Evolution Model of Turbulent Mixing

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Abstract

Mixing of thermonuclear fuel and shell target matter under compression in the ICF problem (Inertial Confinement Fusion) is a practically important and interesting example of a problem of turbulent mixing. Such peculiar features of ICF mixing as the motion of the matter toward the center of a spherical target, accompanied by a decrease of the matter volume and an increase of the matter density, the finite time of the matter motion and mixing evolution (the target compression time), and the initial perturbations of the wavelength comparable to the system size that lead to the development of instabilities and mixing, distinguish the ICF problem from the classical problems of turbulent mixing.

The experimental results, theoretical models and DNA (Direct Numerical Simulation in 2D and 3D geometry) demonstrates the sequence of the development of perturbations of different scale: from small to large wavelengths. On this basis one may consider the mixing in ICF problems within the framework of an evolution model, using the data on linear and nonlinear evolution of single perturbations. One can manage to develop a realistic model of a mixing zone basing on the data about initial perturbation spectrum, linear and nonlinear stages of perturbation development and compression regime.

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