

Passenger exposure to PM while commuting in the Barcelona metro

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People living in urban areas usually spend a considerable amount of their daily time commuting, with underground rail being one of the public transport modes most used in cities worldwide. Despite the undoubted efficiency of subway travel, however, underground commuters are known to be exposed to high levels of particulate air pollution. Surveys of the concentrations and characteristics of inhalable particles existing in these indoor environments are of extreme interest since they have been shown to cause adverse health effects. The metro system in the city of Barcelona (Transports Metropolitans de Barcelona: TMB) is one of the older underground transport systems in Europe, with its first line beginning operation in 1924. By the present decade, the TMB comprises 11 lines (3 of them are new, in operation over the last five years) with a total length of 102.6 km and including 140 train stations. Trains run from 5 a.m. until midnight everyday, with additional services on Friday nights (finishing at 2 a.m.) and Saturday nights (running all night long), with a frequency between 2 and 15 minutes, depending on the day (weekend or weekday) and time of day. The Barcelona metro absorbs around 50% of the urban commuting load, transporting around 1.25 million passengers on workdays. The most frequent average journey time is 35 minutes (approx 10.2 km) round trip. The overall aim of the proposed study is to fully characterise passenger exposure to PM while commuting (including waiting time on the platform and travelling inside the trains) in the Barcelona subway system. Sampling campaigns both on platforms and inside trains and a comparison between the old and the new lines is currently ongoing. The platforms of four stations are equipped with a PM_{2.5} high volume sampler; an optical particle sizer (TSI OPS 3330) monitoring real time TSP, PM₁₀, PM_{2.5} and PM₁; and a real time CO₂ analyzer (TSI IAQ-Calc 7545). Additional measurements on platforms (from 24 stations from five subway lines) and inside the trains (during a one-way trip to and from the beginning of the line) are to be carried out using a portable Aerosol Spectrometer (TSI DustTrak 8533). Measurements are to be performed at each selected station for one hour, divided into periods of 15 minutes in 4 positions approximately equidistant along the platform for greater representativeness and to observe possible spatial differences depending on the position on the platform. A manual control of the exact arrival and departure times of each train is to be performed to assess possible correlations with the variability of the registered concentrations. In this contribution the detailed results of PM concentration variations on platforms and in trains obtained during the first months of the Barcelona campaign will be presented for the first time.

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