# Concentrations of Indoor Submicrometer and Supermicrometer Particulate Matter in a Primary School in Prague.

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Children are susceptible to environment pollution and school is the second environment when they spent most of their time (Silvers *et al.*, 1994). Therefore, pollution in the school environment can affect their health, wellbeing and even their school results (Mendell and Heath, 2005). Particle matter (PM) in schools could have both indoor and outdoor origin. Indoor generated particles are mostly coarse and are produced by resuspension. In urban areas the majority of outdoor PM have its source in traffic. These particles contain a number of hazardous substances and generally and their aerodynamic diameter is usually below 1 micron. It has been repeatedly shown that they easily penetrate into classrooms (Avigo *et al.*, 2008; Branis *et al.*, 2009). However, it was also documented, that submicrometer particles can be produces by children and by the activity they perform (Morawska *et al.*, 2009). The present work investigated concentrations of aerosol particles, in specialized classrooms in an elementary school situated in the centre of Prague.

Mass concentration of PM was measured by DustTrak DRX 8533$^{(TSI)}$ nephelometers while the number concentrations of particles below 1μm were monitored by a P-Trak$^{(TSI)}$ condensation particle counter. The instruments measured in two pairs, one set was situated in the studied classroom and the second one outdoors. The measurement integration time was set to 5 minutes. In total, eight four-day measuring campaigns were performed in 2011/2012 from November to July. The school was situated in a park near the centre of Prague. The traffic was rather low in the school vicinity. Student occupancy data were collected in cooperation with teachers. Measurements took place in three classrooms – Computer classroom 50.7m$^2$ (ground floor); Art/Music classroom 57.5m$^2$ (2$^{nd}$ floor), Biology/Chemistry classroom 55.7m$^2$ (2$^{nd}$ floor).

It was found that mass concentrations of submicrometer particles were dependent on outdoor concentrations (regression, p-value<0.002 or less for all classrooms), in contrast to supermicrometer particles which were affected mainly by students. The outdoor concentration had a very limited influence. Because of smooth transition between submicrometer and supermicrometer particles, a multivariate statistical approach was selected. Students had a significant effect on particles concentrations (RDA, p-value<0.01; outdoor concentrations were set as covariates). The strongest effect was documented for number concentrations of submicrometer particles and supermicrometer mass concentrations (Figure 1). It has to be noticed, that all relationships were week. It is assumed that the level of submicron aerosol pollution in the classrooms depended mainly on outdoor concentrations. Students or/and their activity during lessons had only a weak effect. In contrast, the supermicron mass concentrations of aerosol were more affected by classroom occupancy.

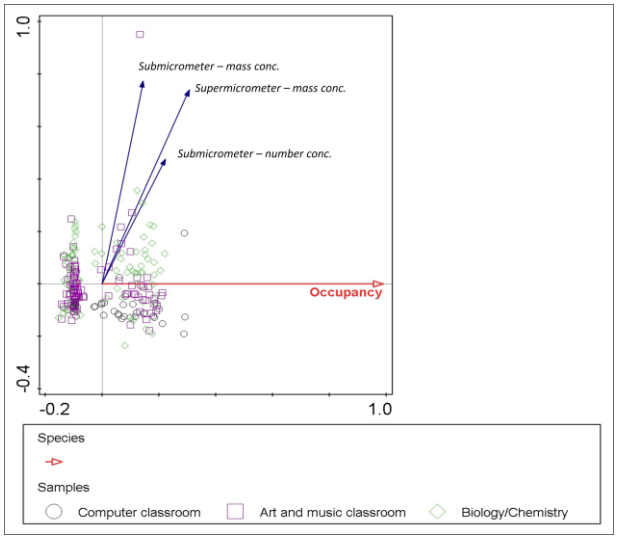


Figure 1. Graph of multivariate analysis RDA (statistical software Canoco)

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