EGU25-15287, updated on 18 May 2025
https://doi.org/10.5194/egusphere-egu25-15287
EGU General Assembly 2025

Extremely low black carbon emissions from modern passenger cars and heavy-duty vehicles

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Black carbon (BC) emissions deteriorate air quality in cities and affect human population health. They are important also from climate point of view since atmospheric BC can absorb the solar radiation, affect cloud formation, and decrease ground albedo when deposited to snow or ice. BC is emitted to atmosphere from large variety of different anthropogenic sources. In respect of human exposure to the BC emissions, especially the on-road traffic emissions have had important role, which has led to tightening emission regulations and advanced emission mitigation actions.

In this study, we fulfil the data gaps found in recent literature review by new BC emission measurements. Measurements were done for passenger cars, including diesel, diesel-hybrid, gasoline, gasoline-hybrid, and CNG passenger cars, and for two heavy-duty diesel trucks. The measurements with passenger cars were conducted at BOSMAL, Poland, in the laboratory at a chassis dynamometer in a temperature-controlled test cell, where the used driving cycle simulated real driving emissions (RDE). Temperatures in the test cell were -9 °C, 23 °C and 35 °C. The experiments with heavy-duty trucks were conducted on road in Finland in winter-time conditions. In both measurements the exhaust gas was sampled partially and diluted before the characterization with an aethalometer (AE33, Magee). BC measurements were done parallel with large number of other measurements for trace gases and particles.

Our preliminary results indicate that the BC emissions of cars varied significantly depending on exhaust aftertreatment systems and driving situations. Very low BC emissions were measured for the cars and heavy-duty trucks with exhaust filtration, and ambient temperature variations had only minor effects on BC emission levels of the studied vehicles.

ACKNOWLEDGEMENTS: This work was supported by the European Union's Horizon Europe research and innovation programme under grant agreement No 101096133 (PAREMPI: Particle emission prevention and impact: from real world emissions of traffic to secondary PM of urban

air).