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A nonlinear description of the viscosity and dilatancy of granular suspensions DAVIDE MONSORNO, CHRISTOS VARSAKELIS, MILTIADIS PAPALEXANDRIS, Université catholique de Louvain — In the first part of this talk we present a rheology law for granular suspensions based on the representation theorem of isotropic tensors. The proposed law has a number of desirable properties, namely, it is free of singularities, it vanishes at equilibrium, and it predicts non-zero bulk viscosity as well as shear-rate dependent normal viscous stresses. Next, we present an evolution equation for the volume fraction of the granular phase that can describe the dilatancy of granular suspensions in a consistent manner. Its derivation is based upon the introduction of the volume fraction and its gradient as internal degrees of freedom. The resulting model has been applied to a number of well-known test cases, such as plane-shear and pressure-driven flows, and its predictions are presented and compared with experimental data. In particular, we show that this model can successfully predict important features of granular suspensions such as normal stress differences and particle migration.

Davide Monsorno
Université catholique de Louvain

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