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Drag anisotropy of a cylinder in fluid-saturated granular beds[1]
ANKUSH PAL, ARSHAD KUDROLLI, Department of Physics, Clark University, Worcester, MA 01610, USA — We study the drag of a solid cylindrical intruder moving perpendicular and parallel to its long axis in fluid sedimented granular bed of polystyrene particles under steady state conditions. The drag in parallel and perpendicular directions are both found to increase nonlinearly with speed from a non-zero value in the zero-speed limit consistent with a HerschelBulkley fluid rheology. The drag anisotropy (ratio of perpendicular to parallel drag) varies with the intruder aspect ratio of the intruder. The ratio of perpendicular to parallel drag is observed to be greater than in case of a Newtonian fluid and is further observed to increase as the aspect ratio of the intruder increases. The contribution of drag arising from circular frontal lobe of the cylinder in parallel direction is much higher compared to the drag arises from the sideways circular lobe in the perpendicular direction. The drag anisotropy is found to further increase after removing the contribution from both circular lobes of the cylinder in parallel and perpendicular direction.

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