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On Particulate Emissions from Individual Trains in Tunnel Environments

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In order to detect the concentrations and size distributions of airborne particles that were generated by individual moving trains on an underground railway platform, a series of real-time measurements were undertaken. The measurement range covered the ultrafine (less than 100 nm) and partly the fine (100 nm to 2.5 µm), but not the coarse fraction (2.5 to 10 µm). The results show that the individual trains with stop and start at the platform elevate substantially the particulate number concentrations with a diameter size greater than 100 nm. Two size modes of the particulate number concentrations are obtained. One mode peaks around 170 nm when a train stopped/started, while the other is around 30 nm when no train operated in the station. By using principal component analysis, four components are extracted from the thirty-two-analyzed particulate sizes, indicating four different contributors in those detected particles. It is revealed from this study that the particulate matter released by individual moving trains (mainly through mechanical wear and turbulent resuspension) is a key contributing source of the fine particles on underground railway platforms, which can be separated from the background by their different size distributions.