1077-65-1732 **Zhu Wang*** (wangzhu@vt.edu), 407 E McB Hall, Virginia Tech, Blacksburg, VA 24061, and **Traian Iliescu**. *Proper Orthogonal Decomposition Nonlinear Closure Models of Engineering Flows.*

Proper orthogonal decomposition is one of the most commonly used methods to generate reduced-order models for turbulent flows dominated by coherent structures. To balance the low computational cost required by a reduced-order model and the complexity of the targeted turbulent flows, appropriate closure modeling strategies need to be employed. We introduce novel nonlinear closure models for complex engineering flows. The new models are supported by extensive numerical experiments such as 3D turbulent flow past a circular cylinder problem. We also prove rigorous error estimates for the finite element discretization of the reduced-order models. (Received September 20, 2011)