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Modified CD method and simulation of vortical structures in plasma and fluids

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The modification of known methods of contour dynamics (CD) used for simulation of evolution and the interaction dynamics of the vortex structures such as FAVR's or V-states, and also the examples of the results of modeling of these processes in fluids are presented. Our modification of the CD method enables us to minimize the errors caused by breaks of contours and the errors of the finite differences method used for calculation of time evolution of FAVR's in the CD algorithm. Modification of standard CD algorithm enables also, on a level with modeling of the unit vortices, to study evolution and dynamics of interaction of N-vortical systems of the various spatial configurations consisting from FAVR's depending on their degree of symmetry, value and a sign of a vorticity. The results of our numerical simulation enable to conclude that the modified CD method is very effective in studying of the vortex phenomena in media where the interacting local vortical regions take place. The results obtained in our simulations, on a level with their obvious importance for adequate interpretation of the effects associated with turbulent processes in fluids and gases can be useful also in the description of turbulent processes in a plasma.

Biography

Vasily Yu Belashov, has a PhD in Radiophysics and a DSci in Physics and Mathematics. His main fields of research interest are theory and numerical simulation of the dynamics of multidimensional nonlinear waves, solitons and vortex structures in plasmas and other dispersive media. Presently, he is a Chief Scientist and Professor at the Kazan Federal University. He is the author of 310 publications including seven monographs.

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