

**Sergey Repin, Rolf Stenberg:** *Two-sided a posteriori estimates for the generalized Stokes problem*; Helsinki University of Technology, Institute of Mathematics, Research Reports A516 (2006).

**Abstract:** *The paper is concerned with deriving computable majorants and minorants of the difference between the exact solution of for the so-called three-field formulation of the generalized Stokes problem and any functions from the admissible (energy) spaces that contain velocity, pressure and stress fields. Physical motivation of this problem is related to models of viscous fluids with polymeric chains. For the the case of uniform Dirichlet boundary conditions this model and respective numerical approximation methods were analyzed in [14]. In the present paper, we consider the generalized Stokes problem with mixed Dirichlet/Neumann boundary conditions and variable viscosity in the context of a posteriori error analysis. For the velocity, pressure, and stress fields we derive two-sided functional a posteriori error estimates. The estimates are practically computable, sharp (i.e., have no gap between the left- and right-hand sides), and are valid for arbitrary functions from the respective functional classes. The estimates are derived by transformations of the integral identity that defines the solution (this method was suggested and used in [39, 40] for certain classes of elliptic type problems). Error majorants are given by weighted sums of the terms that present penalties for violations of all the relations of the problem considered with the weights defined by the constants in the Friedrichs–Poincaré and Ladyzhenskaja–Babuska–Brezzi inequalities, respectively.*

**AMS subject classifications:** Primary 65N30

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