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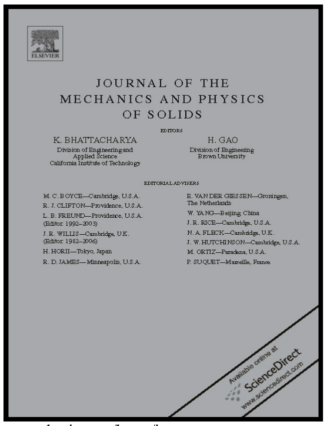

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X.S. Li, Y.F. Dafalias

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DISSIPATION CONSISTENT FABRIC TENSOR DEFINITION FROM DEM TO CONTINUUM FOR GRANULAR MEDIA

X.S. Li[a,*], Y.F. Dafalias[b]

[a] *Hong Kong University of Science and Technology, Hong Kong, China*
[b] *National Technical University of Athens, Greece, and University of California at Davis, USA*

ABSTRACT: In elastoplastic soil models aimed at capturing the impact of fabric anisotropy, a necessary ingredient is a measure of anisotropic fabric in the form of an evolving tensor. While it is possible to formulate such a fabric tensor based on indirect phenomenological observations at the continuum level, it is more effective and insightful to have the tensor defined first based on direct particle level microstructural observations and subsequently deduce a corresponding continuum definition. A practical means able to provide such observations, at least in the context of fabric evolution mechanisms, is the discrete element method (DEM). Some DEM defined fabric tensors such as the one based on the statistics of interparticle contact normals have already gained widespread acceptance as a quantitative measure of fabric anisotropy among researchers of granular material behavior. On the other hand, a fabric tensor in continuum elastoplastic modeling has been treated as a tensor-valued internal variable whose evolution must be properly linked to physical dissipation. Accordingly, the adaptation of a DEM fabric tensor definition to a continuum constitutive modeling theory must be thermodynamically consistent in regards to dissipation mechanisms. The present paper addresses this issue in detail, brings up possible pitfalls if such consistency is violated and proposes remedies and guidelines for such adaptation within a recently developed Anisotropic Critical State Theory (ACST) for granular materials.

KEYWORDS: fabric tensor, anisotropy, critical state theory, DEM, dissipation

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* Corresponding author. Postal address: Department of Civil and Environmental Engineering, Hong Kong University of Science and Technology, Hong Kong, China. Tel.: +86-21-54225381. Email addresses: xsli@ust.hk (X.S. Li), jfdafalias@ucdavis.edu (Y.F. Dafalias).