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Surface fluxes in atmospheric boundary layer flows over complex terrain WEI ZHANG, Cleveland State University, COREY MARKFORT, University of Iowa, FERNANDO PORT-AGEL, WIRE, EPFL — Interactions between the atmosphere and the land/water surface can be described by fluxes of momentum, heat and other scalars. While predicting the atmospheric boundary-layer (ABL) flows and modeling regional/global weather and climate, these surface fluxes need to be specified as boundary conditions. It is a common practice to use formulations based on the Monin-Obukhov similarity theory even for flows over a wide range of complex terrain, which maybe deviate significantly from the conditions of steady, fully-developed ABL flow, due to the knowledge gap for turbulent transport of fluxes across the interface. This work aims to provide insights for spatial distribution of the surface fluxes in ABL flows involving typical complex terrain cases, including surface roughness transition, steep topography and canopy patches. Results from wind-tunnel experiments will be presented to characterize the surface momentum and heat fluxes for different flow regimes and their correlation to the turbulent flow properties in thermally-stratified boundary layers. Application of the similarity theory to such cases is evaluated by comparing to the measurements. Ultimately, new knowledge of surface fluxes will help to improve parameterization of the surface-atmosphere interaction in numerical models.

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