209e Modeling of Slow-Frictional Flow in CFD Eulerian Framework

Peter Spicka

Slow-frictional flow occurs in many industrial transport processes such as emptying hoppers, bins, silos, or drying of agro products. It is characterized by extended inter-particle contact times and strong frictional interactions. Slow flows are usually modeled using concepts of soil mechanics and only recently have these concepts been implemented in the framework of CFD codes. In general, CFD codes require a set of constitutive equations to account for frictional effects in terms of frictional pressure and viscosity. Using the commercial code Fluent 6.2, several commonly used formulations for frictional pressure and frictional viscosity have been tested. Based on our observations from this numerical study, a new approach, based on direct implementation of the Coulomb yield law in the Eulerian framework is proposed. This approach successfully predicts the heap formation of solids as well as hopper discharge rates.