

Abstract Submitted  
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**A study of thermal turbulent boundary layers over heterogeneous surfaces.** LEONARDO CHAMORRO, ROB STOLL, FERNANDO PORTE-AGEL, MEHRAN PARSHEH, University of Minnesota — Wind tunnel experiments and large-eddy simulations are performed to investigate the effect of surface temperature transitions on the dynamics of thermally stratified turbulent boundary layers. Particular attention is placed on characterizing the spatial distribution of turbulent fluxes of heat and momentum, and understanding their relation to the velocity and temperature fields. This information is used to test parameterizations of surface fluxes commonly used in weather prediction and air quality models. These parameterizations, based on Monin-Obukhov similarity theory, are found to significantly underestimate the surface heat flux due to their inability to capture the heat flux enhancement associated with advection of relatively warm air over cold surfaces. The wind tunnel measurements and simulation results are also used to develop and test new parameterizations for the average surface fluxes. The new parameterizations are based on local similarity theory and result in substantially improved predictions of the surface fluxes.

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