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PROCEEDINGS

Solving Advection-Diffusion Equation by Proper Generalized Decomposition with Coordinate Transformation

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ABSTRACT

Inheriting a convergence difficulty explained by the Kolmogorov N-width [1], the advection-diffusion equation is not effectively solved by the Proper Generalized Decomposition [2] (PGD) method. In this paper, we propose a new strategy: Proper Generalized Decomposition with Coordinate Transformation (CT-PGD). Converting the mixed hyperbolic-parabolic equation to a parabolic one, it resumes the efficiency of convergence for advection-dominant problems. Combining PGD with CT-PGD, we solve advection-diffusion equation by much fewer degrees of freedom, hence improve the efficiency. The advection-dominant regime and diffusion-dominant regime are quantitatively classified by a threshold, computed numerically. Moreover, we find that appropriate preconditioners may further improve the effectiveness.

KEYWORDS

Advection-diffusion equation; proper generalized decomposition with coordinate transformation; threshold of diffusivity; model order reduction

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