Bulletin of the American Physical Society

76th Annual Meeting of the Division of Fluid Dynamics
Sunday–Tuesday, November 19–21, 2023; Washington, DC

Session G41: Turbulence: Jets
3:00 PM–4:05 PM, Sunday, November 19, 2023
Room: 206

Chair: Jean Philippe LAVAL, Laboratoire de Mécanique des Fluides de Lille

Abstract: G41.00002 : Lagrangian properties in turbulent round jet flow from Large-Eddy Simulation*

3:13 PM–3:26 PM

Abstract

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Turbulent round jet flows with Taylor Reynolds numbers of 70 and 210 were obtained using Large-Eddy Simulation (LES). Eulerian flow results are in accordance with theory, numerical and laboratory experiments from the literature. These results include the self similar radial profiles of velocity statistics and turbulence kinetic energy (TKE) budget, in addition to the power-law axial evolution along the centerline for several flow properties (velocity variance, TKE dissipation rate and integral timescale, for example). Furthermore, the Lagrangian tracking of point particles seeded at different axial locations is performed. The Lagrangian tracking uses the LES resolved flow field, and the inclusion of a subgrid scale velocity obtained from a Langevin equation is tested. Furthermore, we test the stationarization technique for inhomogeneous, self-similar flows known as the compensation method, which comprises the rescale of the Lagrangian velocity by the Eulerian velocity and integral timescale at the particle position. The success of the method is observed by the collapse of the Lagrangian second-order structure functions from different axial positions. Additional Lagrangian properties such as acceleration autocorrelation functions and their zero-crossing times are investigated as a function of Reynolds number and axial position. Possible impacts of the LES unresolved scales on the results are discussed. Research funded by the Fapesp-Université de Lyon Cooperation Grant 2020/06273-2.

*Research funded by the Fapesp-Université de Lyon Cooperation Grant 2020/06273-2