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Aeolian entrainment of sediment from an aerodynamically rough bed surface

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Particle entrainment due to air at low mobility conditions is important in a range of processes relevant to applied research themes ranging from aeolian sediment transport mechanics to particle technology (e.g. pneumatic transport). Until recently, challenges in accurately measuring particle displacement have hindered progress in identifying the relevant mechanisms responsible for this. In this study, the design of appropriate particle transport experiments in a wind tunnel and measurements of angular displacement of an exposed particle resting on a flat, aerodynamically roughened bed surface. Specifically, the minute displacements (rocking) to full dislodgement events (rolling) of the particle are detected by a high resolution laser distance sensor (LDS). Displacement statistics based on parameters such as variation, frequency, duration, amplitude, time between displacements are investigated and discussed. These results suggest that rocking and rolling of particles can be separated by an angular threshold. Following this statistical framework to establish such a threshold parameter for a wider range of particle features is useful for the determination of the conditions under which transport at low mobility rates occurs.