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Relevant length scales and time scales in shear flow turbulence SUBHAS VENAYAGAMOORTHY, LAKSHMI DASI, BENJAMIN MATER, Colorado State University — Shear flow turbulence has been the subject of fundamental research due to its ubiquitous presence in engineering and natural flows. In this study, we take a fresh approach using dimensional arguments tempered by physical reasoning to gain further insights on their phenomenology. Beginning with the four basic quantities: turbulent kinetic energy k, dissipation rate ϵ, kinematic viscosity ν and mean shear S, we construct six length scales and two time scales that are most relevant to this classical problem and discuss their implications on phenomenology. Analysis of the variation of all six length scales and two timescales using high-resolution DNS data of turbulent channel flow and homogeneous shear flow are used to highlight important transitions in the flow dynamics and provide a framework to explain the energy cascade process.

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