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Resuspension of a granular bed by thermal convection CYPRIEN MORIZE, FAST Laboratory, CNRS/Paris-Sud University, ERIC HERBERT, LIED Laboratory, CNRS, YVES D'ANGELO, CORIA Laboratory, CNRS, ALBAN SAURET, SVI, CNRS/Saint-Gobain, FAST TEAM, LIED COLLABORATION —
The transport, dispersion and resuspension of particles occur in industrial fluid dynamical processes as well as environmental and geophysical situations. Whereas the resuspension of an immersed granular bed by fluid flows such as vortices or shear flows has been the focus of many studies, the ability to fluidize particles with a vertical gradient of temperature remains poorly understood. Using laboratory experiments with a localized heat source, we observe that a massive entrainment of particles into the fluid volume occurs beyond a threshold temperature. The buoyancy driven fluidized bed then leads to the transport of solid particles through the generation of particle-laden plumes. We show that the destabilization process is driven by the thermal conductivity inside the granular bed and demonstrate that the threshold temperature depends on the thickness of the granular bed and the buoyancy number, i.e. the ratio of the stabilizing density contrast to the destabilizing thermal density contrast.

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