

In Memoriam Adelina Georgescu

A FINITE VOLUME METHOD FOR SOLVING GENERALIZED NAVIER-STOKES EQUATIONS*

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Abstract

In this paper we set up a numerical algorithm for computing the flow of a class of pseudo-plastic fluids. The method uses the finite volume technique for space discretization and a semi-implicit two steps backward differentiation formula for time integration. As primitive variables the algorithm uses the velocity field and the pressure field. In this scheme quadrilateral structured primal-dual meshes are used. The velocity and the pressure fields are discretized on the primal mesh and the dual mesh respectively. A certain advantage of the method is that the velocity and pressure can be computed without any artificial boundary conditions and initial data for the pressure. Based on the numerical algorithm we have written a numerical code. We have also performed a series of numerical simulations.

MSC: 35Q30, 65M08, 76A99, 76D05, 76M12.

keywords: generalized Navier-Stokes equations, pseudo-plastic fluids, finite volume methods, admissible primal-dual mesh, discrete derivatives operators, discrete Hodge formula.

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