NUMERICAL MODELING OF DEVELOPMENT OF PERTURBATIONS UNDER RAYLEIGH-TAYLOR INSTABILITY AND TRANSITION TO TURBULENCE

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In the field of instability physics research the problem of initial perturbations transition to the turbulent stage is of interest.

The paper presents the results of computational modeling using the EGAK method [1] of experiments on the development of perturbations induced by Rayleigh-Taylor instability at the air-water interface, conducted within the framework of the project of the National Center for Physics and Mathematics, managed by N. V. Nevmerzhitsky.

The first part of the paper presents the numerical results of studying the development dynamics of circular initial perturbations. It is demonstrated that the initial roughness of media interfaces exerts a considerable impact on the mixing zone width at the stage of fully-developed turbulence [2]. Circular perturbations give no way of defining precisely their dynamics by the photographic method due to shadowing of inner perturbation circles by outer ones. Then, the experiments were set up with extended periodic 2D perturbations on the liquid layer surface [3], which results are given in the second part of the paper.

The proposed predictive criterion of instability transition to the turbulent mixing stage is consistent with the experimental data.

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