A HIGH-ORDER RESOLUTION OF THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS

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ABSTRACT

In recent years has been a revival of the discussion about the most appropriate mathematical formulation of the incompressible Navier-Stokes equations. Although the primitive formulation in function of velocity and pressure has been more frequently used in the past, it seems that incompressible formulation is still an open question.

In the last decade several studies appeared on the numerical solution of the Navier-Stokes equations in the velocity-vorticity formulation. In these works have been shown that this formulation could be a good choice in vortical flow problems.

In this report a high-order resolution for the 3D incompressible Navier-Stokes equations in the velocity–vorticity formulation is proposed. A compact high-order conservative scheme and a suitable form of the vorticity equations have been employed to guarantee the solenoidality of the vorticity. A 3D lid driven cavity problem was chosen as a test case for comparison and validation purpose.