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Turbulent heat flux measurements in thermally stable boundary layers[1] OWEN J. WILLIAMS, TYLER VAN BUREN, Princeton University, ALEXANDER J. SMITS, Princeton University, Monash University — Thermally stable turbulent boundary layers are prevalent in the polar regions and nocturnal atmospheric surface layer but heat and momentum flux measurements in such flow are often difficult. Here, a new method is employed using a nanoscale cold-wire (T-NSTAP) adjacent to a 2D PIV light sheet to measure these fluxes within rough-wall turbulent boundary layer. This method combines the advantages of fast thermal frequency response with measurement of the spatial variation of the velocity field. Resolution is limited solely by the separation of the probe and the light sheet. The new technique is used to examine the applicability of Monin-Obukhov similarity over a range of Richardson numbers from weak to strongly stable. In addition, the velocity fields are conditionally averaged subject to strong deviations of temperature above and below the local average in an effort to determine the relationship between the coherent turbulent motions and the fluctuating temperature field.

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