

A LOW-ORDER LOCAL PROJECTION METHOD FOR NAVIER-STOKES EQUATIONS

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This work presents and analyzes a new Local Projection Stabilized finite element method (LPS) for the non-linear incompressible Navier–Stokes equations. Stokes problems defined element–wisely drive the construction of the stabilized terms which make the present method stable for the finite element pairs $\mathbb{P}_1^d \times \mathbb{P}_l$, $l = 0, 1$ and $d = 2, 3$. Existence of the discrete solution and uniqueness of a non–singular branch of solutions, as well as optimal error estimates in natural norms, are proved under standard assumptions. Numerics assess the theoretical results and validate the LPS method in three dimensions.

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