Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

On the dynamics of cartoon dunes CHRISTOPHER GROH, INGO REHBERG, Experimental Physics V, University of Bayreuth, D-95440 Bayreuth, Germany, CHRISTOF A. KRUELLE, Dept. of Mechanical Eng. and Mechatronics, University of Applied Sciences, D-76133 Karlsruhe, Germany — The spatio-temporal evolution of a downsized model for a barchan dune is investigated experimentally in a narrow water flow channel. We observe a rapid transition from the initial configuration to a steady-state dune with constant mass, shape, velocity, and packing fraction. The development towards the dune attractor is shown on the basis of four different starting configurations. The shape of the attractor exhibits all characteristic features of barchan dunes found in nature, namely a gently inclined windward (upstream) side, crest, brink, and steep lee (downstream) side. The migration velocity is reciprocal to the length of the dune and reciprocal to the square root of the value of its mass. The velocity scaling and the shape of the barchan dune is independent of the particle diameter. For small dunes we find significant deviations from a fixed height-length aspect ratio. Moreover, a particle tracking method reveals that the migration speed of the model dune is one order of magnitude slower than that of the individual particles. In particular, the erosion rate consists of comparable contributions from low energy (creeping) and high energy (saltating) particles. Finally, it is shown that the velocity field of the saltating particles is comparable to the velocity field of the driving fluid.

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Date submitted: 16 Nov 2009 Electronic form version 1.4