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Extreme events in a vortex gas simulation of a turbulent half-jet[1] SAIKISHAN SURYANARAYANAN, JNCASR, Bangalore, GOKUL PATHIKONDA[2], University of Illinois at Urbana-Champaign , RODDAM NARASIMHA, JNCASR, Bangalore — Extensive simulations [arXiv:1008.2876v1 [physics.flu-dyn], BAPS.2010.DFD.LE.4] have shown that the temporally evolving vortex gas mixing layer has 3 regimes, including one which has a universal spreading rate. The present study explores the development of spatially evolving mixing layers, using a vortex gas model based on Basu et al (1995 Appl. Math. Modelling). The effects of the velocity ratio (r) are analyzed via the most extensive simulations of this kind till date, involving up to 10000 vortices and averaging over up to 1000 convective times. While the temporal limit is approached as r approaches unity, striking features such as extreme events involving coherent structures, bending, deviation of the convection velocity from mean velocity, spatial feedback and greater sensitivity to downstream and free stream boundary conditions are observed in the half-jet (r = 0) limit. A detailed statistical analysis reveals possible causes for the large scatter across experiments, as opposed to the commonly adopted explanation of asymptotic dependence on initial conditions.

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[2]Summer Research Intern at JNCASR via RISE, Indo-US Science and Technology Forum.

Saikishan Suryanarayanan
JNCASR, Bangalore

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