

Abstract

This thesis evaluates the spatial variability of PM_{2.5} concentrations during two winter months in the small village Lbín close to Teplice at the turn of the year 2017/2018. The PM_{2.5} concentrations were monitored through a dedicated monitoring network using a total of eight DustTrak laser nephelometers (Model 8520). Six DustTraks were located directly in the village in the valley, one of them was located on the hill above the valley and the last one was located approximately in the half of the hill. Using a network measurements, we tried to determine that the household heatings are the main sources of air pollution in the village. The basic meteorological parameters – wind speed and direction, temperature and air humidity were monitored together with PM_{2.5} concentrations.

It was observed statistically significant difference between the measuring stations, which points to the unevenly distribution of pollution sources. The particle concentrations typically reach peak values in the morning and in the evening. The maximum peak values were 2607 $\mu\text{g}\cdot\text{m}^{-3}$ in December and 4347 $\mu\text{g}\cdot\text{m}^{-3}$ in January. The lowest maximum values were 223 $\mu\text{g}\cdot\text{m}^{-3}$ and 177 $\mu\text{g}\cdot\text{m}^{-3}$ for devices located above the village. An important factor contributing to the current situation was wind speed. If the wind speed was higher than 1,29 $\text{m}\cdot\text{s}^{-1}$ average PM_{2.5} concentrations were below 10 $\mu\text{g}\cdot\text{m}^{-3}$. This was reflected in the comparison of two measuring periods – December and January. December was windier than January and reached even lower average values. In December, the average wind speed was 0,93 $\text{m}\cdot\text{s}^{-1}$, maximum was 4,32 $\text{m}\cdot\text{s}^{-1}$ and average PM_{2.5} concentration was 24 $\mu\text{g}\cdot\text{m}^{-3}$. By contrast, in January, the average wind speed was 0,67 $\text{m}\cdot\text{s}^{-1}$, maximum was 3,60 $\text{m}\cdot\text{s}^{-1}$ and the average PM_{2.5} concentration was 29 $\mu\text{g}\cdot\text{m}^{-3}$. The influence of temperature or air humidity on the concentrations of PM_{2.5} was not observed.

Monitoring of air pollution in small settlements is not currently done. Nevertheless it is confirmed, that the local heatings are significant sources of aerosol particles. In addition, the Fraction PM_{2.5} has a negative impact on human health. That is the reason, why it is necessary to pay more attention to the problem of air pollution in the small settlements.

Key words: PM_{2.5}, village, home heating, air quality, urban microscale