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Stable stratification in turbulent Ekman layers OSCAR FLORES, JAMES RILEY, University of Washington, NICHOLAS MALAYA, ROBERT MOSER, University of Texas at Austin — In order to study the day to night transition in the atmospheric boundary layer we perform DNS of turbulent Ekman layers whose height (h) is prescribed by an overlying inversion. We will present results from several simulations, with friction Reynolds numbers up to $Re_\tau = u_\tau h/\nu = 2800$ depending on the domain size. In all cases, a quasi-steady state is reached with an adiabatic boundary condition at the ground. Then a constant negative heat flux is applied at the ground, to mimic the radiative cooling of the ground during clear sky nights. The results indicate that the buffer region locally collapses when $Lu_\tau/\nu < 100$, where L is the Monin- Obukov lengthscale. In the outer region of the flow, eddies with sizes larger than L are damped by the stratification in times of the order of their eddy turn-over time, even if at those times the mean temperature profile is relatively shallow. These results are consistent with Monin's self-similar theory and with both experimental and field observations. Funded by ARO Grant No. W911NF-08-1-0155 and NSF Grant No. OCI- 0749209.

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