



PBL height by radiosounding data and the pollution with PM10 in Sofia valley

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The agglomeration of Sofia, the capital of Bulgaria, in its daily routine is a huge producer of air pollution, including PM10, PM5, PM2,5, etc. The city is closely surrounded by mountains. In this case, the influence of meteorological conditions on pollution concentrations is very high. One of the most important for air quality meteorological parameters is the planetary boundary layer height (PBL). In this study, the vertical profiles of wind speed and direction, air temperature and humidity from radiosounding data of WMO 15614 station at 12h UTC are used. The radiosounding system of NIMH allowed about 8 -10 m vertical resolution in the period 2001 till 2013 and 5 m after the upgrade of 2013. These 15-years of aerological data have not been extensively explored up to now. This study probes the applicability of different methods and criteria for PBL height determination based on radiosounding data. The mass concentration of PM10 is taken both at stations in the city itself and at the “Kopitoto” peak of Vitosha mountain. Well distinguished seasonal pattern is observed with maximum in the cold period of the year, corresponding to the minimal values of PBL height. Lowest concentrations are observed in the summer, when intensive turbulent mixing is present. Stagnant weather conditions and inversions are the major factor for the high PM10 values, registered during the cold period in Sofia. PM10 concentrations, 3-5 times higher than daily limit values are observed in winter days and anticyclone synoptic situation, when the PBL height is estimated below 150 m. For the analysed period 2012-2014, high correlations (0,8 - 0,95) of PM10 daily concentrations are observed between the different urban stations. The effect of other parameters, such as precipitation, mean wind speed, prevailing wind direction, etc. on the PM10 pollution levels is considered.