Geophysical Research Abstracts
Vol. 19, EGU2017-4934, 2017
EGU General Assembly 2017

Four-dimensional approach to simultaneous analysis of urban fine aerosols and three different meteorological parameters

Libor Hejkrlík and Helena Plachá

Czech Hydrometeorological Institute, Branch Office Ústí nad Labem, Usti nad Labem, Czech Republic (hejkrlik@chmi.cz)

Number concentrations of fine particles had been measured by SMPS in a diameter range of 10 to 800 nm in 7 channels with time resolution of one hour since June 2012 to December 2015 at a background urban site in Northern Bohemia. At nearly the same place hourly means of three meteorological elements were available (air temperature T_h, relative air humidity H_h and global radiation R_h) and as a complementary index of atmospheric pollution the mass concentrations of PM_1-BC (black carbon).

The whole period of observations covered 1309 days, periodically involving all of the seasons of the year. T_h varied between 11,2 ˚C and 36,1 ˚C, for H_h it was between 21% and 100% and R_h reached its extremes between 0,2 and 940,5 W/m^2 (night hours were excluded). Resulting number of analyzed rows of 11 variables was approximately 14 000. The nearly-continuous combinations of meteorological data were transformed into three-dimensional matrix where $T_{h,}H_h$ and R_h were assigned only few discrete values (48, 13 and 13 respectively). In the cells of the 3D matrix mean concentrations of different modes of fine particles and of PM_1-BC were calculated. The results were displayed in the form of XYZ bubble graph, diameters of the spheres being the fourth dimension.

The results offer insight into relation between sub-micron particles concentrations and meteorological conditions on parallel time basis. The nucleation mode of nanoparticles (10-30 nm) demonstrate strong proliferation (N$\sim$10^4/cm^3/hour) under extreme both temperature and solar radiation while air moisture remains moderate. The effect is less obvious for Aitken mode (30-70 nm) and fades gradually away for fine particles (100-800 nm, N$\sim$10^3/cm^3/hour). Particles PM_1-BC ($\leq$ 1000 nm, C_m $\sim$1 μg/m^3/hour), measured by MAAP, show considerable affinity to low visibility and high humidity but the overall picture persists, what may serve as a proof of equivalence of the measuring procedures.