

Abstract Submitted  
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**Jamming under rapid pulling in dense granular suspensions<sup>1</sup>**

SAYANTAN MAJUMDAR, IVO R. PETERS, HEINRICH JAEGER, MRSEC and the James Franck Institute, University of Chicago, IL 60637 — It requires a lot of force to quickly pull out an object immersed in a bath of dense granular suspension like corn starch in water. To understand such striking force response, we experimentally measure the normal force required for pulling out a cylindrical rod vertically from the suspension at a controlled pulling velocity. We observe that for slow pulling velocities the force response is similar to that of highly viscous fluids but above a certain threshold velocity the force show a diverging behavior soon after the initial viscous-like response. The time delay between the initial viscous-like and the diverging force response crucially depends on the proximity of the container walls from the initial contact region of the pulling rod with the suspension. We use in-situ X-ray radiography techniques to map out the local velocity profiles inside the suspension using metallic tracer particles which reveals that the force divergence takes place under pulling when the motion inside the suspension extends up to the container walls. Although the exact mechanism remains to be explained, our experiments suggest that both the magnitude and the delay in force response under pulling are reminiscent of dynamic jamming under impact in dense granular suspensions.

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