This is a review submitted to Mathematical Reviews/MathSciNet.

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Author: Geiser, Jurgen

Title: Mobile and immobile gaseous transport: embedded analytical solutions to finite volume methods.

MR Number: MR2914791

Primary classification: 65M08

Secondary classification(s):

Review text:

The author derives analytical and semianalytical solutions of convection–reaction equations with general initial conditions. The analytical test functions are embedded into discretization methods for the convection diffusion reaction equation. Further mobile and immobile equations can be treated with splitting methods that allow of reducing the computational complexity and yield higher-order discretization schemes.

The author could also verify the new methods with analytical and numerical test examples and present the higher-order results of the underlying schemes.

The convection-dominant equation can be solved with combined analytical and decomposed methods to decouple the complicated equation systems and achieve the accuracy with iterative or analytical embedded methods.

For complex computations of such convection–dominant problems, the author used these methods in the initialization process of the computation and switch after sufficient accuracy to implicit methods with large time-steps.