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Erosion of a cohesive granular bed

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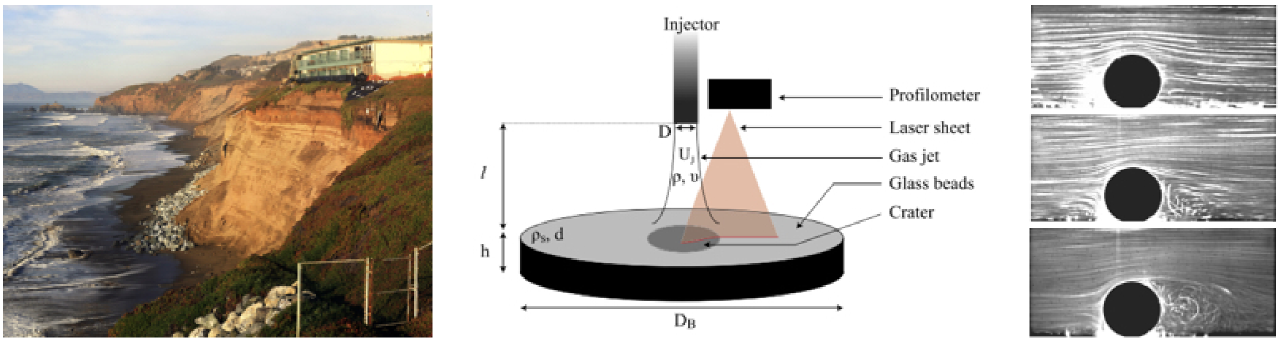
In a large number of natural and technological situations, a granular bed is eroded and resuspended by a fluid flow. In oceans or rivers, the erosion and transport of sediments lead to important environmental hazards, as illustrated in Fig. 1(a).
The sediments that constitute the granular bed are typically separated in two classes: cohesive and noncohesive. Noncohesive sediments, are involved in geomorphic processes but are usually not associated with the transport of contaminants. Various studies have considered the coupling between a non-cohesive granular bed and laminar or turbulent flows.fini



(a) (b) (c)

Figure 1: (a) Example of coastal erosion. (b) Schematic of the jet erosion test setup, from Badr *et al.*, 2014. (c) Fluid flow observed around a spherical particle attached to a substrate visualized with tracer particles (Kudrolli *et al.*, 2016)

In contrast, the physical mechanism underlying the erosion of cohesive sediments, such as clay particles, remains poorly understood and mainly empirical. In this internship, we will use model situations such as the jet erosion test (Badr *et al.*, 2014) or a laminar flow to describe the erosion of a model cohesive granular bed both at the macroscopic scale of the bed [Fig. 1(b)] and the microscopic scale of the grain [Fig. 1(c)]. The experimental results will be rationalized with dimensionless parameters.

The internship will be carried out in the Mechanical Engineering department at the University of California at Santa Barbara (USA) and in collaboration with the FAST Laboratory in Orsay, France (P. Gondret and C. Morize).