Issues in dense granular flow

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Summarizing the discussion interstitial fluid effects in dense powder/granular flows, we pose the following list of challenges, which should be tackled:

1. Develop criteria to expose when the interstitial fluid flow is important in a given problem involving powder flow.
2. Develop a physical understanding of the effect of interparticle forces on the hierarchy of flow-induced inhomogeneous structures.
3. Develop quantitative models for the effects of vibration and pressure pulsations generated through a microphone either by themselves or in conjunction with fluidizing gas flow on the dynamics of particle agglomerates.
4. Develop a better understanding of stick-slip motion of cohesive powders and how it can be manipulated to get optimum flow and mixing characteristics.
5. Probe the possible effect of cohesion on the drag coefficient, through its influence on the microstructure of the assembly.
6. Through a combination of experiments and DEM simulations, develop better continuum rheological models for assemblies of cohesive particles all the way from quasi-static to rapid flow regimes, bringing in the path- and history-dependence, e.g., as manifested by cohesion and compressibility.
7. Develop equations of motion and associated closures by coarse-graining over mesoscale structures (such as collections of agglomerates).