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Direct Numerical Simulation of laminarization in the atmospheric boundary layer

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In the present work the collapse of turbulence in the evening atmosphere is studied by means of direct numerical simulation (DNS). As physical properties of the land surface play a crucial role in either stimulating or moderating the collapse process, emphasis lies on the coupling of the flow model to a realistic surface model. Hereto we apply a heat budget equation at the surface, with contributions from conductive, radiative, and turbulent heat transport. The response of the atmosphere to weak mechanical forcing is studied for various surfaces like: short grass, snow covered surfaces, bare soil and water. Besides numerical simulation also theoretical analysis is used to understand the dynamic feedbacks between the lower stratified atmosphere and the underlying surface. Finally, results are compared with data from various atmospheric field experiments over the world.