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Bayesian Assessment of Mean Velocity Profile Models in Wall-Bounded Turbulence ROBERT MOSER, TODD OLIVER, University of Texas — The form of the mean velocity profile in high-Reynolds-number wall-bounded turbulent shear flows has been the subject of renewed interest in recent years. A number of questions have been raised regarding the universality of the von Karman constant, the dependence of the over-lap layer on Reynolds number and even the appropriateness of a logarithmic description of the overlap layer. The questions have been difficult to resolve because the models predict subtle differences in the mean velocity profiles at finite Reynolds number. However, these subtle differences are important for scaling to very high Reynolds number and for inferring wall shear stress when direct measurements are not available. In this work, Bayesian inference is used to infer parameters (e.g. the Karman constant) and their uncertainty in a variety of turbulent mean velocity representations using experimental data over a wide range of Reynolds number. Moreover, an information theory-based multi-model formalism is used to rank competing models (e.g., the standard log and power laws and finite Reynolds number refinements of these profiles) by a metric that naturally balances data fit versus model complexity. This work is supported by the Department of Energy [National Nuclear Security Administration] under Award Number [DE-FC52-08NA28615].

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