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An analytical framework for aeolian saltation MEREDITH REITZ, DOUGLAS JEROLMACK, University of Pennsylvania — We construct an analytical framework for steady state aeolian saltation, using experimentally-derived splash function relationships and the additional constraint of a threshold height, above which the wind velocity is strong enough to carry a grain from reptation into saltation. This threshold height rises as the wind profile magnitude is lowered by the increasing number of saltating grains being accelerated by the wind, until the number of grains being demoted below this threshold due to loss of energy to collisions with the bed equals the number being promoted. The balance of these populations at steady state determines both the flux of grains in saltation and the saturated wind velocity profile, while the approach to this balance describes the transient evolution to this state. We also formulate the difference between the critical impact Shields stress, defined as the stress below which transport ceases, and the higher critical fluid Shields stress, at which transport is initiated. Finally, we test the dependence of grain flux and trajectory lengths and speeds on the erodibility of the bed, and compare these results with observed differences in scaling. We also compare our results to findings for saltation under water.

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