Estimation of emission rates of resuspended road dust using a mobile monitoring system

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Keywords: PM10, PM2.5, resuspended road dust, emission factor
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Resuspended road dust has been one of the main PM10 emission sources in Western United States and some of European countries including Norway during winter. According to the previous study based on CAPSS(Clean Air Policy Support System) developed by Korean Ministry of Environment, resuspended road dust is likely to contribute with significant amount to PM10 emission not only in road transport sector but also in entire PM10 emission inventory in Seoul metropolitan area including the city of Incheon. One of the main problems in estimating PM10 emission rate of resuspended road dust using the emission estimation equation in AP-42 of US EPA is that there are very large uncertainties in estimated values, which often result in overestimation of the PM10 emission rate of resuspended road dust. This study focuses on reducing uncertainties in estimating PM10 and PM2.5 emission rate of resuspended road dust.

To estimate PM10 emission rate of resuspended road dust, a mobile monitoring system was developed in this study, which is similar to the SCAMPER(System for the Continuous Aerosol Monitoring of Particle Emission Rates from Roads, Fitz and Bumiller, 2005) in principle. Originally, the mobile system was designed in 2005 using the principle of the TRAKER(Testing Re-Entrained Kinetic Emissions from Roads, Kuhns *et al*, 2001) and has been employed to measure silt loading on paved roads in Seoul metropolitan area(Han and Jung, 2012). Therefore, our system employs principles of both TRAKER and SCAMPER and thereby the silt loading data and emission rate of resuspended road dust can be estimated on a test road simultaneously. A schematic of a hybrid type mobile monitoring system is shown in Figure 1.

PM10 emission factors of resuspended road dust on a test road section can also be estimated using the emission estimation equation in AP-42 of US EPA, which uses silt loading and vehicle weight as parameters in the equation. Therefore, if one compares the emission factors (*i.e.* g/km) obtained using the emission estimation equation in AP-42 of US EPA with those obtained using SCAMPER principle, one can correct the predicted emission factors from the emission estimation equation in AP-42 of US EPA. By doing so, uncertainties in the emission estimation equation in AP-42 of US EPA can be reduced and possibility of modification of the equation, for example, by adding a vehicle speed dependency term to the equation as an additional parameter can also be verified. For this, we attempted to correlate the correction factors (or scaling factors hereafter) obtained at different test conditions with vehicle speed and silt loading as parameters.

It was found that the resulting correlation for the scaling factor is approximately proportional to the square of vehicle speed, whereas it has relatively weak dependency of silt loading. Detailed results will be presented in the conference.

Figure 1. A hybrid type mobile monitoring system

This work was supported by the Korea Ministry of Environment (MOE) as "The Eco-Innovation Program".

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