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DNS of stratified Ekman layers over rough surfaces SUNGWON LEE, IMAN GOHARI, SUTANU SARKAR, University of California, San Diego, UNIVERSITY OF CALIFORNIA, SAN DIEGO TEAM — We investigate the evolution of stratified Ekman boundary layers in the presence of surface roughness. The roughness elements are 2-dimensional bumps and the neutral flow is in the transitionally rough regime. A cooling buoyancy flux which is applied for a finite time period is responsible for the stabilizing stratification. The Reynolds number is moderate so as that a broad parametric study of the influence of roughness height (h^+) and cooling flux (normalized Obukhov length, L^+) can be performed using direct numerical simulation (DNS). A cooling flux corresponding to $L^+ \approx 700$ is sufficient to cause the initial collapse of turbulence for both smooth and rough surfaces. Buoyancy and the slope of the surface roughness elements act in conjunction to affect the state of boundary-layer turbulence after the initial transient. The final value of the bulk Richardson number (Ri_b), which is a function of both L^+ and roughness properties, is found to provide guidance on the overall state of the flow, e.g., weak or strongly stable in the sense of Mahrt (1998); continuous, globally intermittent or locally intermittent.

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