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A non linear scheme and maximum principle for diffusion operators discretized using hybrid schemes

Christophe Le Potier, CEA-Saclay, 169082610, clepotier@cea.fr

1. Christophe Le Potier, CEA-Saclay
2. Amadou Mahamane, CEA-Saclay

In the framework of nuclear waste disposal simulation, we are interested in a transport model in porous media which can be described by a convection-diffusion equation. Recently, nonlinear finite volume schemes have been proposed to discretize the diffusion operators. For those schemes, discrete maximum principle has been obtained for distorted meshes or highly anisotropic diffusion tensors.
Recently, a nonlinear correction of cell-centred finite volume schemes has been proposed to insure this principle. In the present work, we extend this technique to the class of hybrid schemes.
We show that this nonlinear correction is equivalent to the original scheme with a modified flux which is consistent. We give a few words about the coercivity of the modified algorithm. Finally, we show that the new method is nonoscillating.
Using an analytical solution, we show the robustness and the accuracy of this algorithm in comparison with results obtained by linear schemes which do not satisfy the minimum principles on this test.