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Force and flow response of granular matter to simultaneous intruders PAUL UMBANHOWAR, Northwestern University, LIONEL LONDON, DANIEL GOLDMAN, Georgia Institute of Technology — For two horizontal, parallel rods vertically penetrating into dense granular matter at constant velocity, we examine the grain flow and the vertical and horizontal components of the force as functions of rod separation s using experiment and DEM simulation. In previous experiments we found that while the vertical force F required to maintain constant velocity increases nearly linearly with the penetration depth d, the dependence of the slope F/d on s is more interesting. As s is increased from zero, F/d increases to a maximum value and then slowly decreases to twice the value of F/d for a single rod at large s. Here we present new results examining the relation between the horizontal and vertical forces acting on each rod and the associated granular flow as functions of s, particle friction coefficient μ, and horizontal rod support compliance. Increasing μ increases the value of s at which $F(s)/d$ is maximum, while decreasing compliance reduces the peak in penetration resistance while increasing the range of s where penetration resistance is enhanced. The flow fields around each rod become more asymmetric in the horizontal as s is decreased and exhibit correlations with both the mean and fluctuating components of the forces on the rods.

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