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Porous media deformation and self-structuring under capillary bulldozing

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An experimental observation of the structuring of a granular suspension under the progress of a gas/liquid meniscus in a narrow tube is reported here. The granular material is moved and compactifies as a growing accumulation front. The frictional interaction with the confining walls increases until the pore capillary entry pressure is reached. The gas then penetrates the clogged granular packing and a further accumulation front is formed at the far side of the plug. This cyclic process continues until the gas/liquid interface reaches the tube' s outlet, leaving a trail of plugs in the tube. Such 1D pattern formation belongs to a larger family of patterning dynamics observed in 2D Hele-Shaw geometry. The cylindrical geometry considered here provides an ideal case for a theoretical modelling for forced granular matter oscillating between a long frictional phase and a sudden viscous fluidization.

References

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