Geophysical Research Abstracts, Vol. 9, 08508, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08508

A discrete numerical model for barchan dune fields

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Barchans are crescent-shaped dunes that form on solid ground in areas with a limited sand supply and a unidirectional wind regime. Isolated dunes have been modeled with success as far as shape and propagation velocity are concerned. However, these models cannot replicate emergent features present in fields of dunes, including the selection of a preferred size and spacing within a dune field and the presence of ‘corridors’. We here introduce a discrete numerical model that attempts to reproduce these fields. We use simplified equations for barchan shape, mass balance, and propagation. Dunes interact via mergers as well as via sand fluxes. Uniquely, this model also incorporates dune calving. An important result is that varying the input flux parameter produces dramatic qualitative differences in the resulting dune fields. The model also displays size selection and spatial inhomogeneities.