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PBL vertical profiles in urban and rural air mases over Sofia valley by noon radiosoundings

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The Central Aerological Observatory (CAO) of the National Institute of Meteorology and Hydrology – Bulgarian Academy of Sciences (NIMH-BAS) is located near the eastern end of Sofia city and therefore gives the opportunity to evaluate characteristics of the Planetary Boundary Layer profiles in such a mountain valley. The city size is about 20 km in NW direction and 30 km in EW direction, so the radio soundings can reveal features of an urban boundary layer at westerly flows. With the introduction in operational work of Vaisala DigiCORA sounding system in May 2001, a 17-year data set of every day high resolution profiles of meteorological elements from the sounding at 12 UTC has been created. During this period, the cases of the wind direction of the whole air masses (up to 3 500 m a.s.l.) from west are nearly triple the cases from the east. For Sofia valley and the CAO location in it, this is the selection between urban and rural air masses respectively. The height of PBL, excluding the days with clouds, does differ significantly from the one taken for all cases. About 20 % of the cases show complicated wind direction profiles with opposite incoming air masses, when the old air masses are still present near the ground. During such days, the convective boundary layer evolution is completely destructed. The noon sounding in Sofia also gives the combination of several temperature inversions with height, some of them with strength of several degrees C. The synoptic situations defining these profiles are studied.