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Atmospheric Measurement Techniques Discussions

Interactive comment on "Physical and chemical characterisation of PM emissions from two ships operating in European Emission Control Areas" *by* J. Moldanová et al.

J. Moldanová et al.

janam@ivl.se

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Emission factors (EF) were calculated according to ISO/DIS 8178-1 (1996) from a measured mixing ratio of the pollutant in the exhaust (concentration in case of PM), exhaust flux (f(e) in nm3/h) and fuel consumption (FC in kg-fuel/h) or break power of the engine (P in kW). The exhaust flux was calculated from FC, the measured fuel carbon content and the measured CO2 mixing ratio mr(CO2) reduced with the atmospheric CO2. The emission factor for pollutant X is then calculated from its mixing ratio in the exhaust mr(X) (no dimension) according to:

EF [g/kg-fuel] = f(e) * mr(X) * 44.6 * MW(X) / FC

EF [g/kWh] = f(e) * mr(X) * 44.6 * MW(X) / P

Factor 44.6 is from recalculation from the gas volume to the mass, MW(X) is the molar mass. PM is measured in μg/m3 and the calculation of EF is:

EF [g/kg-fuel] = f(e) * c(PMx) * 1E-6 / FC

When gases or PM are measured in dried exhaust, correction for the loss of humidity with factor corr(H2O) sometimes needs to be applied. corr(H2O) is then calculated from the fuel H content and the humidity content of the engine intake air. In our experiments both CO2 used for the f(e) calculation and all other gaseous species were measured in dried exhaust meaning that corr(H2O) was not needed. In case of PM part, but not all of the water vapour condensed during the cooled dilution. The measured RH in the warm exhaust (300°C) was ~4% and the temperature decrease from the exhaust to the gas meter was ~280°C, meaning that less than 1% of the exhaust water would remain in the gas phase. Hence we have not applied corr(H2O) for calculation of EF(PM) either.

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