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PowerPoint Presentation (PPT / PDF)

Abstract

THE CONCEPT OF BLOCK-EFFECTIVE MACRODISPERSION FOR NUMERICAL MODELING OF CONTAMINANT TRANSPORT

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Numerical transport models can capture only the low wave number (large-scale variability) effects of the spatial variability in hydrogeologic properties, while the large wave-number effects, associated with subgrid block variability, are suppressed due to homogenization. This suppression is avoidable only if the variability is captured in minute detail, but is impossible to achieve in all but the most trivial cases. A fundamental question to consider then is how to allow flexibility in numerical grid design without ignoring the dispersive action of the unmodeled variability, while preserving the interplay between all relevant length scales: those relevant to spatial variability, as well as those created by design. The concept of block-effective macrodispersion addresses this question in a systematic, analytical manner, and is the subject of this presentation. The theoretical foundations of the concept are presented, and the conditions required for its applicability. In addition, solutions in two and three spatial dimensions, accounting for the effects of geological variability as well as the effects of pore-scale dispersion and spatial variability in the retardation. Results from numerical testing, in support of the theory, are discussed