Abstract Submitted
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On the scalar-dissipation rate in a temporal jet flow with variable viscosity and mass diffusivity[1] LUMINITA DANAILA, YACINE BRAHAMI, EMILIEN VAREA, MICHAEL GAUDING, University of Rouen Normandy, TURBULENT MIXING TEAM — The counterpart of Taylor's predictions for turbulent mixing stands on the assumption that the mean dissipation rate of the scalar variance is independent of the local value of molecular properties (mass diffusivity, or thermal conductivity). Whilst different forms of Taylor's postulate were assessed for decaying homogeneous isotropic turbulence, its validity for decaying shear flows with variable viscosity and mass diffusivity has never been investigated. We use DNS of a jet, that evolves into a different fluid, R times more viscous and diffusive. The ratio R varies between 0.25 and 4. Of specific interest is the dependence of scalar dissipation and the norm of the scalar gradient, on the ratio R. The results are as follows. 1) In the jet core, scalar gradients adapt to diffusivity variations, rendering scalar dissipation independent of these fluctuations, and thus locally validating the classical paradigm. 2) When statistics are conditioned on the distance to the so called Turbulent/Non-Turbulent Interface, we find an intense and persistent effect of the diffusivity variations on the conditional scalar dissipation and on the scalar gradient. Therefore, classical mixing paradigm is not tenable at the T/NT interface, as as diffusivity gradients are maintained during mixing.

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Luminita Danaila
University of Rouen Normandy

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