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Link between precipitations and air quality in Bucharest Greater Area, Romania

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Air pollution and climate change represent today key environmental issues. They are highly linked each other through various ways. Pollutant emission reductions can improve both air quality and mitigate the climate changes. On the other hand, heavy precipitations and/or an increased frequency of their occurrence (climate change) might help to clean the air from pollutants. Despite of the scientific progress, the understanding of atmospheric pollutant wet removal in urban and peri-urban areas is still subject to a large uncertainty. Among factors of uncertainties are aerosol large variability, different sources, aerosol-cloud processing.

This study examines how the concentrations of particulate matter with an aerodynamic diameter below 10 μm (PM_{10}) and below 2.5 μm ($PM_{2.5}$) might be linked with precipitation characteristics using an observational data set for three years (2015-2017) in Bucharest metropolitan area. Particulate matter data and meteorological parameters at each site (atmospheric pressure, relative humidity, temperature, global solar radiation, wind speed and direction) were extracted from the public available Romanian National Air Quality Database. Meteorology was complemented with radar products (images, reflectivity, echotops) from the C-band meteorological radar from National Meteorological Administration in Bucharest. Change of aerosol mass concentration during the evolution of the precipitation events was investigated. The aerosol scavenging coefficients were estimated and compared with those in scientific literature. Correlations between meteorological parameters and ambient PM_{10} and $PM_{2.5}$ levels were analyzed. Connection of meteorological phenomena occurrence and air mass origin was investigated by computing air mass backward trajectories using the HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory) model for 72 hours back.

It was found that heavy precipitations have a strong influence on the atmospheric aerosol concentrations, determining an increased value of scavenging coefficient with up to one order of magnitude higher than in case of a moderate precipitation. Higher values of scavenging coefficient than in literature reveals a good capability of the convective precipitating systems to clear the atmosphere from aerosol and pollutant species.

The obtained results are important for modeling of air quality and for investigations of aerosol wet

deposition processes.

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