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Numerical simulation of a viscous compressible flow around a NACA 0012 airfoil: Low Reynolds number regime FERNANDO VALENZUELA, RUBEN AVILA, UNAM — The two dimensional Navier-Stokes equations for a compressible fluid have been numerically solved to investigate the effect of the viscosity and the compressibility on the instability of the laminar air flow around a NACA0012 airfoil at zero incidence angle of attack. The numerical simulations are carried out at two Re numbers (5,000 and 10,000), and at the Ma number in the range 0.2-0.9. The non-dimensional compressible Navier-Stokes equations have been solved by using a high order Spectral/hp Element Method (SEM) that uses a Discontinuous Galerkin approach. The mesh consists of 2320. The computed values of the pressure coefficient C_p, the lift coefficient C_L and the drag coefficient C_D, have been compared with numerical simulations and experimental data available in the literature. The Mach number countours allow to identify the presence of shock waves in the transonic flow regime. We may conclude that the discontinuous Galerkin method is capable to predict the transition stages that the laminar flow undergoes as the Ma number increases (at fixed Re number).

Fernando Valenzuela
UNAM

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