

The numerical solution of the Advection-Dispersion Equation: A review of some basic principles

Steve WALLIS

Heriot-Watt University, Riccarton, Edinburgh, EH14 4AS, UK
e-mail: s.g.wallis@hw.ac.uk

Abstract

The simulation of solute transport in rivers is frequently based on numerical models of the Advection-Dispersion Equation. The construction of reliable computational schemes, however, is not necessarily easy. The paper reviews some of the most important issues in this regard, taking the finite volume method as the basis of the simulation, and compares the performance of several types of scheme for a simple case of the transport of a patch of solute along a uniform river. The results illustrate some typical (and well known) deficiencies of explicit schemes and compare the contrasting performance of implicit and semi-Lagrangian versions of the same schemes. It is concluded that the latter have several benefits over the other types of scheme.

Key words: solute transport, numerical modelling, finite volume method, advection, reference frame, time marching.