

Abstract Submitted
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Temperature Scales for Thermal Turbulent Boundary Layers XIA

WANG, Oakland University, LUCIANO CASTILLO, GUILLERMO ARAYA, Rensselaer Polytechnic Institute — An inner temperature length scale was assumed based on the analogy between the momentum and the thermal transport for a forced convection turbulent boundary layer. Subsequently, a temperature scale was obtained from the inner energy equation using the theory of similarity analysis. These scales were firstly proposed by Wang and Castillo (2003), which was shown to successfully remove the effects from upstream conditions, pressure gradients and the Peclet number on the downstream flow. However, there are some other important factors such as the effects of various Prandtl numbers and various wall conditions which affect the behavior of the boundary layer flow and have not been studied yet. In this investigation, we will improve both the length and temperature scales and verify them using the experimental or numerical simulation results with various Prandtl numbers and wall conditions. All these effects are expected to be removed when the temperature profiles are normalized using the scales proposed here. Meanwhile, the methodology used to derive the scales will be explored to investigate the thermal boundary layer flow subject to the nature convection heat transfer or the combined convection heat transfer.

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