



Atmospheric planetary boundary layers: nature, theory, modelling and role in PEEEX

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Atmospheric planetary boundary layers (PBLs) control turbulent exchange processes linking the atmosphere with underlying land, vegetation, urban-canopy or water surfaces. The key PBL parameters are vertical turbulent fluxes of energy, matter (pollutants, greenhouse gases, aerosol particles, etc.) and momentum at the PBL lower and upper boundaries, and the PBL height. This paper presents recent advancements in our understanding the nature of PBL and calculation of the above PBL parameters for the newly discovered PBL types, namely, conventionally-neutral and long-lived stable PBLs, and accounting for large-scale self-organised structures in convective PBLs (cells and rolls in the shear-free and sheared convection, respectively). The emphasis is put on the PBL processes determining local features of weather, climate, and air quality, such as extreme weather events, heavy air-pollution episodes and local consequences of global warming.