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Planetary Boundary Layer Dynamics: optical emission and space-time resolved spectroscopy

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The Planetary Boundary Layer (PBL) is the lowest layer of the troposphere where the atmosphere interacts with the ground surface. The importance of PBL lies in the fact that it provides a finite but varying volume in which pollutants can disperse. The aim of this paper is to analyze the PBL altitude, temperature profiles, thickness variations and pollutants variability over Iasi region using complementary optical emission space-time resolved spectroscopy techniques. The pollutants include some of the following well known chemical compounds: sulphur dioxide, ozone, carbon dioxide, volatile organic compounds, hydrogen sulphide, particulate matter, carbon monoxide, toxic air contaminants (mercury, lead, etc) where their contributions in the time-scale atmosphere dynamics are far from fully understood as following discussed details. Moreover, aerosols have a significant impact on severe convective storms, electric phenomena, e.g. their intensity, location or type (rain or hail). Complex self-organization tropospheric behaviour included chemical organic and inorganic compounds aerosols, variable sources type activity, meteorological conditions, budget radiations, clouds liquid droplet and ice nuclei formation. The impacts of urban-enhanced aerosol concentrations is the research subject of high interests that include models approach because they may induce a significant turbulence on the dynamics, microphysics, convective but also upon the storm development and precipitations. Moreover, in order to better understanding the fundamental of some critical physico-chemical transformation of the atmosphere compounds, several complementary active (fast laser optical emission spectroscopy) and passive (IR camera) remote techniques have been used. Our new LIDAR instrument is used to capture fast plume airborne image (2ns gate time), to investigate in real time several chemical compound behaviour at a given point of the free atmosphere, PBL size particle space-time distribution, temperature and humidity profiles, etc. Using the results from different studies of PBL, the numerical models of atmospheric clouds parameterization may improved where the clouds properties are considered ideal parameters for short periods of time. In addition to improve quality of the used models, because of the several stratocumulus clouds types (which are formed just above the PBL) are influenced by the thermal turbulences occurring in the planetary boundary layer, complementary IR camera measurements have been investigated, too.