Variational Multiscale and SUPG Stabilization of Proper Orthogonal Decomposition Approximation for a Generalized Oseen Problem.

The Proper Orthogonal Decomposition reduced-order modeling technique for the approximation of partial differential equations has several well-documented drawbacks. One of the drawbacks indicated is the numerical instability inherited in convection-dominated problems. In a recent paper, Iliescu and Wang analyzed the numerical solution using POD for a convection-dominated convection diffusion problem, showing numerical estimates thereof. In this paper, we discuss the extension of this concept to a generalized Oseen problem. We derive numerical estimates for the POD solution, when applying both the variational multiscale (VMS) as well as the streamline upwind Petrov-Galerkin (SUPG) stabilization technique to the reduced-order variational problem. (Received September 22, 2011)