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Erosion of a granular bed by an oscillating foil SIVAR AZADI, UC Santa Barbara, CYPRIEN MORIZE, PHILIPPE GONDRET, FAST Laboratory, CNRS/Paris-Sud University , ALBAN SAURET, UC Santa Barbara — Immersed solid structures oscillating near the surface of a granular bed are encountered in various systems. For instance, the motion of an underwater flapping foil can be used for energy harvesting but modifies locally the sediment transport disturbing the marine life. Indeed, these immersed structures generate complex flow patterns that trigger erosion and transport of particles. To study the coupling between the motion of the foil, the flow generated and the erosion process, we developed a model experiment consisting of a horizontal rigid foil placed above the surface of the granular layer and subjected to vertical periodic oscillations. The oscillations generate vortices, which in turn trigger the erosion of the granular bed. We describe the influence of the different parameters on the onset of erosion. Using PIV measurements, we characterize the periodic vortices generated by the oscillation of the foil. The experimental measurements of the erosion threshold are then rationalized by coupling the fluid flow model and a local erosion criterion. This approach allows us to obtain a general condition that leads to the erosion of the sediment bed based on the motion of the foil.

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