## Analogy between consistent formulations of plasticity and liquid retention models for porous media

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## ABSTRACT

Analogies between plasticity and retention models for porous media have already been made by other researchers; see e.g. [1-2]. Nonetheless, the implicit implementation of liquid retention models has not yet been fully described. It was found by the authors that the plasticity analogous consistent tangent moduli for rate-type retention models do require a consistent second order tangent modulus in addition to the more conventional first order one [3]. This contribution carefully discusses the origin of the requirement for second order moduli by making an analogy to conventional plasticity and the definition of consistent moduli. A powerful rate-type liquid retention model and its underlying framework are explained [4-6]. A number of 2D and 3D simulations illustrating the quadratic convergence of the global FE solver are also presented. The effect of the use of non-consistent first order and second order moduli is also demonstrated by showing the loss of quadratic convergence.

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