

LA CALIDAD DEL AIRE URBANO: Problemas Y Posibles Soluciones  
Valencia 4 y 5 Febrero 2016

## Real Driving Emissions of diesel cars

Results from the 2015 remote sensing campaigns (UK)

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# METHOD

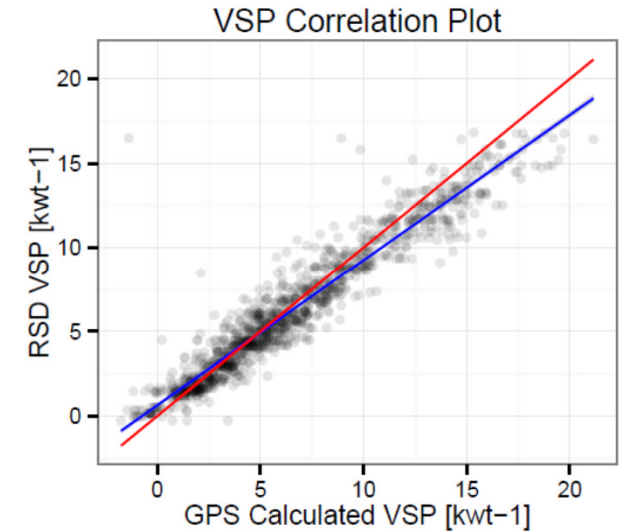
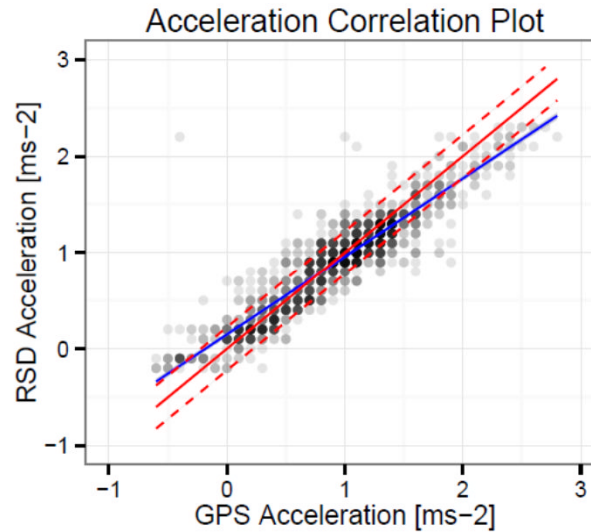
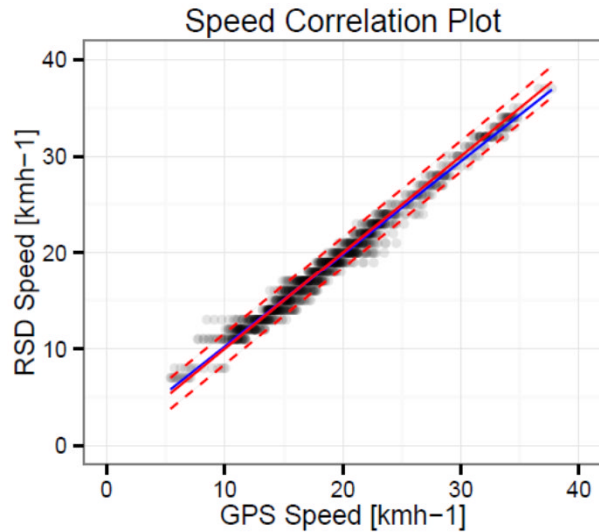
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# METHOD

## Verification of speed & acceleration measurements

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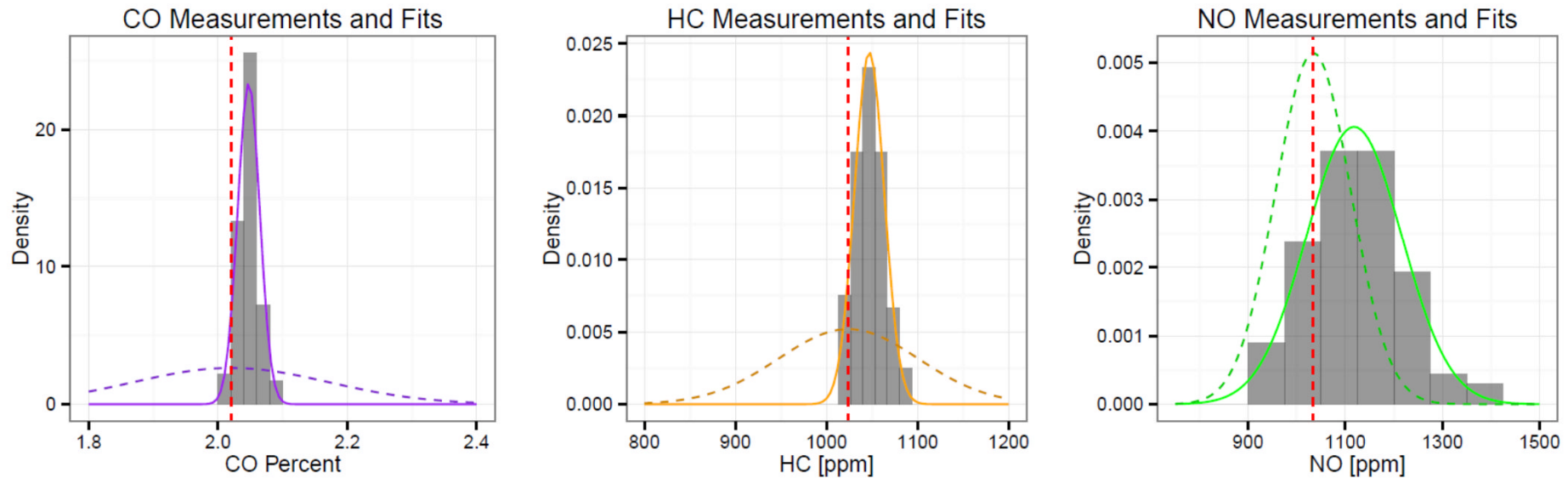


$$VSP = (0.2va) + (4.39v\sin(\theta)) + (95.4 \times 10^{-3}v) + (27.2 \times 10^{-5}v^3)$$

$v$  = speed,  $a$  = acceleration,  $\theta$  = road gradient

# METHOD

## Verification of concentration measurements

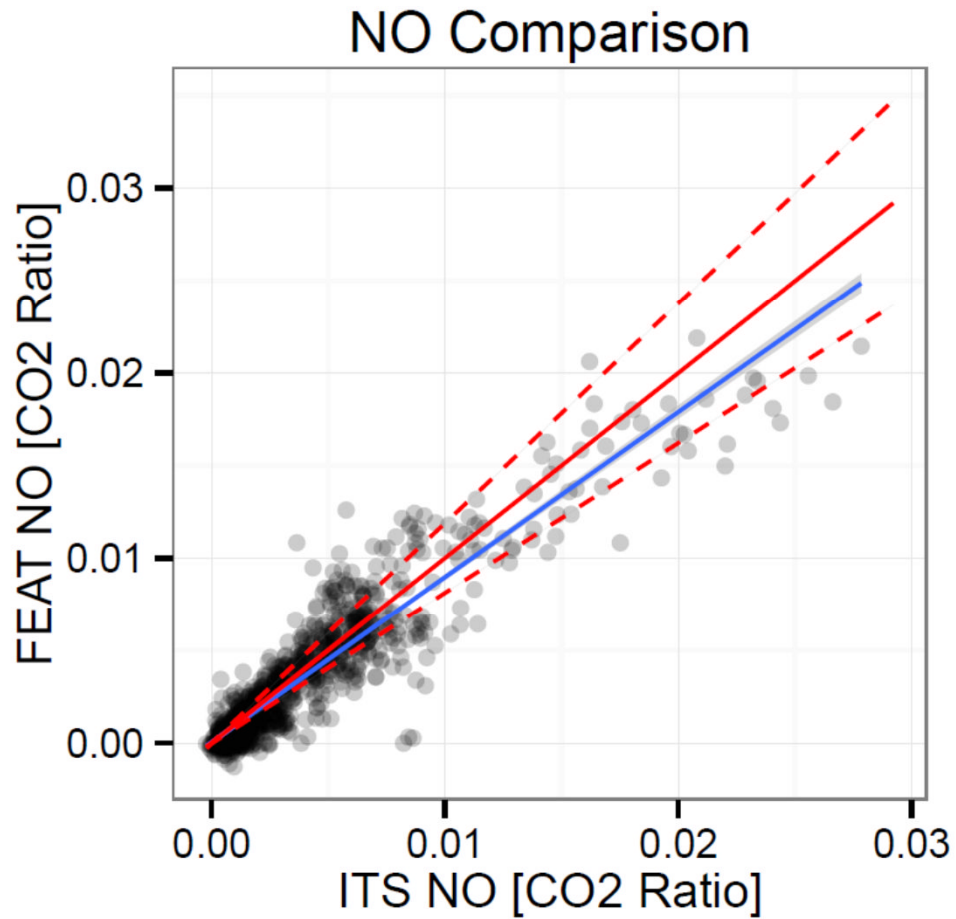


Distribution of the measurement distribution of a controlled gas mixture with known relative abundances. The binned data shows the measurements with the solid line showing a Normal distribution derived from the measured data (solid) and theoretical (dashed).

Species	Percentage Error	Offset	Specified Error
CO	1.5	+0.02%CO	15%
HC	3.2	+23ppm	15%
NO	18.9	+84ppm	15%

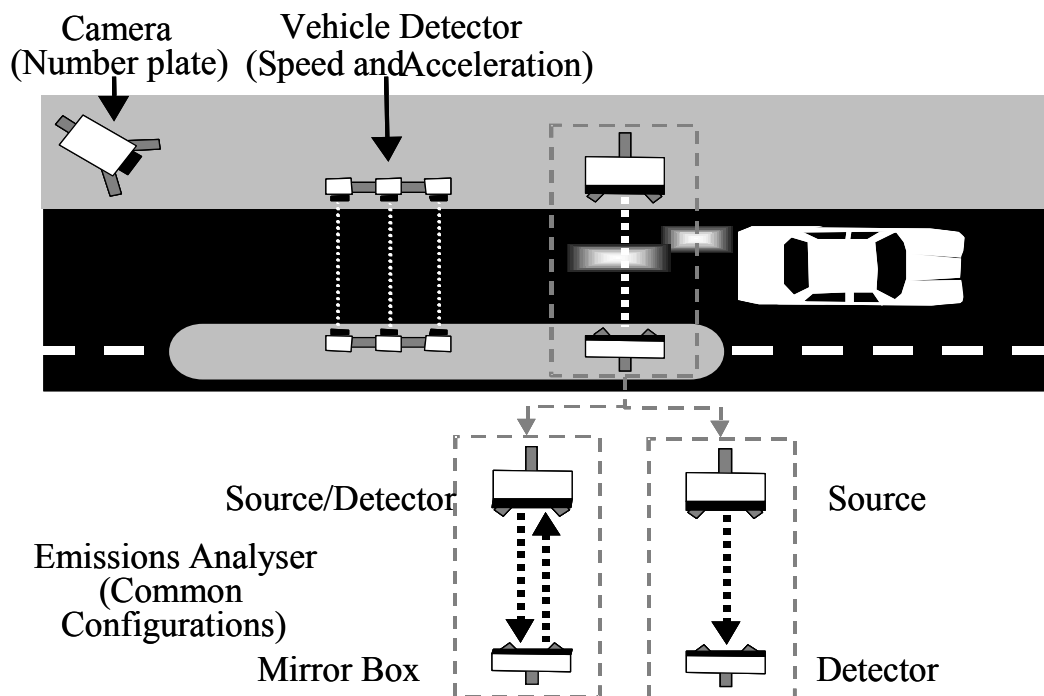
# METHOD

## Inter-comparison of two Remote Sensing Devices



# METHOD

## Measurements



## ESP RSD-4600 instrument

[www.esp-global.com](http://www.esp-global.com)

## Emission ratios

From peak exhaust plume conc.

$$\begin{aligned} &CO/CO_2 \\ &HC/CO_2 \\ &PM_{OPACITY}/CO_2 \\ &NO/CO_2 \end{aligned}$$

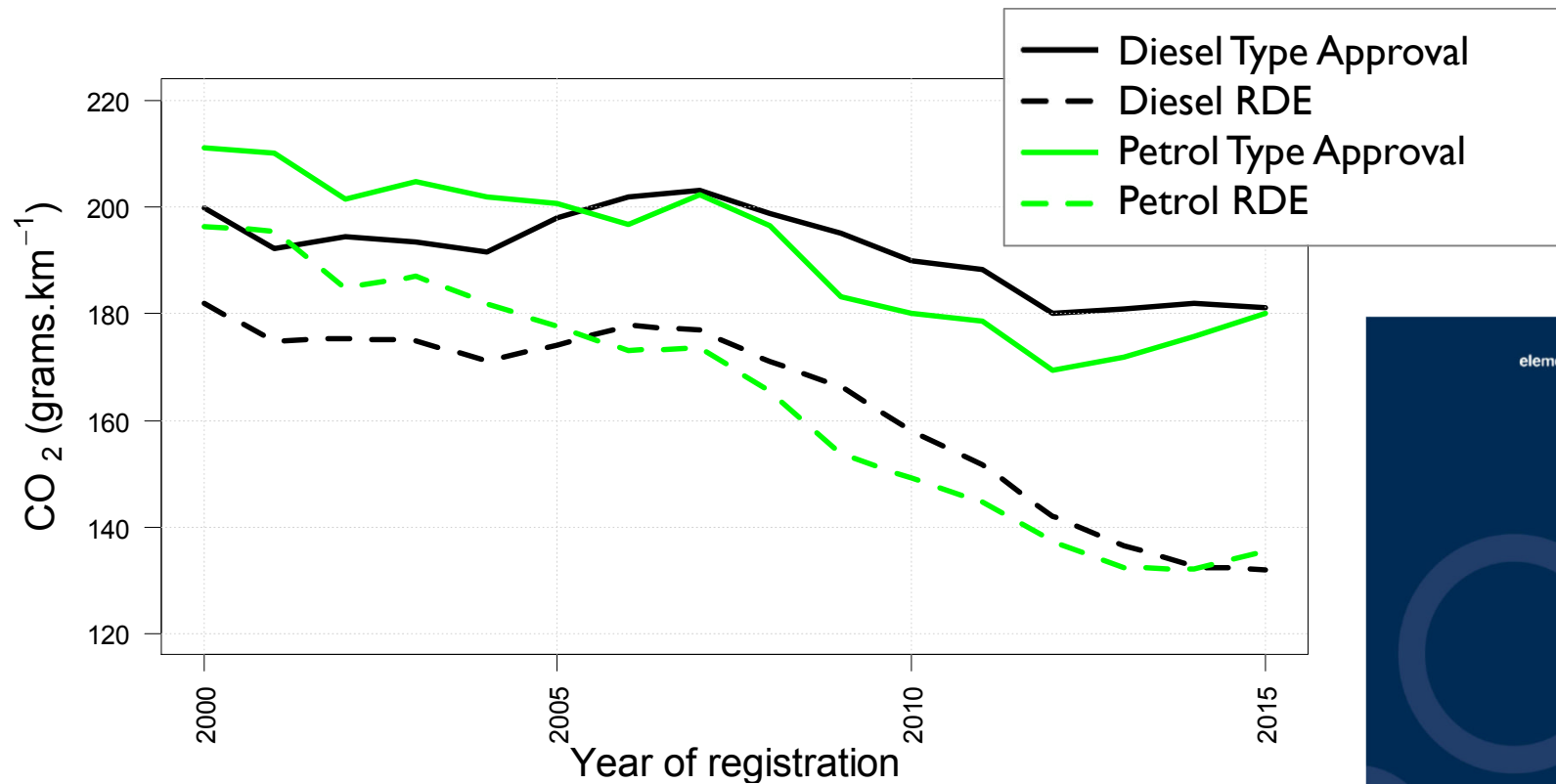
Predict  $NO_2$  and total  $NO_x$  contribution using f- $NO_2$  reported by Carslaw (2014)

Euro Standard	Petrol f- $NO_2$	Diesel f- $NO_2$
Euro 0	2	8
Euro 1	2	8
Euro 2	3	8
Euro 3	4	16
Euro 4	7	26
Euro 5	12	26
Euro 6	12	34

# METHOD

## Estimation of Emission Factors

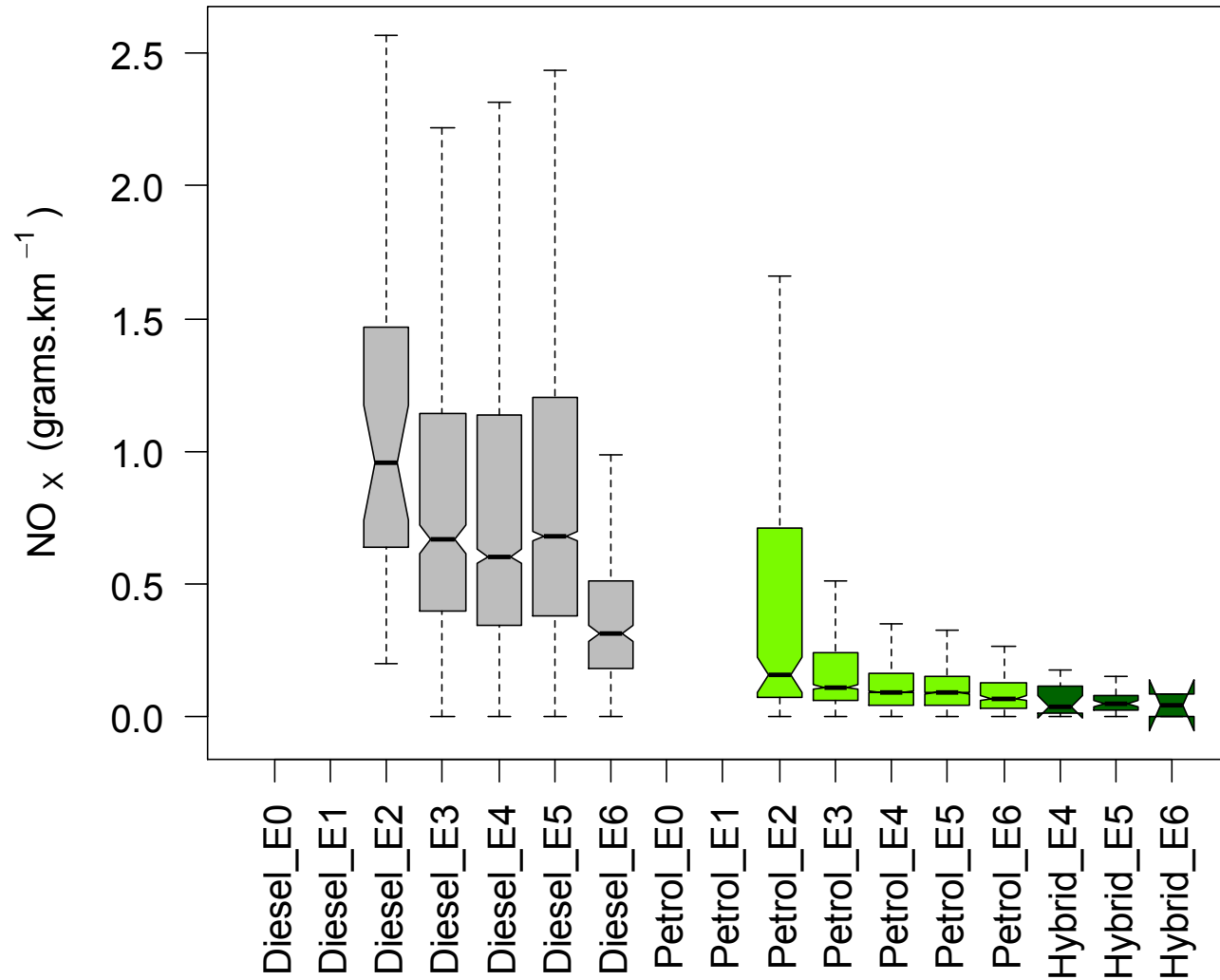
$$EMISSION\ FACTOR\ (gr.\ km^{-1})_{RSD} = \left(\frac{NO_X}{CO_2}\right)_{RSD} \times \left(\frac{CO_2}{km}\right)_{MANU} \times (Correction\ Factor)_{ICCT}$$





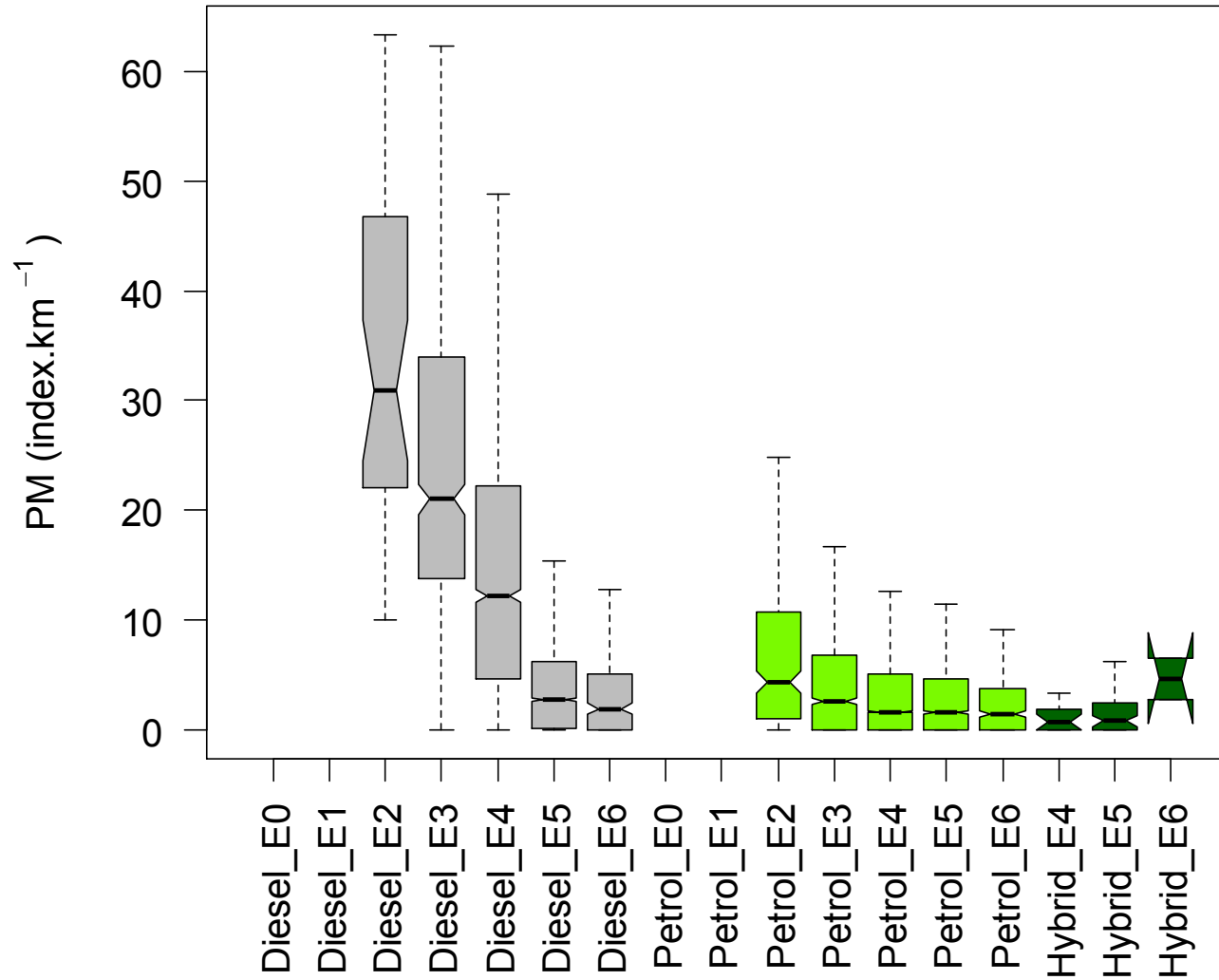
# Euro 6

Passenger cars, Spring/ Summer 2015



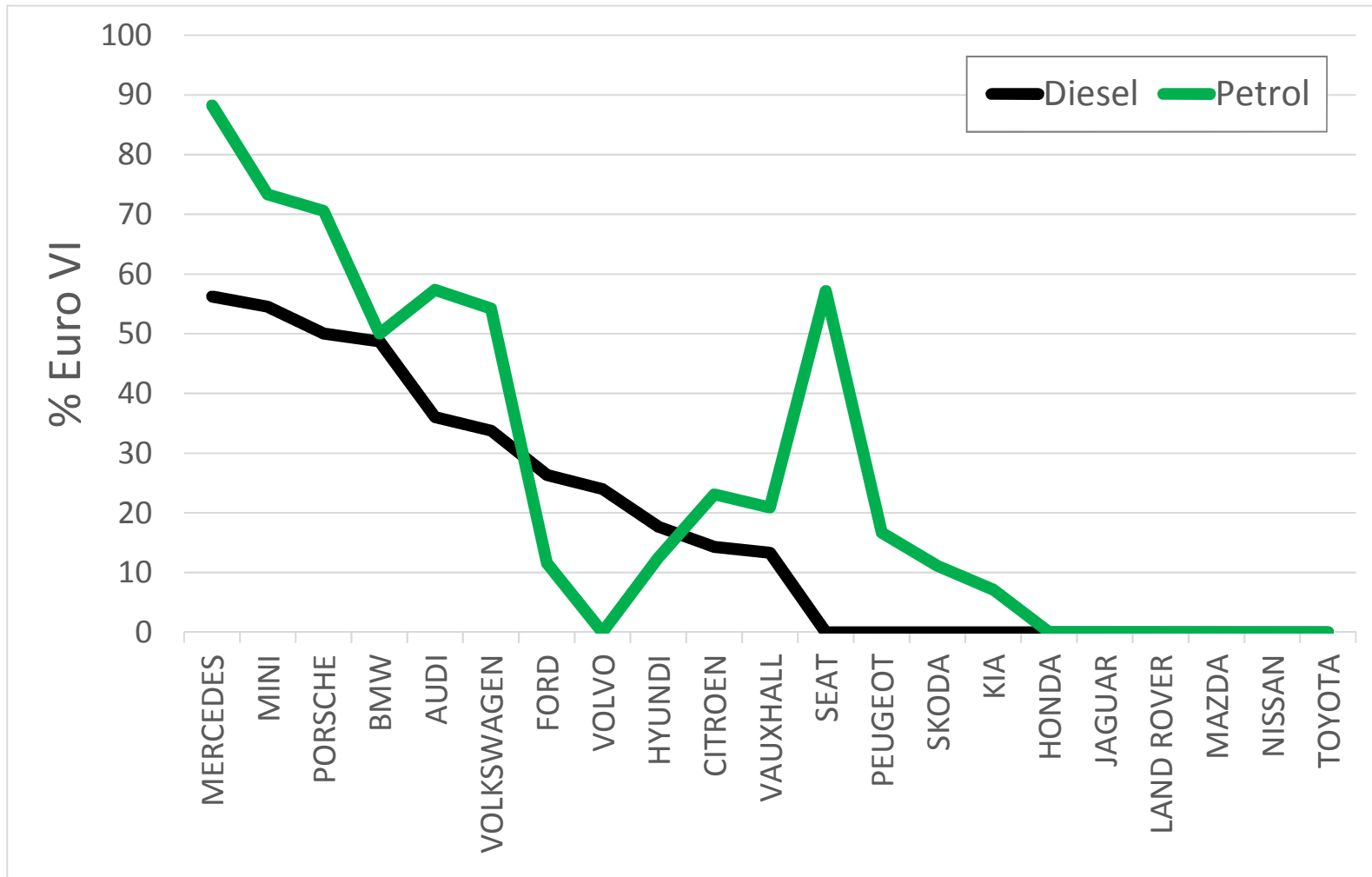
# Euro 6

Passenger cars, Spring/ Summer 2015



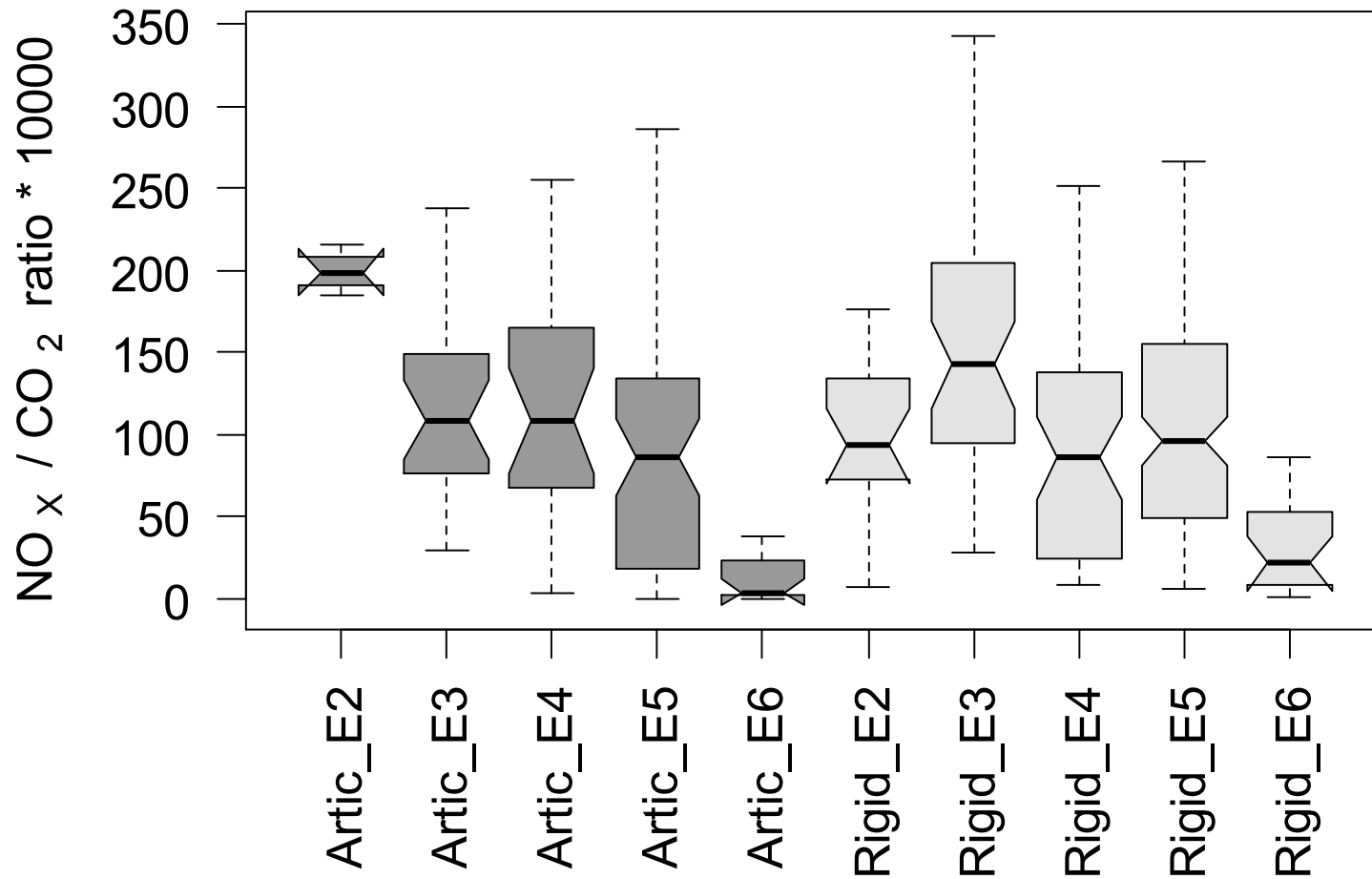
# Euro 6

% of Passenger cars registered since Sept 2014 that are Euro VI



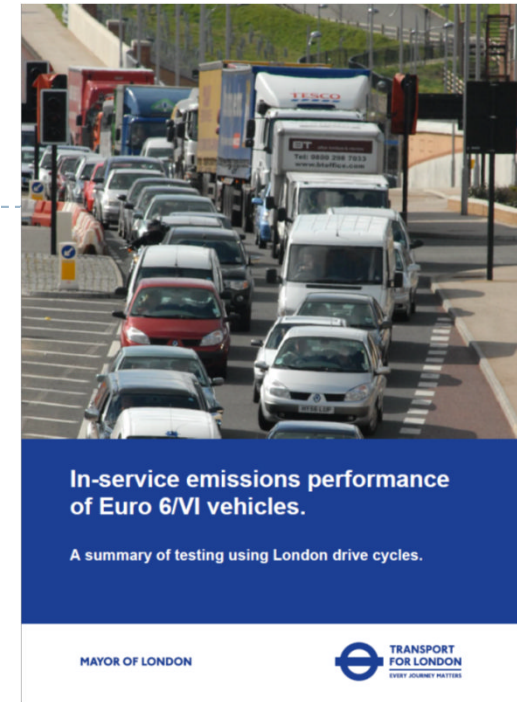
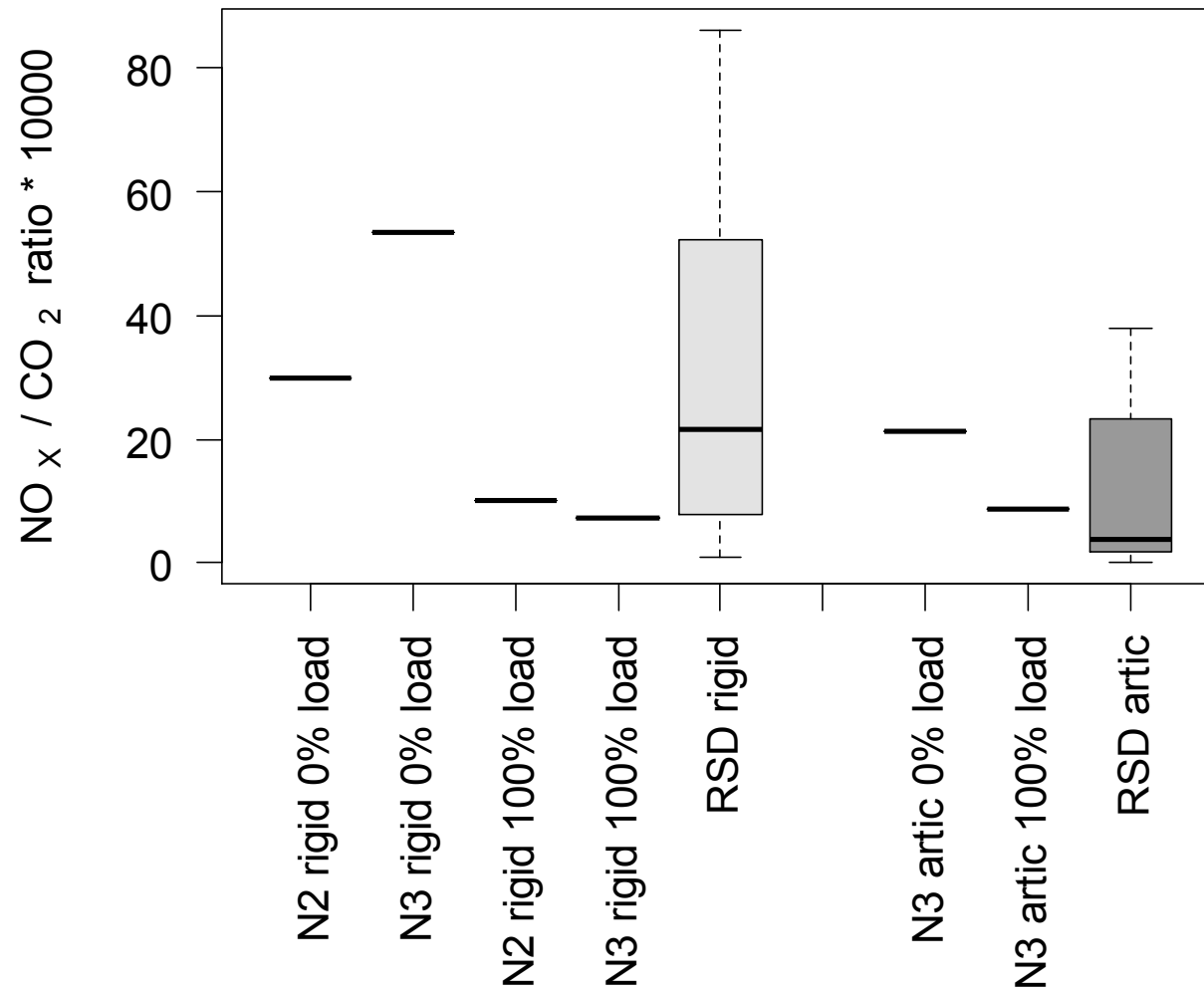
# Euro VI

NO<sub>x</sub> Heavy Commercial Vehicles, Spring/ Summer 2015



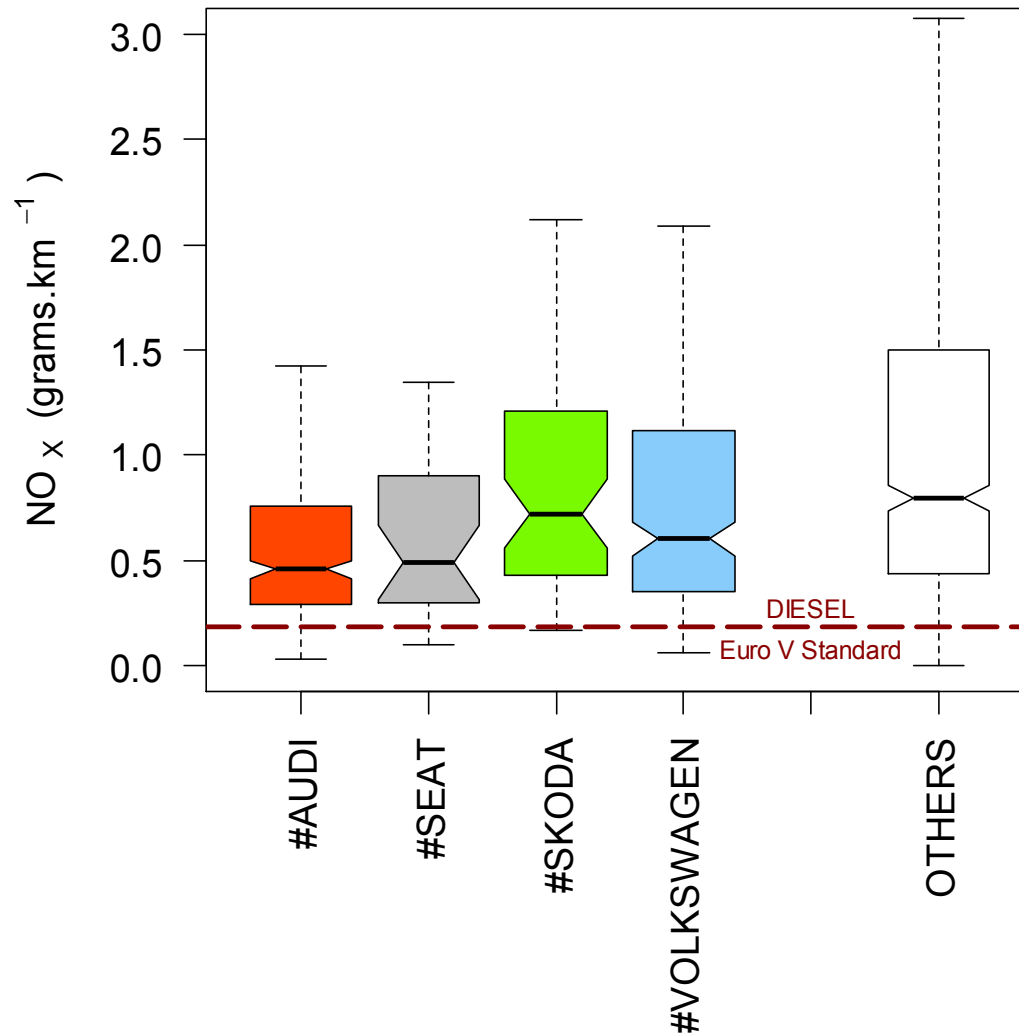
# Euro VI

## NO<sub>x</sub> HCVs – Corroboration TfL data



# Manufacturer comparison - CARS

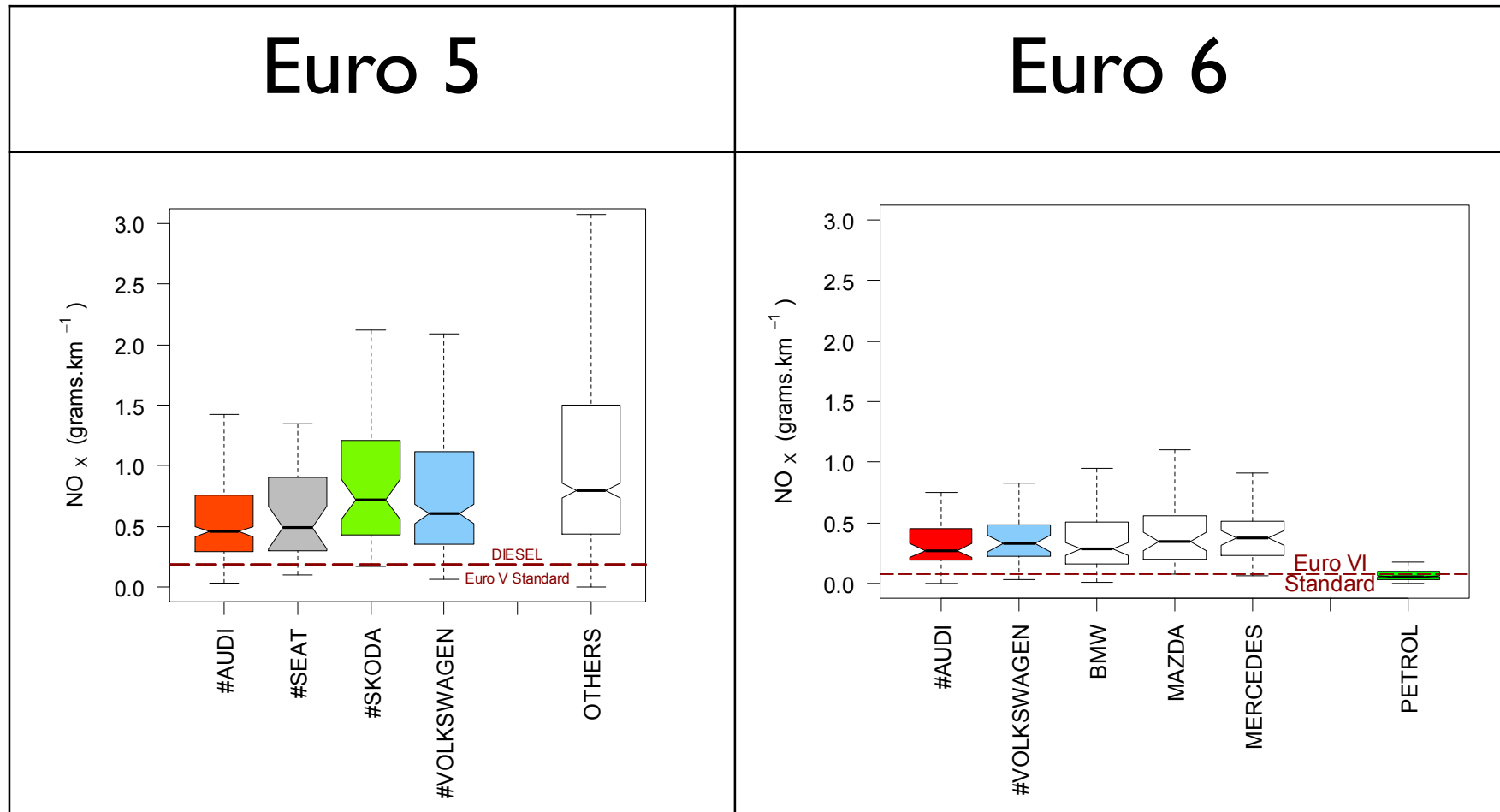
Euro 5 2.0-litre diesel cars with EA189 engine



OTHERS:  
2.0-litre diesel  
engines from other  
Marques  
e.g.  
BMW  
FORD  
KIA  
TOYOTA  
VAUXHALL

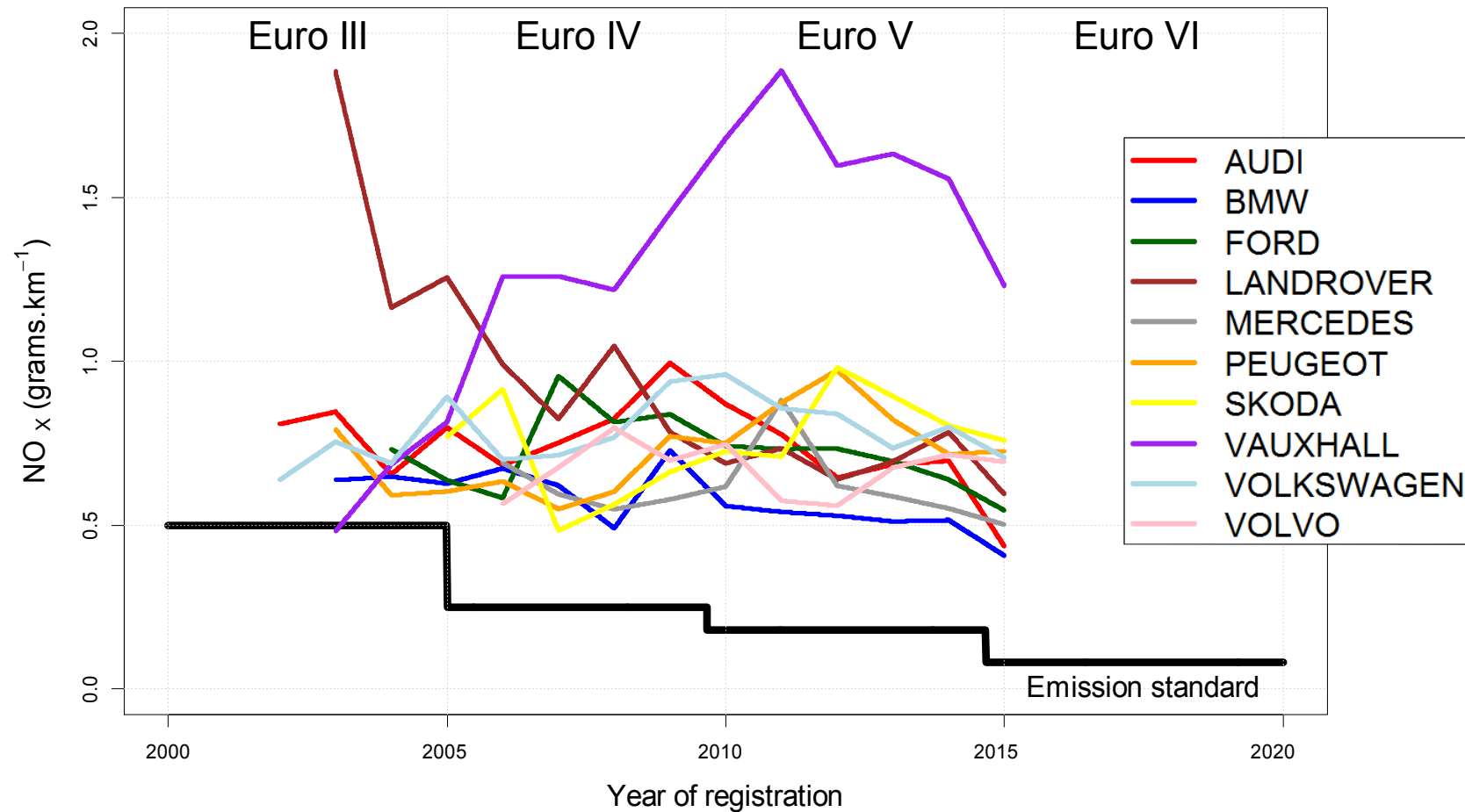
# Manufacturer comparison

## Euro 6



# Manufacturer comparison – Diesel cars

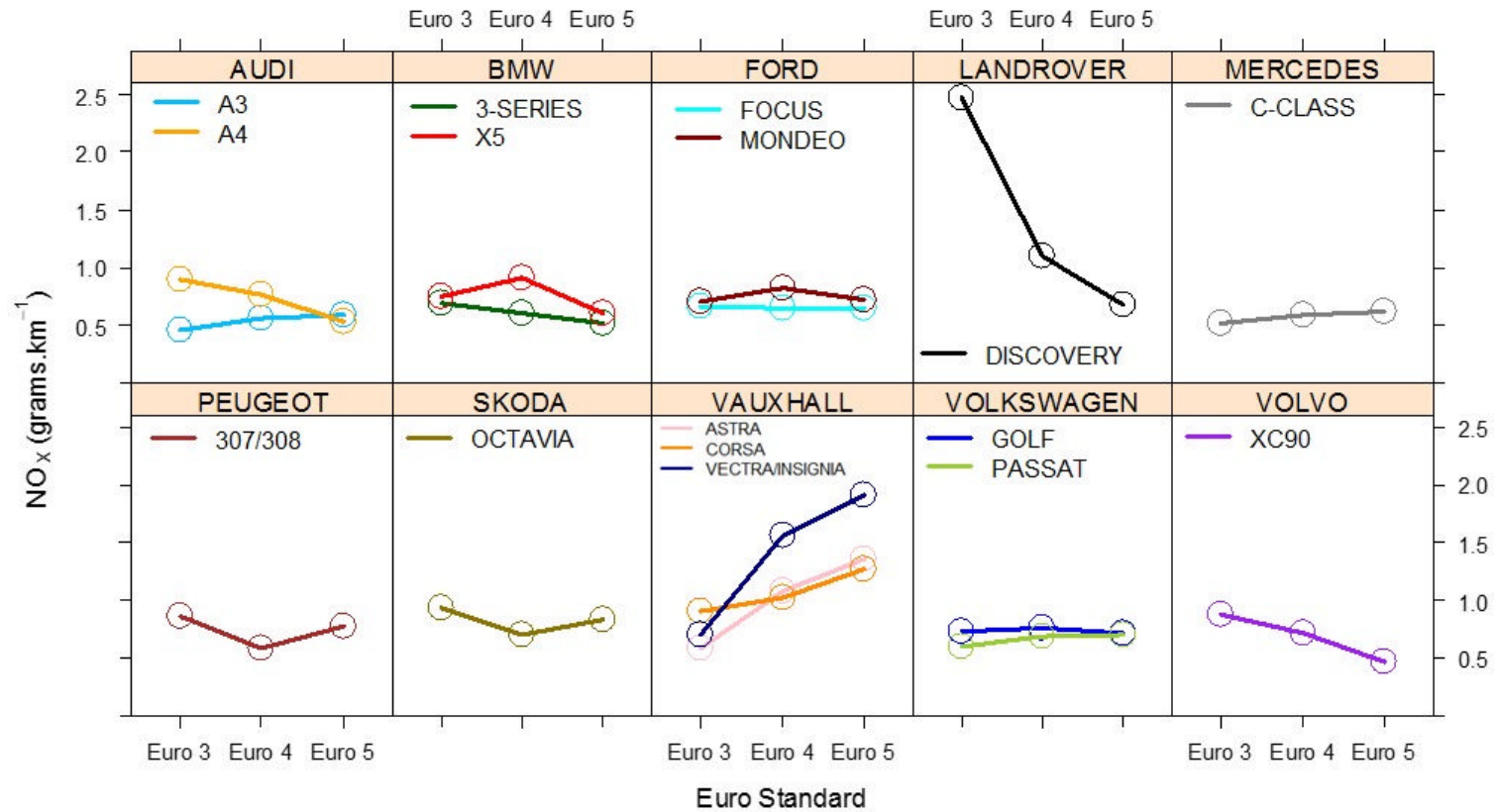
NO<sub>x</sub> emissions by manufacturer & Year of 1<sup>st</sup> registration





# Manufacturer comparison – Diesel cars

NO<sub>x</sub> emissions by manufacturer & model



# Euro VI

10

National

The Guardian | Thursday 22 October 2015

## Diesel cars emit more toxic pollution than buses, data shows

Damian Carrington

A modern diesel car pumps out more toxic pollution than a bus or heavy truck, according to research, a situation described as a "disgrace" by one MEP.

The revelation shows that effective technology to cut nitrogen oxides (NOx) pollution exists, but car manufacturers are not implementing it in realistic driving conditions.

Diesel cars tested in Norway produced quadruple the NOx emissions of large buses and lorries in city driving conditions, according to a report from the Norwegian Centre for Transport Research. A separate study for Transport for London



23,500

The number of people NOx pollution is thought to kill in Britain each year. The issue was highlighted by the VW scandal

showed that a small car in the "supermini" class emitted several times more NOx than most HGVs and the same amount as a 40-tonne vehicle.

"It is crackers," said emissions expert James Tate, from Leeds University. His research, which uses roadside equipment to measure passing traffic, also shows the latest diesel model cars produce at least as much NOx as far heavier buses and trucks.

The issue of NOx pollution, thought to kill 23,500 people a year in Britain, gained prominence when VW diesels were discovered to be cheating official US emissions tests. The scandal led to revelations that the diesels of many car manufacturers produce far more NOx on the road

than in EU lab tests, though not by illegal manipulation of software.

The government says the failure to keep NOx from vehicles low in the real world means road transport is "by far the largest contributor" to the illegal levels of NOx in many parts of the country.

"It is disgraceful that car manufacturers have failed to reduce deadly emissions when the technology to do so is affordable and readily available," said Catherine Bearder, a Lib Dem MEP and a lead negotiator in the European parliament on the EU's new air quality law.

"The dramatic reduction in NOx emissions from heavier vehicles is a result of far stricter EU tests, in place since 2011,

that reflect real-world driving conditions. If buses and trucks can comply with these limits, there's no reason cars can't as well."

Greg Archer, of the green thinktank Transport & Environment, said: "Car makers' claims [that] new diesel cars are clean are preposterous. Governments must ignore the bleating of carmakers for lenient limits and fix the problem for good."

Tate said the reasons car manufacturers were not implementing the NOx reduction technology on cars were convenience and cost. The most common technology requires a chemical compound known as urea to be squirted into the exhaust gases, but a large urea tank would be heavy while a small one would require frequent refills.