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Exploring morphological indicators for improved model parameterization in transport modeling

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Two phenomena that control transport of colloidal materials, including nanoparticles, are interaction at the air-water and solid-water interfaces for unsaturated flow. Current approaches for multiphase inverse modeling to quantify the associated processes utilize empirical parameters and/or assumptions to characterise these interactions. This introduces uncertainty in model outcomes. Two classical examples are: (i) application of the Young-Laplace Equation, assuming spherical air-water interfaces, to quantify interactions at the air-water interface and (ii) the choice of parameters that define the nature and shape of retention profiles for modeling straining at the solid-water interface. In this contribution, an alternate approach using some morphological indicators derived from X-ray micro-computed tomography (μ-CT) to quantify interaction at both the air-water interface and solid-water interface is presented. These indicators, related to air-water and solid-water interface densities, are thought to alleviate the deficiencies associated with modeling interaction at both the solid-water and air-water interfaces.