

Critical phenomena in wet granular matter

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Dry sand is almost a fluid, as it can be seen when it runs gently through the orifice of an hourglass. As soon as it gets wet, however, it dramatically changes its mechanical properties and becomes a pasty solid from which beautiful sculptures can be carved. The cause for this change are tiny capillary bridges of fluid, spanning from one grain to the next. By virtue of surface tension, this disordered network of liquid bridges lends stability to the pile. However, when this medium is subject to a certain supercritical stress, it may undergo a sudden transition to a liquid state. Among geologists, this is called soil liquefaction and causes devastating landslides. The talk discusses this and other critical phenomena in wet granular matter, using molecular dynamics simulations, mean field theory and experiments. It is aimed at demonstrating that even non-equilibrium physics of this rather complex type of material may be well understood by means of rather simple and lucid models.