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Rheology, Self-organisation & Instabilities in Granular Flows

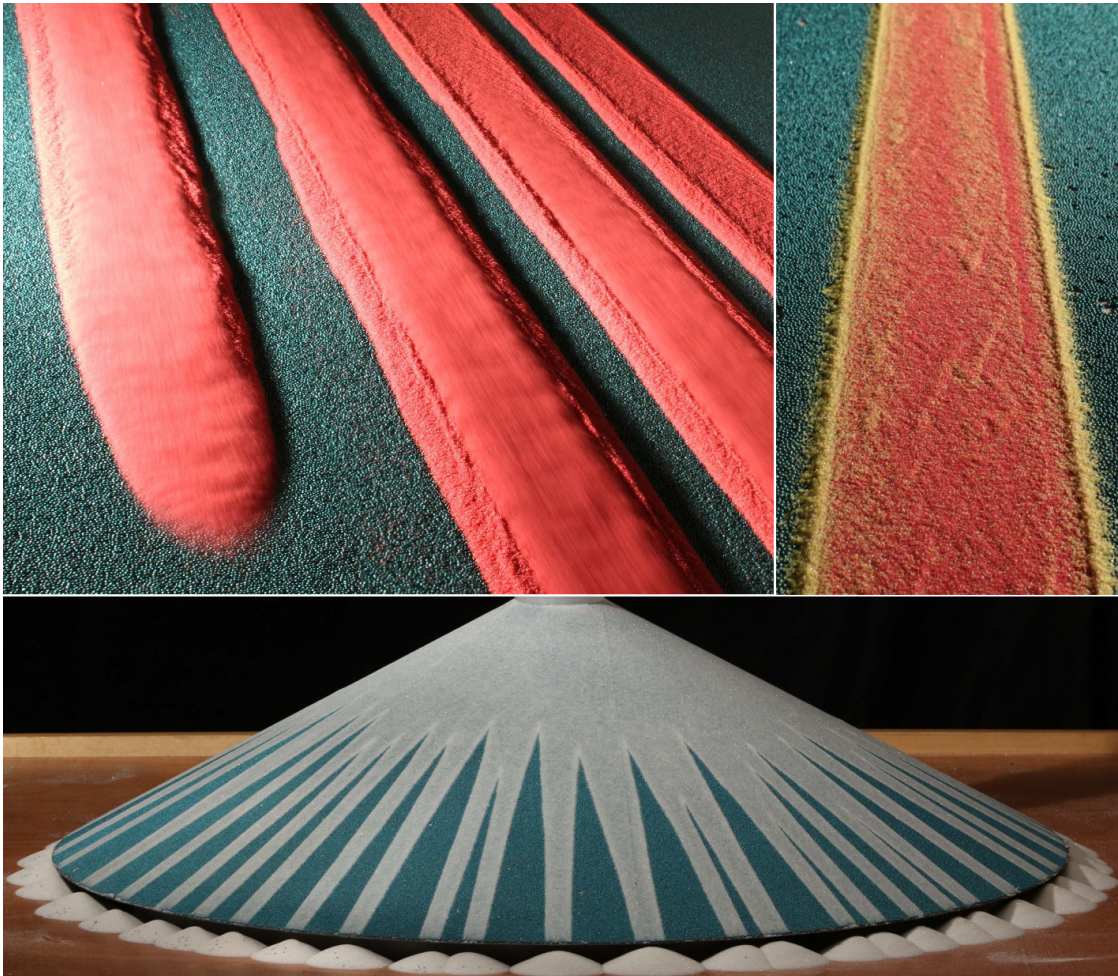
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Rheology, Self-organisation & Instabilities in Granular Flows

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How do grains flow collectively? Although this question has been puzzling scientists since the ancient Egyptian civilisation, modelling dense granular flows is still an open challenge. From a technological and innovative point of view, predicting how grains flow has a substantial economic interest since grains are the second most used material in industry, coming after only water. On the other hand, granular flows are at the core of large-scale geophysical flows, such as debris flows and landslides, which are among the most dangerous natural hazards that pose risks to people and infrastructure. In this talk, we will discuss some reasons that make these flows challenging and the progress made over the last two decades in the physical understanding and mathematical modelling of dense granular flows in the light of continuum theories. Along these lines, we will discuss simple techniques to characterise constitutive flow rules for granular flows and how the intrinsic rheology leads to very peculiar self-organisation patterns and flow instabilities.



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