

VERIFICATION, VALIDATION, AND BENCHMARKS FOR NUMERICAL FLUID FLOW SIMULATIONS

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A systematic procedure for the verification and validation of computational algorithms for fluid flow analyses is presented. The procedure is exemplified by the application of a spectral/hp finite element algorithm to the numerical solution of the Navier-Stokes equations governing viscous incompressible flows. Benchmark problems, based on smooth analytic solutions to the stationary and non-stationary Navier-Stokes equations, are proposed to verify the computational algorithm. In addition, benchmark problems in the form of published numerical studies and published experimental data are proposed for validation of the algorithm.

Key words: verification and validation, benchmark problems, incompressible viscous flow