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Numerically measured scale-dependent eddy viscosity in homogeneous isotropic turbulence YASAMAN SHIRIAN, ALI MANI, Stanford University — In the present work, we report the directly measured eddy viscosity in incompressible homogeneous isotropic turbulence using the macroscopic forcing method. Our results provide a scale-dependent eddy viscosity; specifically, in the low-wavenumber-limit, eddy viscosity is a constant, while in the high-wavenumber limit, it becomes inversely proportional to the wavenumber. Our results present a contrast to the previously reported eddy diffusivity via renormalization group theories (Yakhot and Smith 1992), this difference is attributed to proper quantification of transport at small scales by large-eddies in the present study. We also report the scale-dependent turbulent Schmidt number as well as collapse of the measured eddy-viscosity operator with increase of flow Reynolds number.
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yasaman shirian
Stanford University

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