Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Experimental investigation of thermally stable turbulent boundary layers ALEXANDER J. SMITS, Princeton University, Monash University, OWEN WILLIAMS, TRISTEN HOHMAN, Princeton University, TYLER VAN BUREN, Rensselaer Polytechnic Institute — Thermally stable turbulent boundary layers are prevalent in the polar regions and instrumental in determining surface heat fluxes. At present, theoretical treatments of such flows have been found to be inaccurate. Experiments were thus conducted to gain further insight into changes in turbulent structure and corresponding statistics under stable conditions. Isothermal and constant heat flux boundary conditions were investigated as well as smooth and rough surfaces. PIV was used to examine the velocity field, and a thermocouple rake was used to measure the mean temperature profile. Under particular investigation are (1) the existence of a critical Richardson number at which turbulence was strongly suppressed and whether this was influenced by the surface roughness condition, and (2) the effects of increased stratification on the hairpin vortex structure and its organization into packets. This work was made possible by support received through Princeton University's Grand Challenges-Energy program, supported by the Thomas and Stacey Siebel Foundation.

Owen Williams
Princeton University

Date submitted: 02 Aug 2013 Electronic form version 1.4