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The effect of acoustic waves on stick-slip behaviour in sheared granular media, with implications to earthquake processes

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We are studying the effects of acoustic waves on sheared granular material, with two goals in mind: one is to understand the intriguing physics that arises in this experimental system, and the other is to see if such experiments offer insight into earthquake processes, in particular the phenomenon where one earthquake triggers another nearby, or distant, earthquake ('dynamic earthquake triggering'). We conducted laboratory experiments of stick-slip in granular media using a double-direct, shear apparatus, while applying low amplitude vibration as well as pulsed waves. We find that vibration and pulses significantly perturb the shearing behaviour of the granular material, and that the manifestation of vibration is extremely complex, including strong material memory of the acoustic perturbation, that persists. We note that the wave disturbance must take place near the critical point, where the granular material is near failure, otherwise no effect is observed. Also, horizontal loads on the system can eliminate the effect if they arelarge ($\geq$4-5 MPa).