Abstract

Ambient air pollution, caused by harmful pollutants, is considered a severe problem for the natural environment and its components. Effective pollution regulation is possible with reliable data from monitoring stations covering the whole country. Those stations are mainly located at the altitude of 2 m above the surface, possessing their well-known horizontal representativeness. However, the knowledge of the vertical representativeness of these monitoring stations is not sufficient, causing problems while determining the relevance of these measurements for studying the effects of pollutants in various altitudes. The gradient of ozone concentration (determining the change of ozone concentration for each 10 m) was computed to determine the vertical profile of tropospheric ozone (the gradient in this work is using the unit [$\mu g.m^{-3}$/10 m]). Data, containing the ozone concentrations, were measured in altitudes of 2, 8, 50 and 230 m and sourced from the National atmospheric observatory Košetice in the time interval from 6.9.2013 to 31.12.2020. The ozone concentrations show a yearly periodicity, with higher values during the summer period (from 1.4. to 30.9.) and lower values during the winter period (from 1.10. to 31.3.). The gradient for layer 230-50 m outlines considerable stability throughout the year without significant changes (values in interval 0,30-0,43 in the winter period and 0,30-0,50 in the summer period) that is in direct contrast compared to the gradient for layer 50-8 m, the only layer with a yearly periodicity (values in interval 0,87-1,82 in the winter period and 1,55-2,54 in the summer period). The layer 230-8 m differed from layer 50-8 m in a small seasonal variability and gradient values are approximately three times lower (values in interval 0,44-0,62 in the winter period and 0,58-0,86 in the summer period). The gradient of layer 8-2 m contains considerably high values (in the interval -7,73-0,82 in the winter period and -4,67-7,62 in the summer period). The gradient of this layer has a significant amount of negative values, indicating a decrease in ozone concentration from the altitude of 2 m to 8 m. The analysis of gradient values suggested that ozone concentration for each layer is different, indicating an uneven growth in the vertical direction and showing dissimilar dynamics of ozone concentration during summer and winter periods. The gradient variability also testified that measurements in the altitude of 2 m are not entirely relatable with ozone concentrations in higher layers. The dataset for the year 2020 is specific because it has lower values due to the covid-19 pandemic.

Keywords: ambient air pollution, vertical gradient, air pollutants, ground-level ozone, aerosol, sulphur dioxide, nitrogen oxides