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SOLITONS IN SOLUTIONS OF HYDRODYNAMICS EQUATIONS IN DESCRIBING COLLISIONS AND OSCILLATIONS OF ATOMIC NUCLEI

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Within the framework of our approach, we have found an analytical solution of the equations of hydrodynamics in the soliton approximation for the collision of layers in the one-dimensional and two-dimensional cases. The contraction stage, the expansion stage, and the expansion stage are considered within the framework of a single formula for layers with energies on the order of ten MeV per nucleon. Such a reduction of solutions of hydrodynamic equations to soliton solutions has not been considered before. The introduction of dispersion into the effective forces and into the pressure does not violate the concept of the formation of a hot spot. The introduction of additional dimensions does not violate this representation. Here we develop an approach to the approximate analytical solution of these equations, both in the case of weak nonlinearity, by reducing them to the Korteweg-de Vries equations, and in the case of large-amplitude perturbations, using soliton-like solutions. Our generalization to the two-dimensional case leads to the idea of the formation at the stage of expansion of a rarefied region-bubble, the search for which is the subject of long-standing research. And the approach itself is of independent interest and can be used in other areas of physics and technology when calculating the nonlinear dynamics of oscillations of complex systems. In our works [1-4], it was shown that the local thermodynamic equilibrium in the process of collisions of heavy ions is not established immediately. The nonequilibrium approach to hydrodynamic equations makes it possible to describe experimental data better than the equation of state corresponding to traditional hydrodynamics, which assumes the establishment of local thermodynamic equilibrium.

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