

# Department of Aerospace Engineering Seminar Series



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## **Logarithmic scaling in wall-bounded turbulent flows**

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**Aerospace Engineering Conference Room, 3164 Martin Hall**

**ABSTRACT:** Logarithmic scaling is one of the corner stones of our understanding of wall-bounded turbulent flows. In 1938, Clark B. Millikan advanced an overlap argument that framed the logarithmic variation of the mean velocity in simple dimensional terms. Seventy-five years later, however, basic aspects of this logarithmic region, such as its slope (described by von Karman's constant), and its spatial extent, are still being debated. In addition, Townsend in 1976 proposed a logarithmic scaling for the streamwise and spanwise components of turbulence based on the attached eddy hypothesis, but to date the experimental verification has been elusive. Here, we use pipe and boundary layer flow measurements over a very large Reynolds number range to examine these expectations of logarithmic scaling, and to show that at sufficiently high Reynolds number these flows reveal both expected and unexpected implications for our understanding and our capacity to model turbulence.

**Bio** Dr. Smits is the Eugene Higgins Professor of Mechanical and Aerospace Engineering at Princeton, as well as a Professorial Fellow at Monash University in Australia. His research interests are centered on fundamental, experimental research in turbulence and fluid mechanics. In 2004, Dr. Smits received the Fluid Dynamics Award of the American Institute of Aeronautics and Astronautics (AIAA). In 2007, Dr. Smits received the Fluids Engineering Award from the American Society of Mechanical Engineers (ASME), the Pendray Aerospace Literature Award from the AIAA, and the President's Award for Distinguished Teaching from Princeton University. In 2014, he received the Aerodynamic Measurement Technology Award from the AIAA. He is a Fellow of the American Physical Society, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the American Academy for the Advancement of Science, the Australasian Fluid Mechanics Society, and he is a Member of the National Academy of Engineering.



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