Numerical solution of one-dimensional advection-diffusion equation with constant and periodic boundary conditions

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Abstract

For constant and periodic boundary conditions, the one-dimensional advection-diffusion equation with constant coefficients is solved by the explicit finite difference method in a semi-infinite medium. It is shown how far the periodicity of the oscillating boundary carries on until diminishing to below appreciable levels a specified distance away, which depends on the oscillation characteristics of the source. Results have been tested against an analytical solution reported for a special case [1]. The explicit finite difference method is shown to be effective for solving the advection-diffusion equation with constant coefficients in semi-infinite media with arbitrary initial and boundary conditions.

Keywords: advection-diffusion equation, periodic boundary conditions, finite difference schemes

References

[1] Wang, W., Dai, Z., Li, J., Zhou, L., A hybrid Laplace transform finite analytic method for solving transport problems with large Peclet and Courant numbers, Comp. & Geosc. 49 (2012) 182–189.