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Leo Rebholz* (rebholz@clemson.edu). *The reduced order NS- α model for incompressible flow.*

This paper introduces a new, reduced-order NS- α (rNS- α) model for the purpose of efficient, stable, and accurate simulations of incompressible flow problems on coarse meshes. We motivate the new model by discussing the difficulties in efficient and stable algorithm construction for the usual NS- α model, and then derive rNS- α by using deconvolution as an approximation to the filter inverse, which reduces the fourth order NS- α formulation to a second order model. After proving the new model is well-posed, we propose a C^0 finite element spatial discretization together with an IMEX BDF2 timestepping to create a linearized algorithm that decouples the conservation of mass and momentum equations from the filtering. We rigorously prove the algorithm is well-posed, and provided a very mild timestep restriction, is also stable and converges optimally to the model solution. Finally, we give results of several benchmark computations that confirm the theory and show the proposed model/scheme is effective at efficiently finding accurate coarse mesh solutions to flow problems. (Received January 26, 2015)