Geophysical Research Abstracts,
Vol. 11, EGU2009-3625, 2009
EGU General Assembly 2009

Experiments and simulations of RT and RM fronts

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Experimental and numerical results on the advance of a mixing or non-mixing front occurring at a density interface due to gravitational acceleration are analyzed considering the fractal and spectral structure of the front. The experimental configuration consists on a unstable two layer system held by a removable plate in a box for the Rayleigh-Taylor fronts and shock tube high Mach number impulse across a density interface air/SF6.
The evolution of the turbulent mixing layer and its complex configuration is studied taking into account the dependence on the initial modes at the early stages and its spectral, self-similar information. Most models of the turbulent mixing evolution generated by hydrodynamics instabilities do not include any dependence on initial conditions, but in many relevant physical problems this dependence is very important, for instance, in Inertial Confinement Fussion target implosion. We discuss simple initial conditions (such as a jet array versus a plate removal) with the aid of numerical models. The analysis of Kelvin-Helmholtz, Rayleigh-Taylor, Richtmyer-Meshkov and of accelerated instabilities is presented locally, and seen to dominate the turbulent cascade mixing zone differently under different initial conditions. Fractal and neuron network analysis of Turbulent Mixing under RT and RM instabilities are presented comparing the different experiments and numerical simulations.