

Self-similarity of the surface-layer turbulence revisited

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Since its first publication in 1954, the Monin-Obukhov Similarity Theory (MOST) of the surface-layer turbulence underlies representation of the turbulent fluxes near the surface, as well as the turbulent viscosity, heat-conductivity and diffusivity within the surface layer – all over environmental science and its practical applications, such as operational weather prediction, air-pollution modelling, climate modelling, etc. In spite of increasing empirical evidence of principal drawbacks of MOST, in particular, in pronounced convection and strongly stable stratification, this theory has not been seriously questioned. The present paper aims to identify principal faults of MOST, to explain the related physical mechanisms and, keeping untouched the true aspects of this famous theory, to develop novel theory of the surface-layer turbulence, accounting for the recently recognised self-control of shear-generated turbulence in stably-stratified flows and self-organization of buoyancy-driven turbulence in convective flows.