Balloon measurements of temperature, relative humidity, O_3 and NO_x vertical profiles and inversion layer height observation in polluted urban atmosphere

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According to WHO an air pollution by PM has been classified as human carcinogen. Limits for PAHs, PM, NO_x, O_3 and other hazardous substances are exceeded in urban area especially during the winter period. Reasons are frequent inversion situations combined with household coal heating, traffic, industrial and other emission sources.

Knowledge about inversion layer height is important for estimation of the pollution impact and it can give us also information about the air pollution sources. NO_x and O_3 vertical profiles are appropriate complements to ground measurements.

Therefore, comprehensive characterization of urban aerosol was conducted in residential district of the city of Kladno Švermov, about 30 km NW of Prague, from the 2nd Feb. to the 3rd of March 2016. The Švermov is considered the as air pollution hot-spot due to long time exceedances for benzo[a]pyrene - B[a]P, reaching the second highest B[a]P annual concentration in the Czech Republic. The Švermov is in the shallow valley. Isothermal mobile station was placed at the football field and balloon measurements were conducted in the immediate vicinity to the station which records aerosol size distribution (14 nm to 10 µm by SMPS and APS), CO, NO_x, SO_2, O_3, CH_4, NMHC by automatic monitors (Horiba-360 series), meteorological parameters, 13 PAHs in 24h resolution and 27 elements with 2h resolution in 8 aerosol size fractions. Using a helium-filled balloon series of vertical profiling up to the height of 300 m within the atmospheric boundary layer were conducted, for two types of parameters. While meteorology parameters - T and relative humidity - RH and pressure were acquired with 4 Hz frequency (Vaisala), NO, NO_2 and O_3 profiles were measured with 1min integration time by the ATEKNEA Little Environmental Observatory (LEO). Gaseous components data were corrected with the Horiba analyzers in the mobile station.

The measurements confirmed frequent formation of temperature inversion within boundary layer up to the height of 50m (Fig. 1). Gaseous component vertical profiling is in progress.

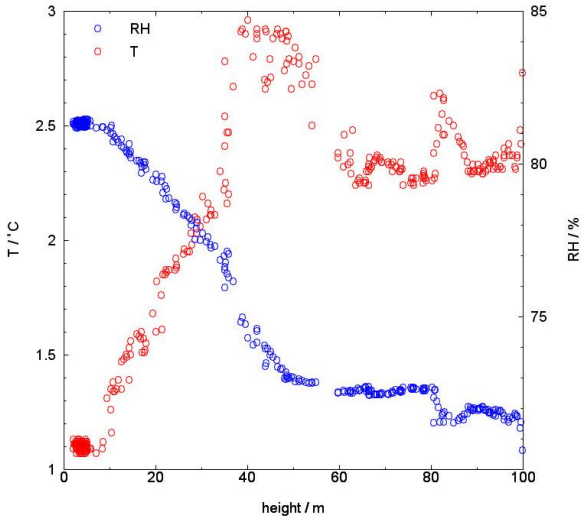

Figure 1. T and RH vertical profiles within and urban atmosphere

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