

Superconvergence results for Brinkman–Forchheimer–extended Darcy equation

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It is well known that the piecewise polynomial conforming finite element solution of Poisson equation approximates the interpolant to a higher order than the solution itself. This type of superconvergence is established for a nonstandard interpolant of the (Q_2, P_1^{disc}) element applied to the nonlinear Brinkman–Forchheimer–extended Darcy equation which describes the flow behaviour in porous media. After stating the optimal convergence for the family of $(Q_{k+1}, P_k^{\text{disc}})$ elements, $k \in \mathbb{N}$, the supercloseness results are presented. Applying (Q_3, P_2^{disc}) post-processing technique, we can state a superconvergence property for the discretisation error of the post-processed discrete solution to the solution itself. Numerical experiments verify the predicted convergence rates.

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