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Cascade non locality in Baroclinic driven flows

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We present for either shocks or Rayleigh Taylor turbulent fronts measurements of the intermittency and multifractal dimensions D(i), as function of the intensity of the chemical concentration, velocity or volume fractions as the baroclinic instabilities evolve in time. other measured parameters such as the enstrophy as well as higher order velocity moments and their multi-fractal structures which are physically relevant indicators of the turbulence are used. Aspect ratios of the bubble induced convective cells are seen to depend on the boundary and initial conditions applied to the flows. The evolution of the Rayleigh-Taylor instability develops into a which change with the sign of the Baroclinic vorticity production. Image analysis gives more realistic estimates of the spatial/temporal non-homogeneities (and intermittencies in the Kolmogorov 62 sense obtained as spatial correlations of the turbulent dissipation, or from structure functions. It is possible that different fractal dimensions indicate different levels of intermittency (and thus different spectra, which are not necessarily inertial nor in equilibrium). These techniques are helpful in providing more realistic estimates of spatial and temporal variations of the mixing processes. Turbulent mixing fronts with self-similar characteristics of the flow and their evolution of the multi-fractal dimensions of density, velocity and vorticity contours provides indication that most mixing takes place at the sides of the dominant convective blobs. In the context of determining the influence of structure on mixing ability, multifractal and spectral analysis are used to evaluate intermittency and determine the regions of the front which contribute most to molecular mixing.