

Two phase granular transport in cylindrical confinement

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We experimentally study the granular transport properties of a gas/liquid interface as it progresses through a horizontal capillary tube, filled with a mixture of water and a sedimented granular layer. The displacement dynamics of such dense mixtures exhibit a rheology determined by the frictional interactions between the individual grains, capillary thresholds and the viscous interactions. By direct imaging and pressure measurements we observe different transport regimes as the pumping rate is varied. We classify these regimes according to the observed predominance of frictional or viscous interactions in a phase diagram. For the frictional regime the granular material is not transported out of the tube but structured in a pattern, characterized by its series of granular plugs and gaps. with the pressure signal displaying intermittent stick-slip behavior.