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Comparing thresholds and dynamics for oscillating and inclined granular layers[1] J.P. GOLLUB, Haverford Coll. and U. Penn, S. AUMAITRE, Haverford Coll. and CEA Saclay, C. PULS, Penn State U. — The onset and dynamics of flow in horizontally oscillating granular layers are studied as a function of the depth of the layer. Measurements of the flow velocity made from the top and side are presented in the frame of reference of the container. The rheology of the material is found to vary in time during the cycle in surprising ways. If the inertial force (proportional to the container acceleration amplitude) is slightly higher than what is required to produce flow, then the flow velocity grows as soon as the inertial force exceeds zero in each cycle, but flow ceases long before the inertial force returns to zero. At higher accelerations, the motion is fluid-like over the entire cycle. As is also found for avalanches, the thresholds for starting and stopping are slightly different. The variation with depth of the starting acceleration for the oscillating layer matches (approximately) the corresponding variation of the tangent of the starting angle for avalanches in the same container. However, the mobile fraction of the cycle is typically far higher than what static considerations would predict. Finally, the flow profiles as a function of depth follow the simple Bagnold form when fully mobilized, even though the motion is oscillatory.

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