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Incipient motion of spherical particles induced by a vortex ring disturbance MARIA-LAURA BENINATI, Bucknell University, MICHAEL MCERLEAN, MICHAEL KRANE, ARNOLD FONTAINE, Pennsylvania State University — Experiments to characterize the ability of a vortical disturbance to induce incipent motion of a stationary particle resting on a horizontal planar surface are described. The ultimate goal of this study is to assess the role of turbulent boundary layer coherent structures in particle suspension. In this study, a vortex ring plays the role of a model flow disturbance because its compact, three-dimensional structure and speed are easily controlled and characterized. The vortex rings are generated by injecting a slug of fluid at a specified height above the ground plane. The vortex ring and its motion are described in terms of the convection speed, size, and circulation, using a combination of high-speed video and DPIV. The flow disturbance at the wall is characterized using wall pressure measurements during the passage of the vortex ring. These measurements are used to determine the relationship between the measures of the vortex ring disturbance and the resulting pressure fluctuation at the wall. Finally the ability of a vortex ring of known strength and convection path to induce motion to a single particle placed on the ground plane is assessed using high-speed video.

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