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Multiscale modelling of multi-component granular mixtures DEEPAK TUNUGUNTLA, ANTHONY THORNTON, Mathematics of Computational Science and Multiscale Mechanics, STEFAN LUDING, THOMAS WEINHART, Multiscale Mechanics — Efforts to extract, or "coarse grain," continuum fields (macroscopic dynamics) from microscopic data have existed for decades. We present novel coarse graining expressions for the stress fields for discrete mechanical systems and illustrate their application to segregating granular chute flow. These expressions are applicable near boundaries/interfaces and also to multi-component granular mixtures. Boundary interaction forces are taken into account in a self-consistent way and thus allow for construction of a continuous stress and interaction force field, avoiding problems many other methods have near boundaries. Similarly, stress and drag forces can be determined for individual constituents/components of a mixture. The resolution and shape of the coarse-graining function used in the formulation can be chosen freely, such that both microscopic and macroscopic effects can be studied. The method does not require temporal averaging and thus can be used to investigate time-dependent flows as well as static and steady situations. Furthermore, discrete element simulations of granular mixtures are presented to illustrate the strength of the new boundary/mixture treatment and show that the coarse graining scale (i.e. resolution) is independent of the size of the components (for spheres).

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