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**Fast Wheels in Loose Granular Media** ANDRAS KARSAI, Georgia Inst of Tech, SHASHANK AGARWAL, KENNETH KAMRIN, Massachusetts Inst of Tech, DANIEL GOLDMAN, Georgia Inst of Tech — We experimentally investigate the mechanics of single wheeled locomotion in loosely packed granular media. A recent study [Slonaker et. al., arXiv:1604.02490] has demonstrated that granular Resistive Force Theory (RFT) [Li et al, Science 2013; Askari Kamrin, Nature Materials, 2016] successfully models the movement of slowly rotating wheels in the quasistatic limit, predicting that slip (defined as $S = \frac{\omega r - v}{v}$, where $v$ is translational velocity, $r$ is the wheels radius, and $\omega$ is its angular velocity ) is $\approx 1.2$ and insensitive to rotational speed. To test if RFT applies at increased $\omega$, we study a 16 cm diameter wheel in a granular bed of loosely packed poppy seeds ( 1 mm diam.) driven at constant $\omega$ from 15 to 360 degrees per second. As in previous work, for low $\omega$, $S$ is constant. However, as $\omega$ increases beyond 90 degrees per second, $S$ increases as the wheel loses traction with the granular media. At the highest $\omega$, the wheel fails to move due to a rapid excavation of material underneath. Our results suggest that granular RFT may have to be modified for new effects at higher $\omega$.

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