

# Impact of high biodiesel blends on pollutant emissions, fuel consumption and PM toxicity

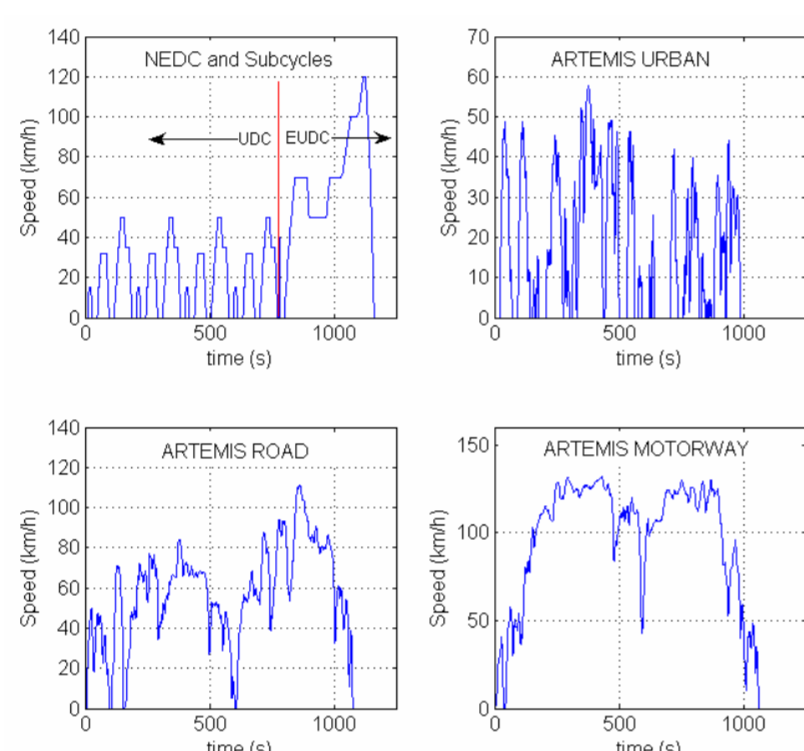
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## Introduction

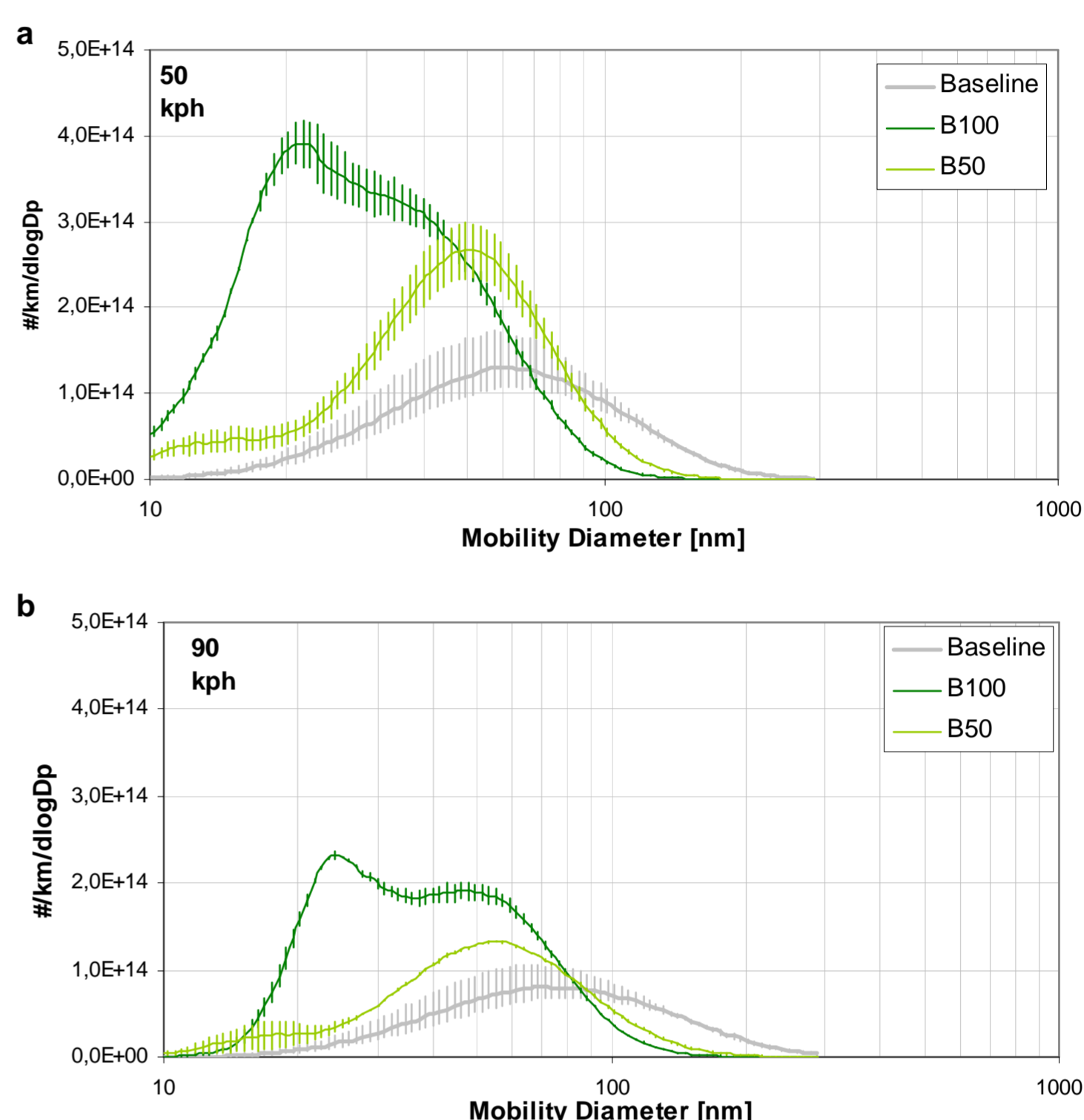
- Biodiesel use as an automotive fuel is expanding around the world calling for better characterization of its impact on diesel combustion, emissions, air quality and ultimately on human health.
- Aim:** To investigate biodiesel effect on regulated and non-regulated pollutants, including carbonyl compounds, particle number and size distribution. Toxicological analysis.

## Experimental

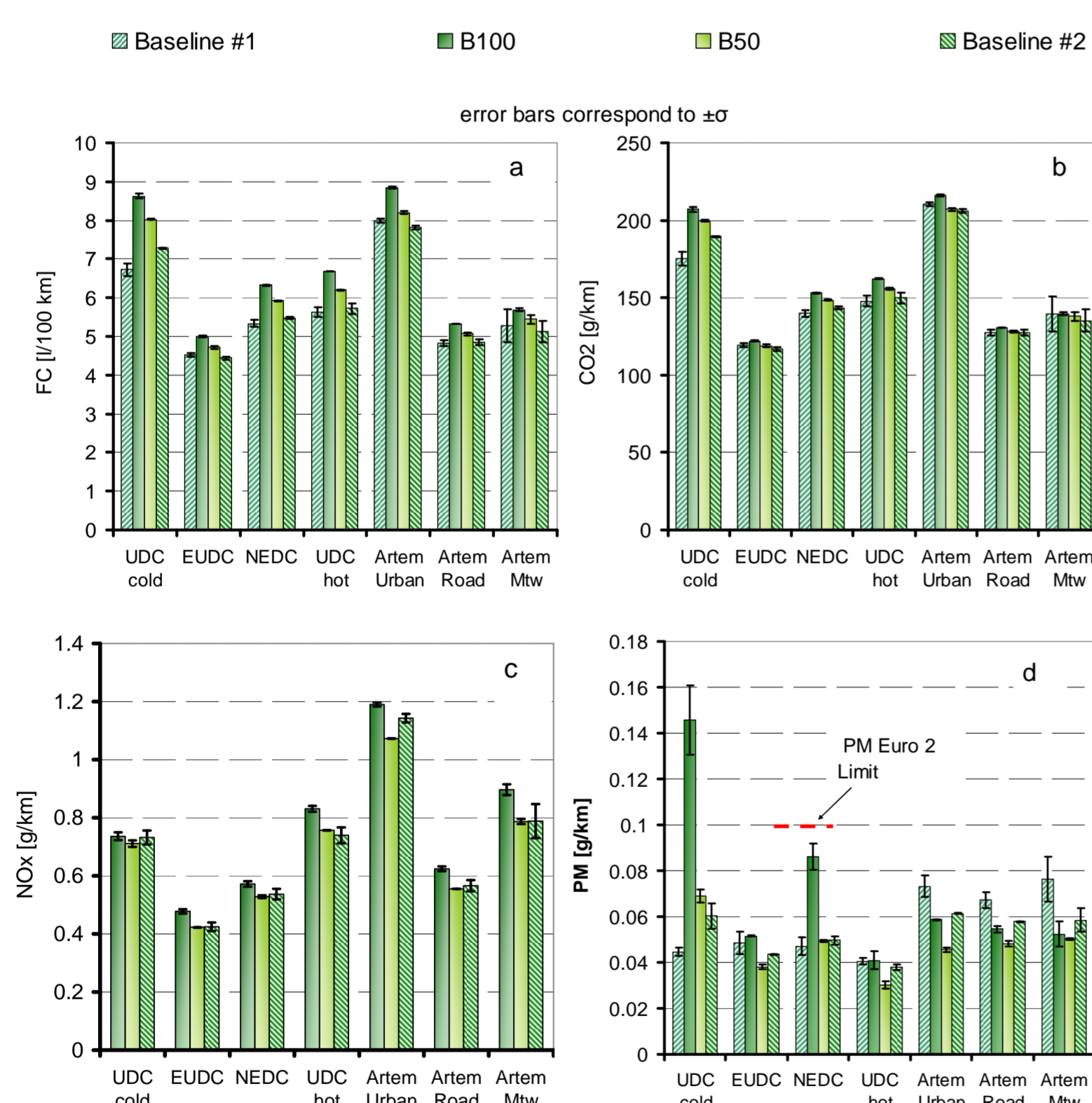
- Vehicle: VW Golf 1.9 TDi, Euro 2, DOC
- Fuels: Low S Diesel, B100 and B50 (soyaseed oil-biodiesel)
- Measurements were conducted over the NEDC (certification test) and the Artemis cycles



## Particle characterization



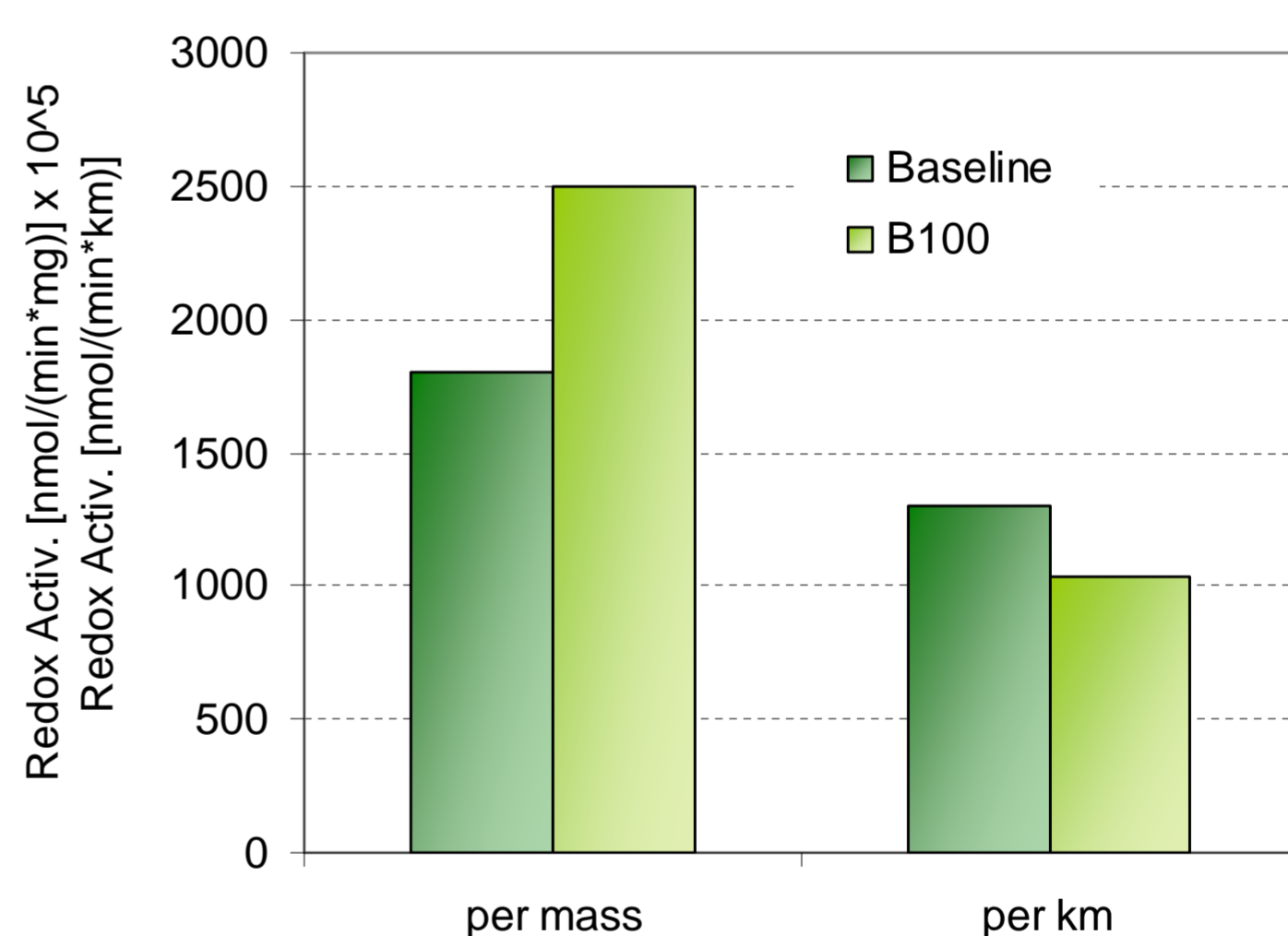
## Regulated Pollutants



## Carbonyl Compounds

Carbonyls mg/km	Diesel				B100			
	NEDC	Art. Urban	Art. Road	Art. Motorway	NEDC	Art. Urban	Art. Road	Art. Motorway
Formaldehyde	0.1606	0.0211	0.0007	0.0041	1.1596	1.0984	0.4864	1.3141
Acetaldehyde	0.0536	0.1036	0.0289	0.0132	0.9784	0.8764	1.0284	1.2674
Acrolein/Aceton e	0.0667	0.0928	0.243	0.0198	0.9565	2.6445	2.2443	1.6895
Propionaldehyde	0.0175	0.0007	-	0.0009	0.4217	0.4566	0.3314	0.1823
Crotonaldehyde	-	-	-	-	0.5397	0.6013	0.242	0.1912
Methacrolein	0.0028	0.0267	0.0048	0.0026	0.3421	0.3225	0.3002	0.3158
2-Butanone	0.009	-	-	-	0.2765	0.5794	0.1222	0.0951
Butyraldehyde	0.0012	-	-	0.0046	0.2082	0.4	0.3823	0.1875
Benzaldehyde	0.0031	-	-	-	-	-	-	-
Valeraldehyde	-	-	-	-	-	-	-	-
p-Tolualdehyde	0.0027	0.0158	-	-	0.2486	0.4138	-	0.1006
Hexanaldehyde	0.0053	0.002	0.0021	-	0.0323	0.9376	-	0.0612

## Toxicology - Results



- Toxicological analysis of PM samples is underway with the initial results of the dithiothreitol (DTT) assay indicating a lower toxic potential of B100 per unit of distance driven compared to petrodiesel. Toxicity on a per unit of PM mass basis is higher for biodiesel.

## Conclusions and Outlook

- Biodiesel at high blending ratios may strongly impact the characteristics and the toxicity of emissions
- Biodiesel impact follows a rather non-uniform pattern with the actual effect depending on driving conditions and blending ratio
- Certain parameters that are of high impact on human health should be further studied
- In-vivo imaging on mice regarding health responses is being conducted

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