

4.170 Developing PM Source Profiles of Diesel Vehicles and Its Application on Source Apportionment of PM_{2.5} in China.

Early Career Scientist

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Abstract:

Vehicular emission is one of the most important sources of particulate matter (PM) in Beijing, China, which has significant adverse effects on air quality, human health and climate change. However, the estimate of contribution of vehicular emission to ambient PM_{2.5} is highly uncertain due to the lack of local source profiles in China and limited chemical species used for source apportionment. In order to develop local source profiles of diesel vehicles and evaluate the sensitivity of CMB (Chemical Matter Balance) model results to different vehicle source profiles, six excavators, and five trucks were tested. The average emission factors for PM (EF_{PM}) from excavator and truck emissions were 829 ± 806 and 498 ± 234 mg kg⁻¹ fuel, respectively. EF_{PM} and PM constituents were significantly influenced by fuel quality, operational mode, and emission standards of the vehicles. For example, a good and positive correlation ($R^2 = 0.79$, $p < 0.01$) was found between EF_{PM} for excavators and the sulfur contents in fuel. The highest average EF_{PM} for working excavators was 904 ± 979 mg kg⁻¹ fuel as a higher engine load was required in this mode. For trucks, the vehicle with higher emission standard exhibited lower emissions of PM. From China II to China III standard, the EF_{PM} for truck was decreased by 63.5% and it was decreased by 65.6% when switching from China III to China IV standard. The developed new source profiles are applied in the CMB model to test sensitivity of vehicle source profiles to source apportionment results of PM_{2.5} in Beijing-Tianjin-Hebei regions. In addition to source profiles, more organic tracers are also included in the model (polycyclic aromatic hydrocarbons, hopanes, steranes etc.) to test the sensitivity of source apportionment results to fitting species used in the model and improve the quantification of vehicular source contribution.