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On the transition between saltation and suspension on Earth and on Mars[1] DAVID KORDA, ROBERT SULLIVAN, DONALD BANFIELD, LANCE COLLINS, Cornell University — If the wind blowing along a bed of sand grains exceeds the threshold friction speed, it will induce the grains to move either by saltation (grains bumping along the surface) or suspension (grains swept by the turbulent eddies). The transition between these two modes of motion on Earth is governed by the Rouse number, defined as the ratio of the terminal velocity to the threshold friction speed. On Earth the transition from suspension to saltation occurs at a Rouse number of unity. Images taken by the Mars Exploration Rover (MER) show evidence of saltation at Rouse numbers considerably below unity. Our study re-examines the physics of the transition from suspension to saltation using direct numerical simulations (DNS) of channel flow. Tracking the motion of particles at conditions that mimic the atmosphere on Earth and on Mars, we have identified a second parameter, the particle Stokes number, that also influences the transition. The trends we observe are consistent with the MER images that show a shift in the transition Rouse number to lower values.

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