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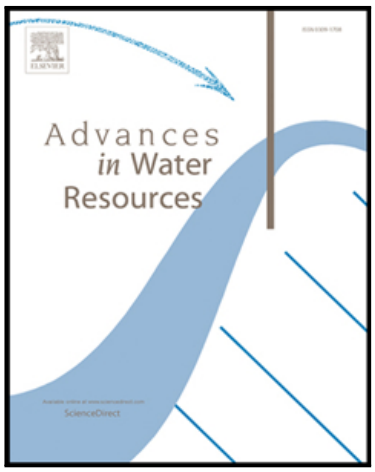

Transport of water and ions in partially water-saturated porous media. Part 3. Electrical conductivity

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- The conductivity of porous media depends non-linearly on the pore water conductivity
- This non-linearity can be modeled using a volume-averaging approach
- The non-linear model explains a number of empirical models.
- Comparison with numerical and experimental data is sucessful.

Transport of water and ions in partially water-saturated porous media. Part 3. Electrical conductivity

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Abstract. In hydrogeophysics, we need a reliable petrophysical model connecting (non-linearly) the conductivity of a porous material (like a soil) to the conductivity of the pore water and the water saturation. Classical models are too simplistic especially at low salinities. The convexity of the electrical conductivity of a porous material as a function of the pore water conductivity is due to both a textural effect and the dependence of the specific surface conductivity on salinity. The textural effect arises because of a change in the distribution of pore network conductances with salinity. From volume averaging arguments, it is possible to provide a general equation for the

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