

## Oscillatory flow over a particle bed induced by a flexible plate

Anna Prati<sup>1</sup>, Michele Larcher<sup>1</sup>, James T. Jenkins<sup>2</sup> and Luigi La Ragione<sup>3</sup>

<sup>1</sup> Faculty of Science and Technology, Free University of Bozen, 39100 Bozen, Italy

<sup>2</sup> School of Civil and Environmental Engineering, Cornell University, 14853 Ithaca, USA E-mail:jtj2@cornell.edu

<sup>3</sup> DICAR, Polytechnic University of Bari, 70125 Bari, Italy E-mail:luigi.laragione@poliba.it

*Keywords: Bedforms, Granular Materials, Failure.*

Is it possible to modify the morphology of a fully saturated particle bed, by a plate oscillating in the water above it? A recent contribution by La Ragione et al. [1] answers in a positive way to this question by showing the formation of a heap below the plate. The oscillatory motion of the plate, which implies the absence of a mean shear stress on the bed [2], generates a pressure gradient that is able to lift particles from the bed and this, essentially, creates a heap below the oscillating plate. These vertical pressure gradients facilitate particle displacement in its interior and transport at and near its surface (see Figure 1).

Here we extend the present analysis on the role of the flexibility of the plate and the consequent pressure induced over the particle bed. Some initial data indicate how the shape and the stiffness of the plate influence the morphology of the particle bed within a proper range of parameters, like amplitude and frequency of the plate oscillations, distance of the plate from the bed, dimensions of the plate [3].

### References

- [1] La Ragione, L., Laurent, K., Jenkins, J.T., Bewley, P. G., "Bedforms Produced on a Particle Bed by Vertical Oscillations of a Plate", *Physical Review Letter* (2019)
- [2] Johnson, B.A. and Cowen, E.A., "Sediment suspension and bed morphology in a mean shear free turbulent boundary layer", *Journal of Fluid Mechanics* (2020)
- [3] Prati, A., Larcher, M., Jenkins, J.T. and La Ragione, L., "Particles bed morphology under an oscillating stiff and flexible plates", *Powder and Grains, Buenos Aires (Argentina), 2021*

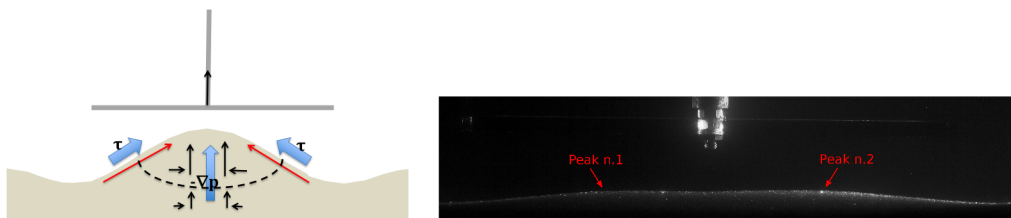


Figure 1: A scheme for the heap formation (left). A picture showing two peaks under an oscillating, flexible, plate (right).