PM10 Emissions of Road Traffic from Abrasion and Resuspension Processes

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Motivation

- Known emission factors from dynamometric testing
- Actually circulating fleet
- Emissions from abrasion and resuspension

Goals of the project

- PM10-emission factors for specific traffic situations
- Discrimination of emissions from exhaust pipe and from abrasion/resuspension
- Emissions of light-duty and heavy-duty vehicles

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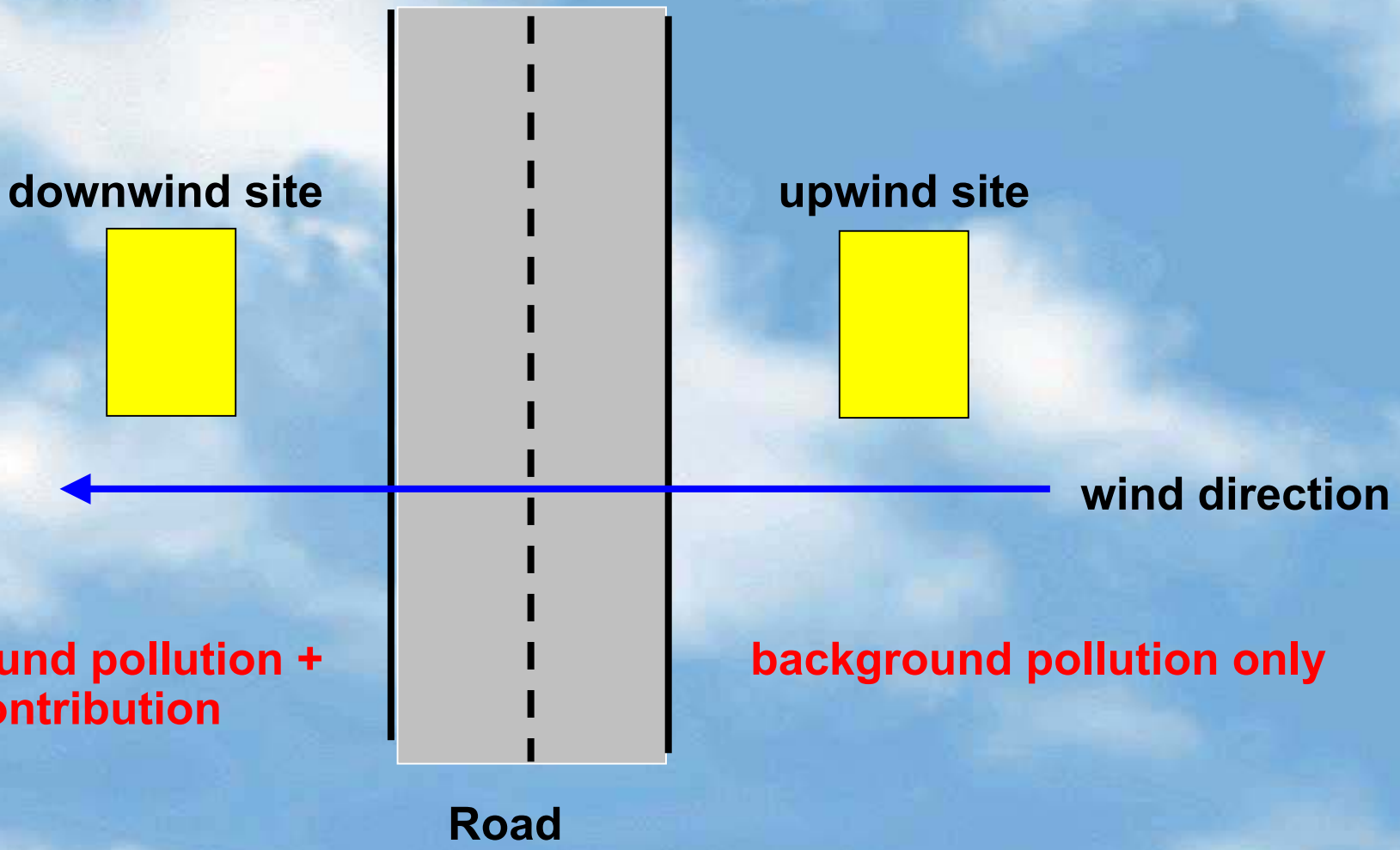
Measurement concept (1)



Measurement concept (2)

ΔPM1 interpreted as exhaust pipe emissions

Δ(PM10-PM1) interpreted as emissions from abrasion and resuspension

Dilution from ΔNOx und EF(NOx)

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Measurement concept (3)

$$\Delta NOx = \frac{EF_{NOx,LDV}}{v} \cdot n_{LDV} + \frac{EF_{NOx,HDV}}{v} \cdot n_{HDV}$$

$$d = \frac{EF_{NOx,LDV} \cdot n_{LDV} + EF_{NOx,HDV} \cdot n_{HDV}}{\Delta NOx}$$

$$\Delta PM1 = \frac{EF_{PM1,LDV}}{d} \cdot n_{LDV} + \frac{EF_{PM1,HDV}}{d} \cdot n_{HDV}$$

$$\Delta PM10 = \frac{EF_{PM10,LDV.}}{d} \cdot n_{LDV} + \frac{EF_{PM10,HDV.}}{d} \cdot n_{HDV}$$

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Measurement sites (1)

Site Traffic situation	total veh./h	% HDV	speed (km/h) LDV/HDV*)
Aathal (rural)	1173	6.1	50/50
Birrhard (motorway)	2760	9.6	120/85
Humlikon (motorway)	1681	12.5	85/75
Rosengartenstrasse (urban, slope 8%)	2909	5.8	50/40
Schimmelstrasse (urban, directly at traffic lights)	1154	6.9	0-50/0-50
Weststrasse (urban, 50 m distance from traffic lights)	1080	6.1	0-50/0-50

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Measurement sites (2)

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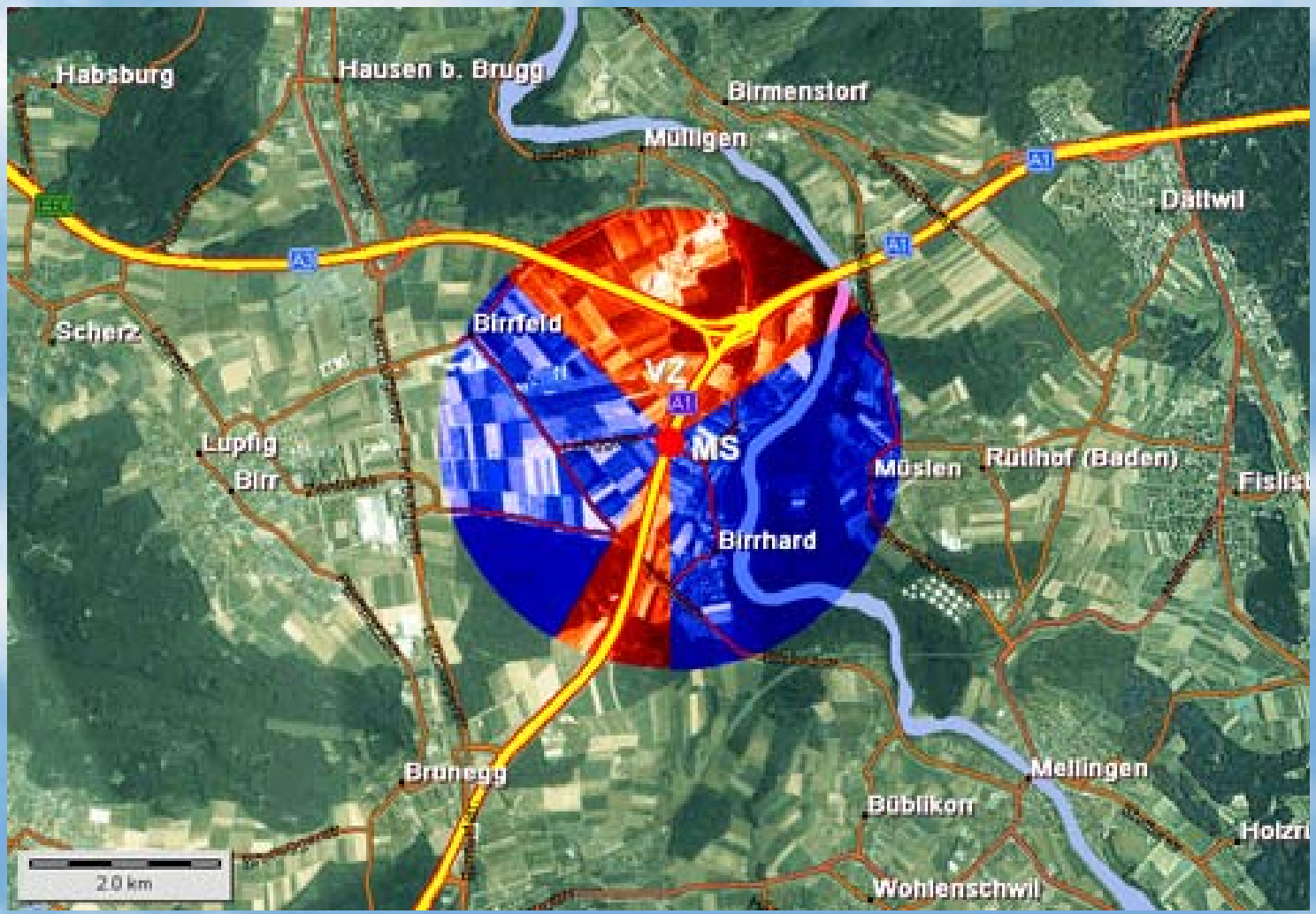
Measurement sites (3)



Measurement sites (4)

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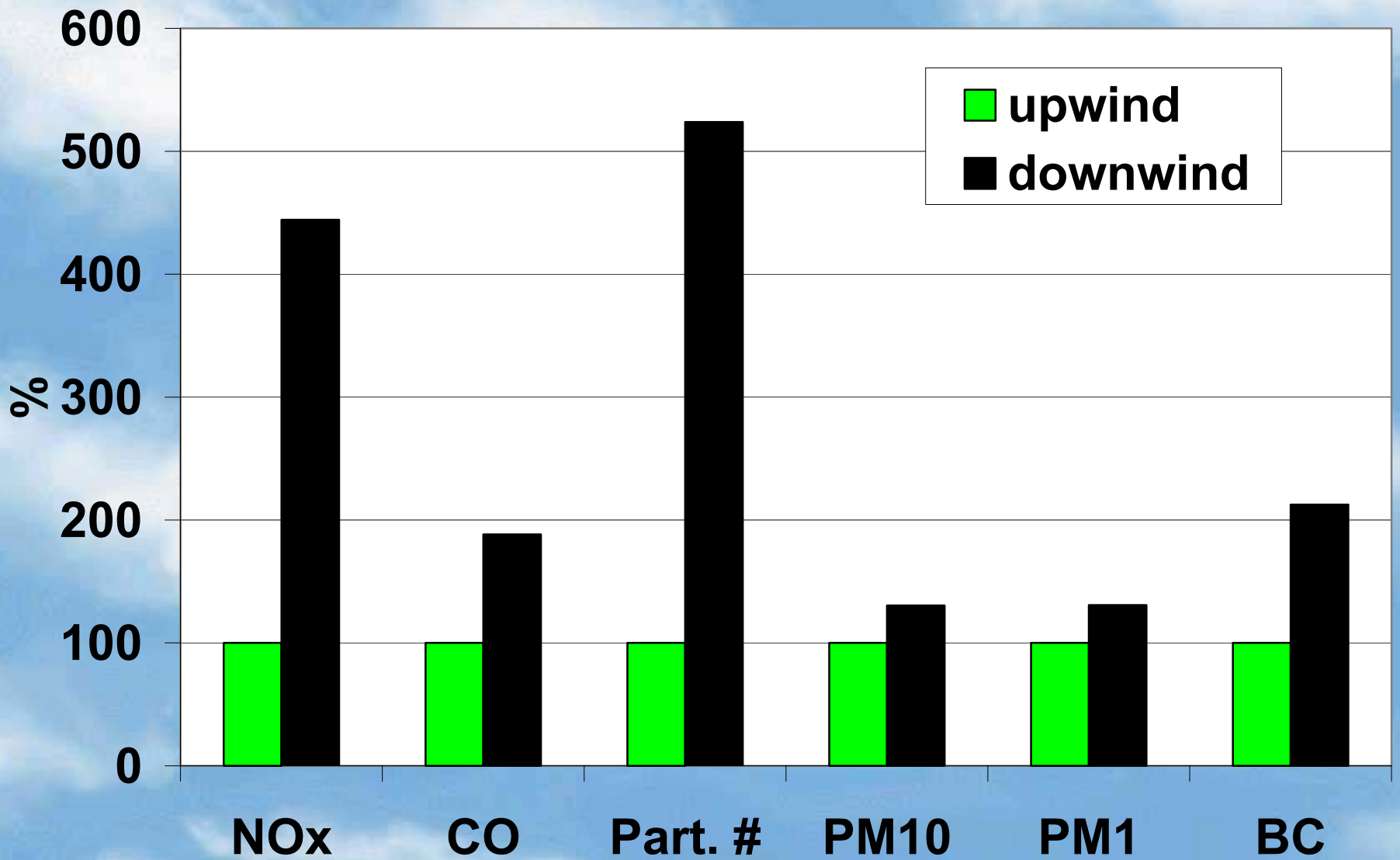
Results Birrhard (motorway)



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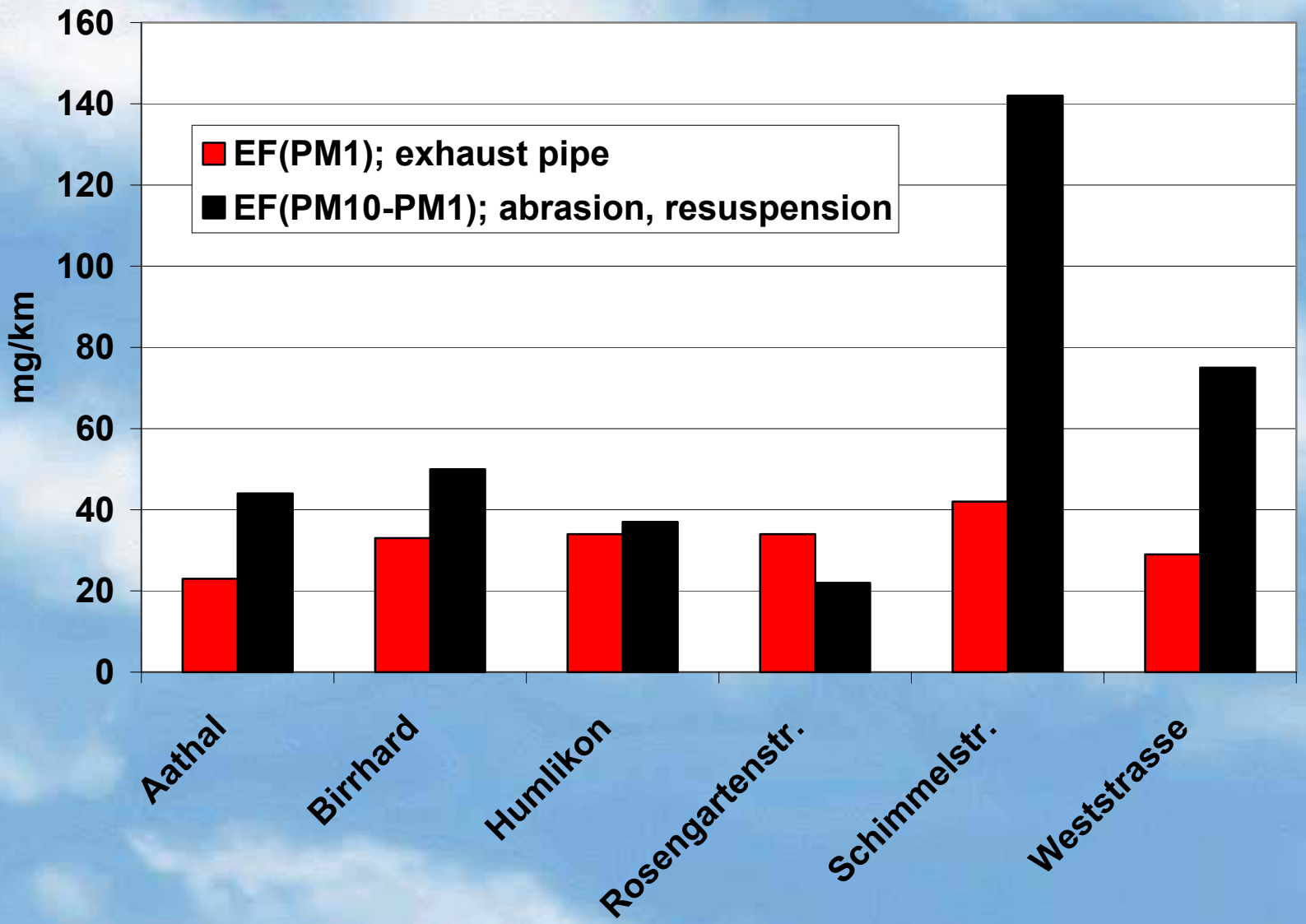
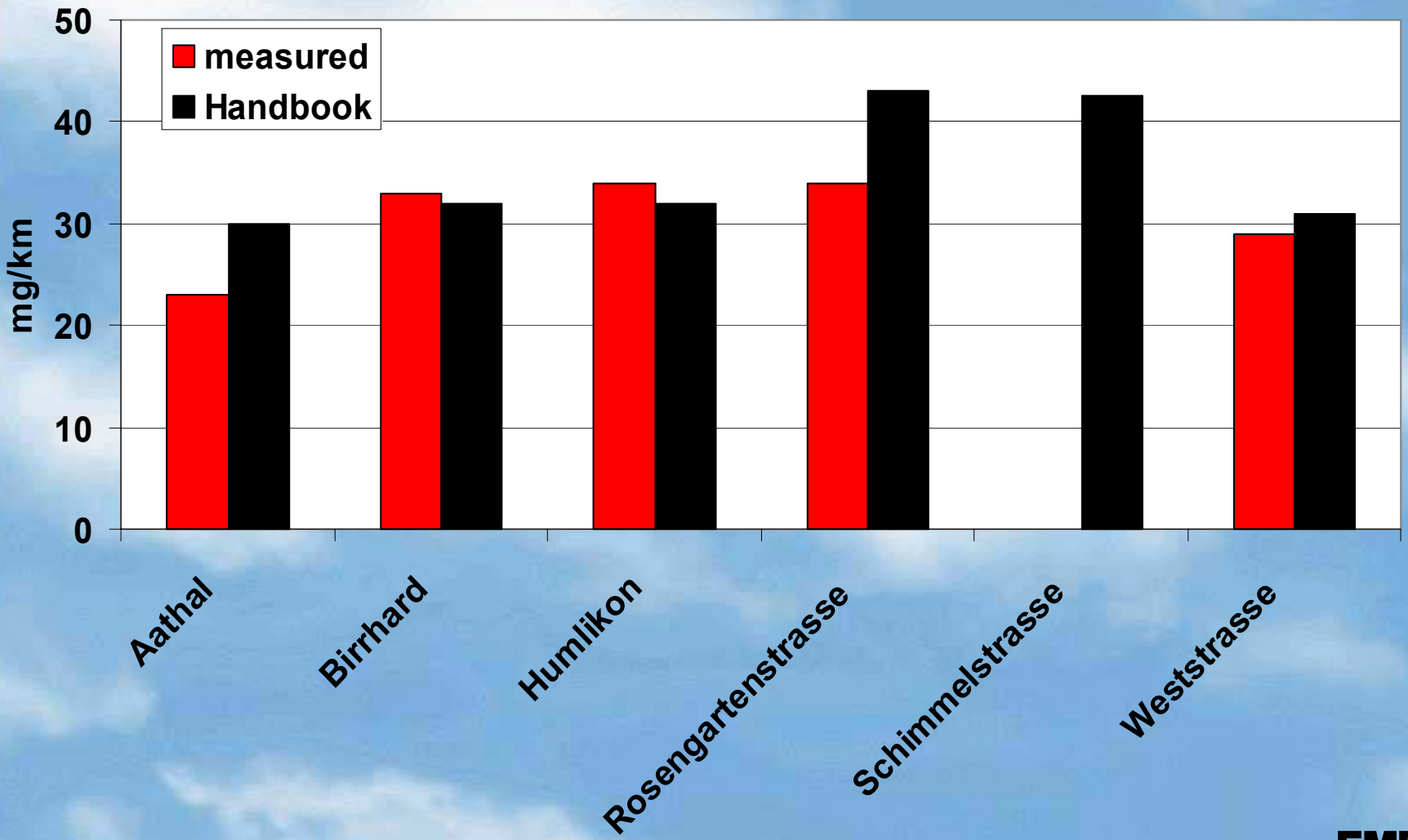
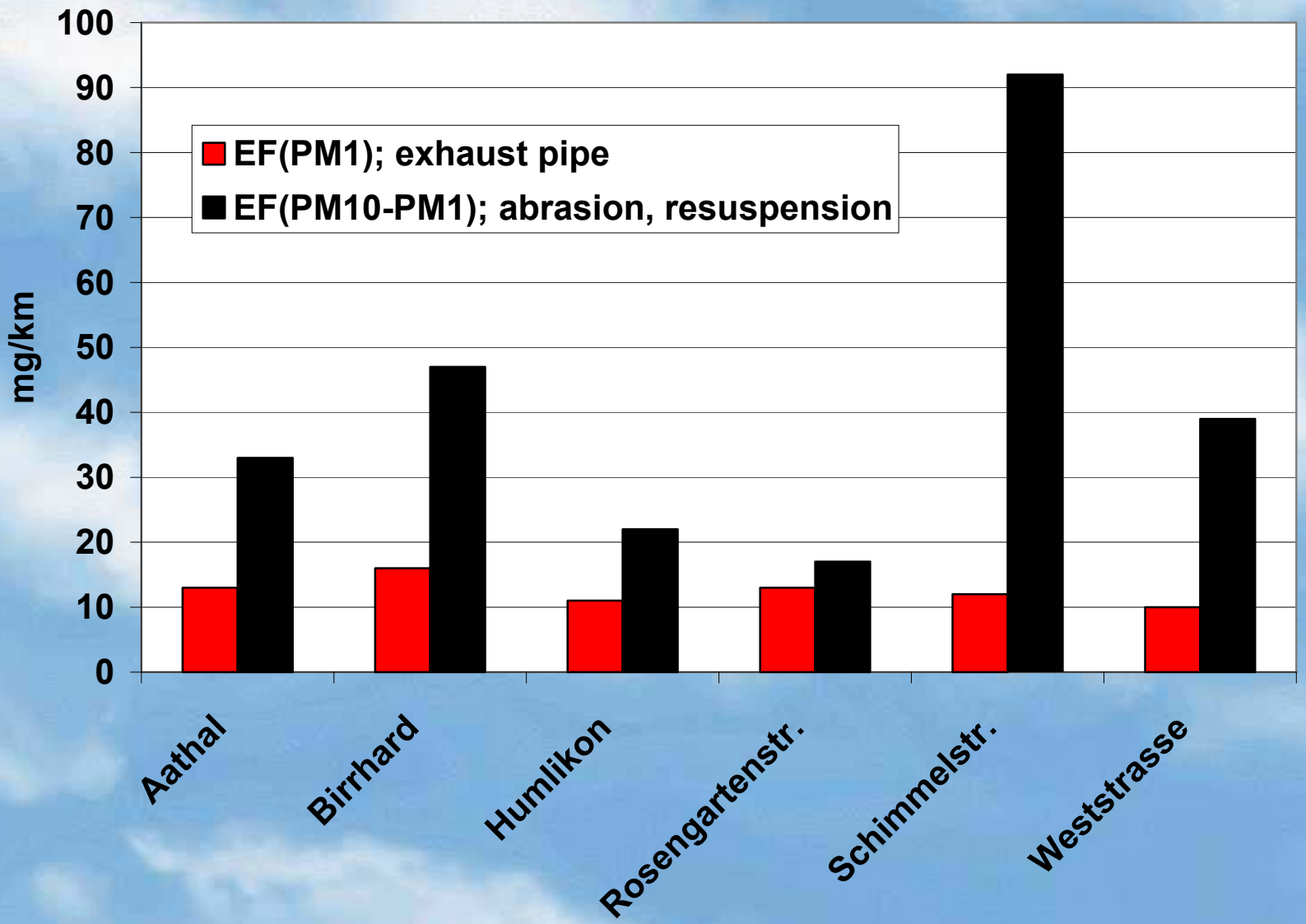
Emission factors (all vehicles)



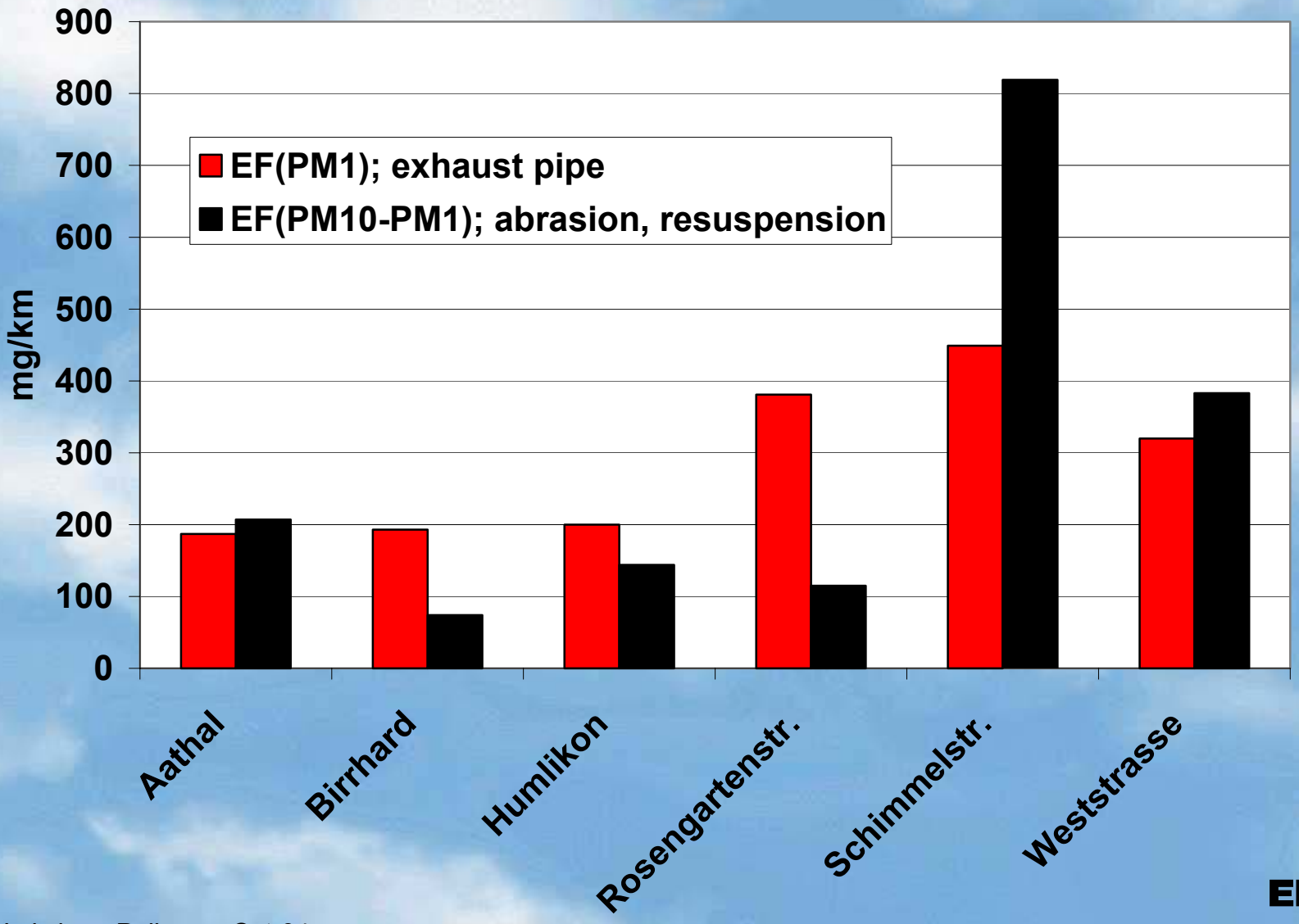
Emission factors of PM1 (all vehicles)



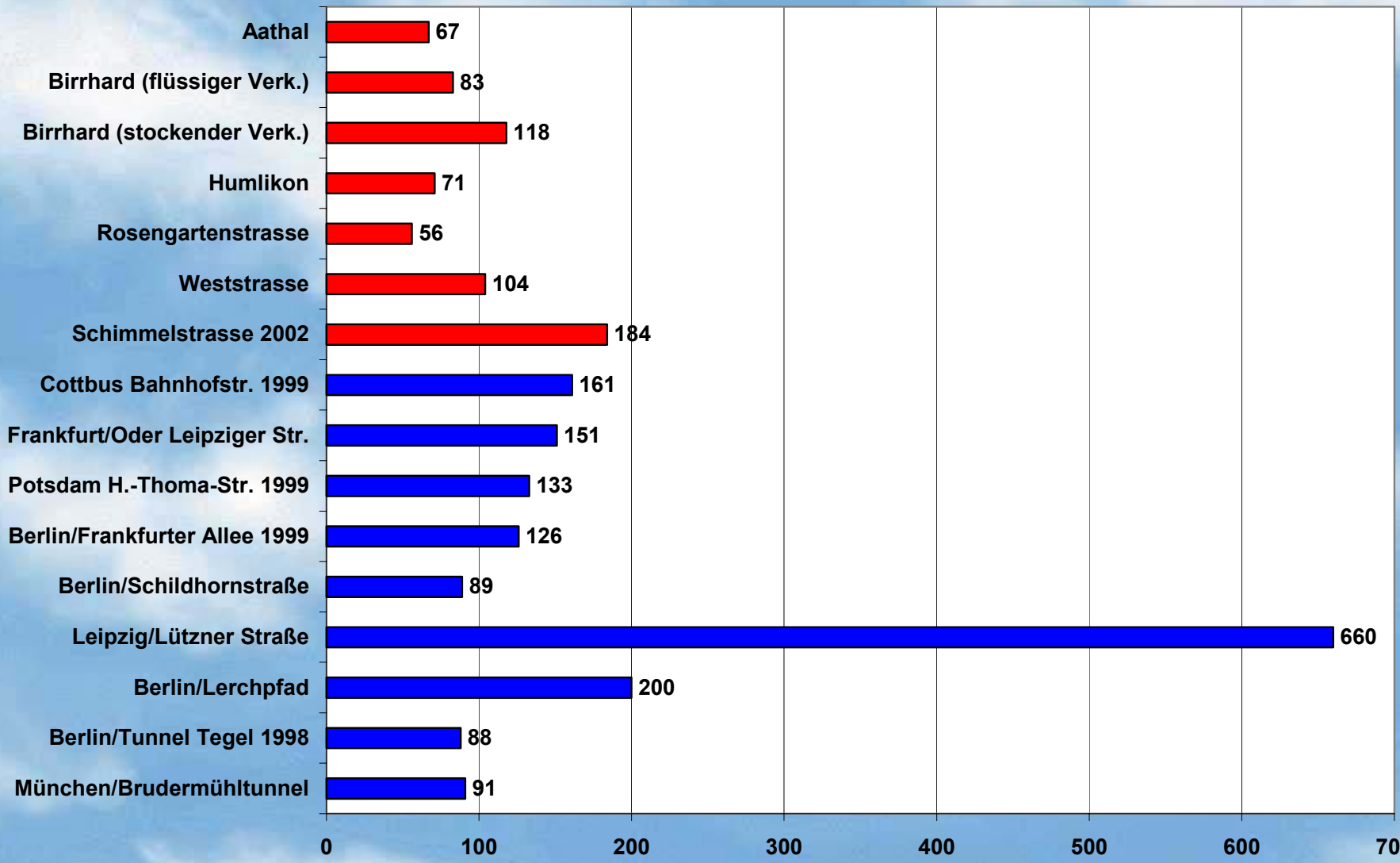
Emission factors (LDV)



Emission factors (HDV)



EF(PM10): Comparison with other studies



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Conclusions

Exhaust pipe emissions from dynamometric tests confirmed.

Particle emissions from abrasion and resuspension processes are considerable.

Open questions

Unsufficient knowledge about sources of particle emissions from abrasion and resuspension.

Toxicological assessment of emissions from abrasion and resuspension.

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