

Abstract Submitted
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Nearly Free Convection in Thermally Stratified Boundary Layers RODDAM NARASIMHA, Jawaharlal Nehru Centre for Advanced Scientific Research, India — Thermally stratified boundary layers have generally been handled through Monin-Obukhov theory, although there has been considerable discussion about the free convection limit of this theory. Based on two atmospheric boundary layer experiments, one at Jodhpur in India and the other in Oklahoma, US, it is shown here that if the mean wind is sufficiently low, the drag varies linearly with wind while the heat flux continues to be governed by the free convection law. These characteristics define what may be called the ‘weakly forced convection’ sub-regime within the broader regime of mixed convection. To make scaling arguments in this sub-regime, it is shown that it is useful to adopt the heat flux, rather than the wall stress (equivalently friction velocity) as Monin-Obukhov theory does. Several candidates for a heat-flux velocity scale are considered, and their relative merits assessed. These arguments lead to novel definitions of drag and heat transfer coefficients that are independent of wind speed.

Hassan Nagib
IIT, Chicago, USA

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