1110-65-89 Leo Rebholz and Mengying Xiao* (mengyix@clemson.edu), SC 29630. On reducing the splitting error in Yosida methods for the Navier-Stokes equations with grad-div stabilization.

This paper analyzes the accuracy of the 'discretize-then-split' Yosida solver for incompressible flow problems, when divergence-free elements are used together with grad-div stabilization (with parameter γ). The Yosida method uses an inexact block LU factorization to create linear algebraic systems that are easier to solve, but at the expense of accuracy. We prove the difference between solutions of the exact and approximated linear algebraic systems is $O(\gamma^{-2})$ in the natural norms of the associated finite element problem, and thus that full accuracy can be obtained by the Yosida method if large γ is used ($\gamma \ge 10$ is sufficient in our numerical examples). The proof is based on transforming the Yosida inexact linear algebraic system into finite element problems, and analyzing these problems with finite element techniques based on pointwise divergence-free subspaces and their orthogonal complements. (Received February 11, 2015)