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Effect of microstructural anisotropy on the fluid-particle drag force WILLIAM HOLLOWAY, JIN SUN, SANKARAN SUNDARESAN, Princeton University — The permeabilities of particle assemblies with anisotropic microstructures have been determined through lattice-Boltzmann simulations. Such assemblies were created by subjecting them to simple shear in a periodic domain. The extent of anisotropy depends on the scaled rate of deformation of the particle assembly $\left|\underline{\underline{D}}\right| d \Big/ \sqrt{T}$, where d is the particle diameter, $\left|\underline{\underline{D}}\right|$ is the magnitude of the rate of strain tensor, and T is the granular temperature. The anisotropy of the permeability tensor increases with the scaled rate of deformation and the particle volume fraction, and it can readily be rationalized in terms of the structure tensor of the assembly. A model for the anisotropic permeability is proposed in terms of mean free path of the deformed assembly, and the rate of strain tensor.

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