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Numerical simulation of influence of turbulent mixing zone on local perturbation growth under Rayleigh-Taylor instability conditions

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It is known that in case of the turbulent mixing zone absence the self-similar local perturbation growth occurs according to the law

$$R_{l} \cong \beta \left(\frac{\rho_h - \rho_l}{\rho_h + \rho_l} \right) \cdot \frac{gt^2}{2},$$

and the growth constant β is approximately three times as much than the self-similar turbulent mixing zone growth constant α. According to two-dimensional and three-dimensional numerical simulations by Euler code EGAK it was revealed that when at initial time the local perturbation (R_{l0}) and perturbations (R_{turb0}) determining turbulent mixing zone later on were existed at interface, the continuous continuum of self-similar solutions was realized, in which β is function of the relation R_{l0}/R_{turb0} and $\alpha < \beta < N\alpha$ ($N = 3$ and $N = 6$ according to the two-dimensional and three-dimensional cases). Thus the turbulent mixing zone does not absorb the local perturbation, but decrease the self-similar growth constant β depending on initial conditions.

The numerical simulation results agree with the jelly substance experiments.