Cascade processes in plane flows

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The diffusion of a tracer in a two dimensional turbulent flow which is forced by non-homogeneous distribution is dominated by the structures in

the flow. In case of acceleration producing baroclinic vorticity due to density differences, Instabilities such as the Rayleigh-Taylor [1] or the Kelvin-Helmholtz appear. These are investigated using multi-fractal techniques, analyzing mixedness, [2], ESS [3]and higher order

order structure functions, that indicate both direct or inverse cascades towards the large scales and producing spectral variations [4]. These can be studied numerically using both DNS and Kinematic Simulation (KS) forcing a set spectra. The direct comparison of the Eulerian and Lagrangian features The mixing processes are compared by mapping the different intermittency (Obtained by relating it to the sixth and third order structure function scaling exponents) and to the measured maximum Fractal dimension showing that and there are a set of functions that provide a complex intermittency scaling.

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