



Air pollution over Romania: a comparative study 2019 - 2020 using ground-based measurements

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Abstract:

Air pollution in general and urban air pollution in particular have significant influences on atmosphere composition and hence on climate, environment, and human health. Although ground-based measurements have been performed for some decades and many observational studies were reported, information on air quality in some areas in East Europe are sparsely distributed. Romania represents the largest country at the crossroads of Central, Southeastern and Eastern Europe, and experience rapid economic growth since 2000s. It has a terrain distributed relatively equally between mountains, hills, and plains, and various regional climates (from alpine climate, to cold or wet warm continental, to warm oceanic due to proximity of Black Sea, in Koeppen classification). Various levels of development generate more by-products, including air pollution, deteriorating therefore the air quality at regional levels. Meteorology and topography also may influence the air pollution.

The aim of present study was to comparatively assess the air pollution levels in 15 urban area spread out over Romania in 2019 and 2020, as the first pandemic year of COVID-19. The selected cities have different level of economic development, have various climate and topographic conditions, and they are expected to be impacted by manifold pollution sources. A special attention was paid to the evaluation of the impact of different levels of social restrictions that were taken in order to diminish the spread of SARS-CoV-2 virus.

Using the ground-based measurements from the Romanian National Air Quality Network, two observational data sets were constructed with particulate matter with an aerodynamic diameter below 10 μm (PM_{10}) and below 2.5 μm ($\text{PM}_{2.5}$) and with major gaseous air pollutants (CO , NO_2 , SO_2 , O_3) mass concentrations for 2019 and 2020. Air pollutants variations were statistical analyzed for each season for each site.

The largest contributor to the pollution was Bucharest, the most developed city. Lowest air pollution levels were measured during the lockdown period in spring, as main traffic and non-

essential activities were severely restricted. The reductions of air pollution mass concentrations due to the imposed social restrictions were found to be urban area-dependent.

Outcomes of present research contribute to scientific knowledge regarding temporal and spatial variation of major air pollutants at the country scale, can help for identification of air pollution sources and in air quality modeling at urban scale.

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