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Theoretical analysis of the upwind finite volume scheme on the counter-example of Peterson
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Keywords: advection problem with a constant velocity; theoretical analysis; counter-example of Peterson; upwind finite volume; geometric corrector; two dimension

Review text:

The authors consider the upwind finite volume method to approximate an advection problem with a constant velocity in two dimension. By numerous methods, geometric paths counting, recursion, Fourier analysis, generating function, matrix computation, the authors established closed form expressions of an upper bound of the geometric corrector, which has been introduced by the authors some years ago, for the initial (square) Peterson and related (semi infinite, triangular) domains for oblique advection velocity. The most convenient expression appears to be a weighted sum of binomial coefficients. As a result, an explicit upper bound for the geometric corrector proportional to h and θ is proved, where θ is the angle of the advection velocity with the vertical. Therefore, the L^∞ norm of the corrector is of order h for a non vertical advection direction. As a consequence, the upwind scheme on initial (square) Peterson mesh and on related (triangular, semi-infinite) meshes is therefore of order h for a non vertical advection direction.

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