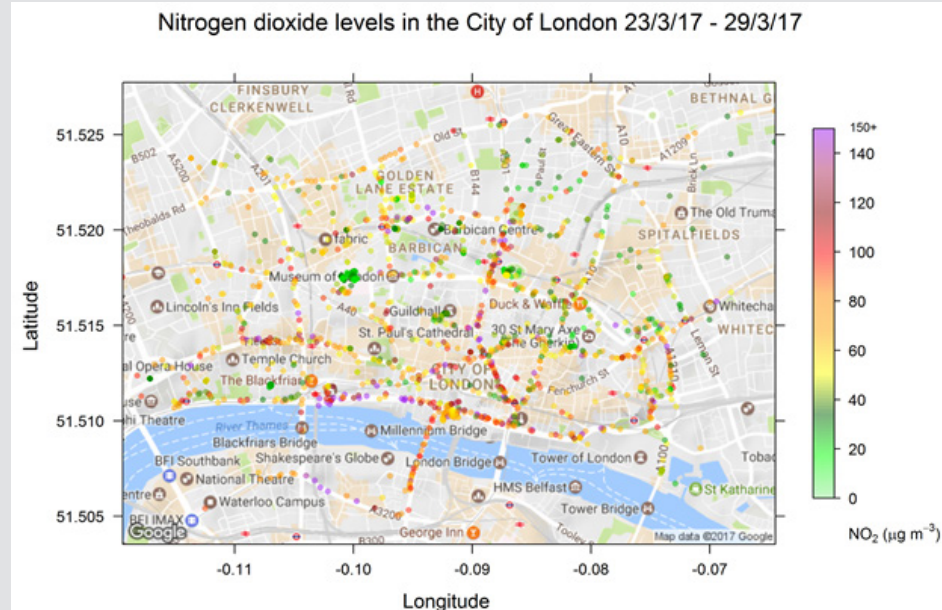
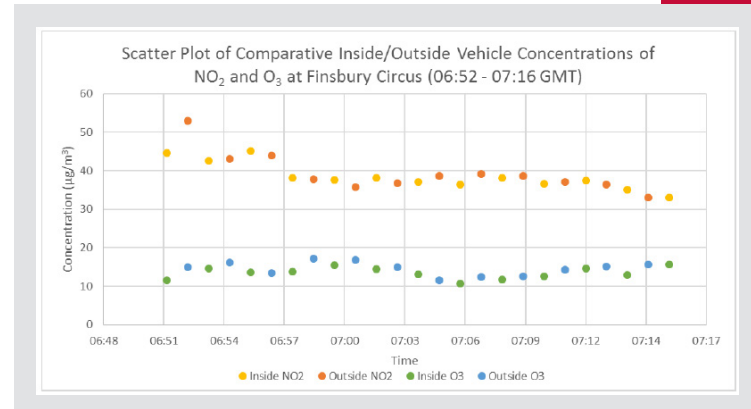
## Client: Undisclosed

For this study our client wanted to quantify the concentrations of common air pollutants ( $\text{NO}_2$ ,  $\text{O}_3$ , black carbon,  $\text{CH}_4$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  (vapour)) at various locations across the City of London, in order to gain a better understanding of the spatial distribution of air pollution.

The study also aimed to determine how these pollutant concentrations vary when comparing weekdays to Sundays, when comparing air inside a vehicle to air outside the vehicle, and air sampled from a low height (~30cm) compared to air sampled from a greater height (~2m).

Results showed that the highest concentrations of  $\text{NO}_2$  were found on busier roads, with consistently lower concentrations being found on surrounding side streets. The results also showed a clear tendency for  $\text{NO}_2$  and black carbon concentrations to be lower on Sundays in comparison to weekdays.

When comparing pollutant concentrations inside the vehicle's cab to those outside the vehicle, this study found that  $\text{NO}_2$  was generally far more concentrated inside the vehicle.





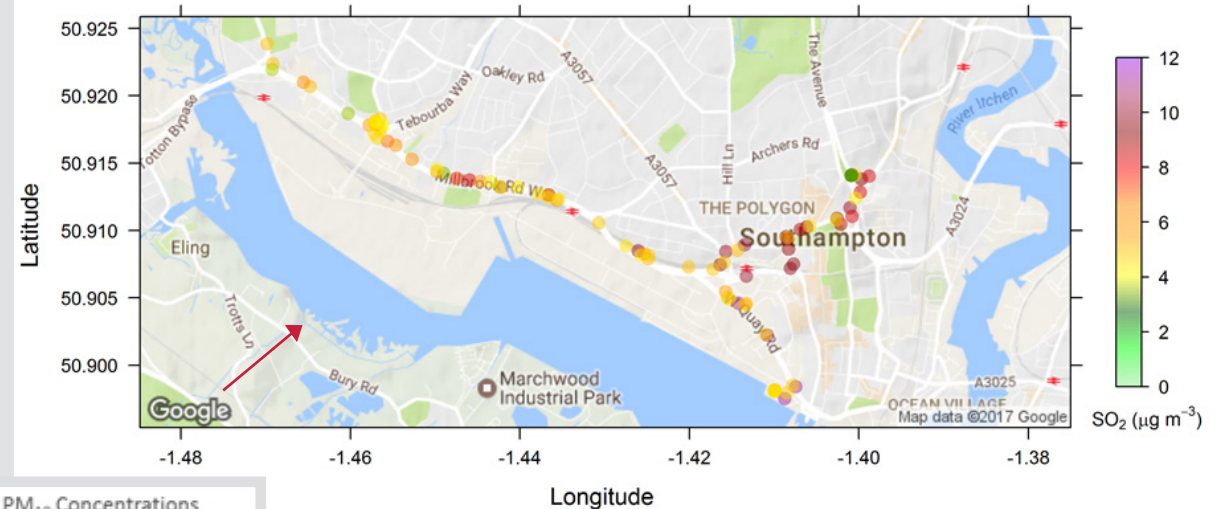
# Southampton Shipping Emissions Study

Client: **BBC**

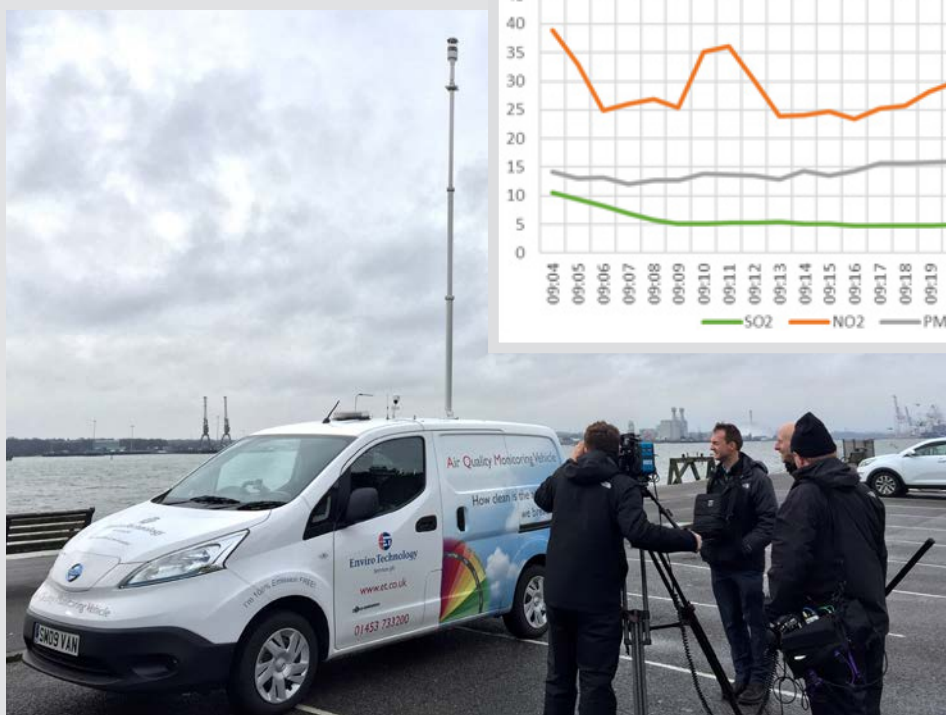
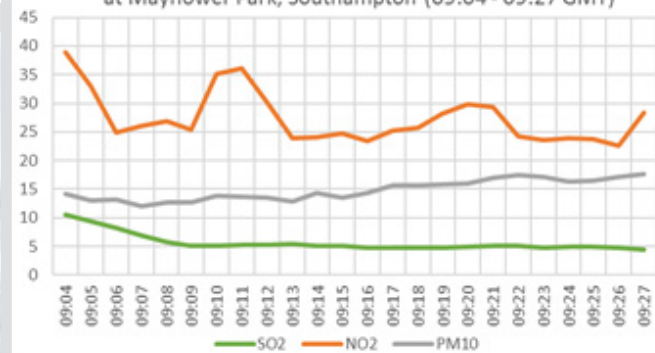
In February 2017 The Smogmobile monitored  $\text{NO}_2$  and  $\text{SO}_2$  levels around Southampton's docks for an episode of the BBC's "Inside Out" programme.

The results concluded that measured  $\text{NO}_2$  levels were highest when driving into Southampton via the M271. In contrast, measured  $\text{SO}_2$  levels were noticeably higher near the docks and within the city than on the M271.

Sulphur Dioxide levels in Southampton 02/02/17



Time Series Plot of  $\text{NO}_2$ ,  $\text{SO}_2$ , and  $\text{PM}_{10}$  Concentrations at Mayflower Park, Southampton (09:04 - 09:27 GMT)





# Cattle Shed Methane Emissions Study

During this exercise the Smogmobile was driven around the perimeter of a dairy farm near ET's main office.

Stopping for 15 minutes at a time, due North, West, Southwest, and South of the shed, we were able to assess emissions.

Findings showed CH<sub>4</sub> concentrations directly downwind of the shed were consistently higher, peaking at almost 4ppm (double the ambient background level).



CH<sub>4</sub>

Methane levels around a cattle shed in Coaley, Gloucestershire 26/04/17





# Other products



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