ATTEMPTS AT DESCRIBING NONEQUILIBRIUM VADOSE ZONE FLOW AND TRANSPORT PROCESSES AT THE FIELD SCALE

Martinus Van Genuchten, Federal University of Rio de Janeiro, +55-21-3264-7025, rvangenuchten@hotmail.com

1. Martinus van Genuchten, Federal University of Rio de Janeiro

Accurate simulation of contaminant transport in macroporous soils and fractured rock remains a major challenge in both research and engineering. A large number of process-based dual-porosity and dual-permeability formulations have been developed over the years in attempts to account for nonequilibrium or pre ferential flow at the field scale. The many different models that exist now reflect the multitude of often simultaneous physical and chemical processes that can affect nonequilibrium flow. Unfortunately, most approaches require an inordinate number of parameters that are difficult to estimate. One alternative approach for flow is to use composite functions of the unsaturated hydraulic conductivity to account for the separate effects of macropores (or fractures) and micropores, and to combine this approach with a nonequilibrium formulation for solute transport that assumes the presence of immobile liquid regions. Several example problems are given to show that this approach can be quite effective in capturing preferential flow processes at the field scale. Much of this research started in the mid 1970s when I was a postdoctoral student in Professor George Pinder's group at Princeton University. His guidance and inspiration to me and many others over the years have been truly phenomenal, as well as his own superb contributions in research, student education, and service to the profession.