Abstract Submitted
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**Stick-slip dynamics in point-loaded granular media comprised of disks or polygonal grains**[1] RYAN KOZLOWSKI, Duke University — Dry granular packings, granular suspensions, and colloids can exhibit significant changes in rheological properties when the rotational symmetry of idealized spherical or circular particles is broken. Here, we report on experiments in which a quasi-two-dimensional layer of either disks or pentagons is penetrated by a grain-scale intruder, with the packing fraction adjusted to yield stick-slip dynamics. We track particle positions and orientations and use photoelastic measurements to characterize propagation of forces throughout the medium. We observe that the propagated stress on the channel boundaries does not extend as far in front of the intruder for pentagons as for disks, and we connect this difference to the grain- and meso-scale structures in the force networks and the velocity and rotation fields during slip events. We observe that disks tend to flow collectively around the intruder as it moves, whereas pentagons do not, and that force chains tend to curve more strongly for disk packings, leading to an increased probability of forces propagating behind the intruder. Our results indicate that grain rotation constraints, a key feature of real granular media found in nature, significantly modify mesoscale force transmission and correspondingly enhance resistance to flow.

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