

A Way to Improve the Solution of Local Projection Stabilization

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Composite finite elements and novel postprocessing based on the local L_2 projection are proposed in order to improve the solution of standard one-level Local Projection Stabilization (LPS) on quadrilateral meshes, cf. [1,2,3]. Theoretical results are justified by several tests for convection-dominated problems in two dimensions. Numerical results show that the discrete solution is oscillation-free and of optimal accuracy in the regions away from the boundary layer whereas the spurious oscillations are significantly reduced near the boundary layers when the postprocessing is applied.

References:

- [1] *Matthies Gunar, Skrzypacz Piotr, and Tobiska Lutz* A unified convergence analysis for local projection stabilisations applied to the Oseen problem. *M2AN Math. Model. Numer. Anal.*, 41(4):713-742, 2007.
- [2] *Matthies Gunar, Skrzypacz Piotr, and Tobiska Lutz* Stabilization of local projection type applied to convection-diffusion problems with mixed boundary conditions. *Electron. Trans. Numer. Anal.* 32 (2008), 90–105.
- [3] *Schieweck Friedhelm and Skrzypacz Piotr* A local projection stabilization method with shock capturing and diagonal mass matrix for solving non-stationary transport dominated problems. *Comput. Methods Appl. Math.* 12 (2012), no. 2, 221–240.

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