Abstraction

The objectives of this work are as follows:

1. Develop a general multi-compartment mass transfer model incorporating advection, diffusion and capillary zone mass transfer. The model has the following properties:
   - Order of magnitude rapid and systematic calculation of all the important parameters.
   - Flexibility and thus the ability to treat any number of compartments.
   - Reduction in the size of the algebraic system to solve for the overall mass transfer coefficient.
   - Flexibility to model more than one physical situation by changing the resistance parameters.

2. The maximum possible resistance in each compartment is given by the authors.

3. Incorporation of groundwater (saturated and capillary zone) mass transfer into an SVI system.

Correspondence of Equation (4) with the Johnson and Ettinger (J&E) Model (J&E notation)

Example: Two-Compartment Building Model (J&E notation with addition of basement to bring space advection and diffusion across compartments)

Example: Three-Compartment Building Model (J&E notation with addition of column with different diffusion volume flux parameters)

CONCLUSIONS

"All models are wrong. Some models are useful..."

George Box

The model embodied in Equation (4) is equivalent to the J&E model for the same physical situation, but in practical situations the importance of the various parameters in Equation (4) increases with the number of compartments.

However, Equation (4) permits a variety of complex situations to be treated systematically, and rapidly. It would be useful in any circumstances where the important parameters are not controlled systematically.

A Different Way of Looking at Soil Vapor Intrusion

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ABSTRACT

The models of this work are as follows:

1. A general multi-compartment mass transfer model incorporating advection, diffusion and capillary zone mass transfer.
   - The model has the following properties:
   - Order of magnitude rapid and systematic calculation of all the important parameters.
   - Flexibility and thus the ability to treat any number of compartments.
   - Reduction in the size of the algebraic system to solve for the overall mass transfer coefficient.
   - Flexibility to model more than one physical situation by changing the resistance parameters.

2. Development of a general multi-compartment mass transfer model incorporating advection, diffusion and capillary zone mass transfer.

3. Incorporation of groundwater (saturated and capillary zone) mass transfer into an SVI system.

MODEL

Derivation of the Basic Equation

Using dimensionality, advection flux in the ith compartment is given by:

\[ q_i = D_{crack} v_i C_i \]

where:

- \( q_i \) = advection velocity
- \( D_{crack} \) = diffusion coefficient
- \( v_i \) = cross-sectional flux area in compartment \( i \).

Multiple compartment model

Conclusion: (based on incorporating mass transfer)

Example: Additional of Saturated and Capillary Zones (J&E notation with different diffusion volume flux parameters)

Example: Addition of Saturated and Capillary Zones (J&E notation with different diffusion volume flux parameters)

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