Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08610, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08610
EGU General Assembly 2008


# Dynamics of sand deposits in a flume

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The understanding of the formation and dynamics of aeolian bed forms is still a challenge for physicists and geophysicists. An important issue is to determine the pertinent mechanisms responsible for the selection of the dune size.

Field studies are essential to improve our understanding of sand dunes dynamics. However, the collection of reliable data on pertinent length and time scales in environment hostile to instrumentation is difficult. An alternative is to develop laboratory experiments at smaller scales in a flume. The great advantage is to control the flow conditions as well as the sand availability. Experimental approaches in flumes can therefore provide new insights in sand transport processes and dunes formation.

To address these questions, we designed a rectangular closed flume with a system of sand supply which allows to control the incoming sand rate $Q_{in}$ injected in the channel, independently of the water flow rate. The particles used in the experiments are well sorted glass beads,$100\mu m$ in diameter and $2.5g/cm^3$ in density.

We studied the temporal evolution of the deposits for different sand discharges and various roughnesses of the bottom. The water flow rate was the same for all experiments. A Moiré system allows to determine the 3D topography of the deposits and their evolution in course of time. We found two types of sand patterns depending on sediment discharge values. For low discharge, deposits are isolated and have a crescentic shape: they resemble barchan dunes. As $Q_{in}$ increases, deposits are more and more connected and loose their crescentic shape to form transverse dunes. The morphological transition is found to occur at a critical incoming rate of order of one tenth

of the saturated sand flux. We investaged the morphological evolution of the transverse dunes. After a transient, we observe that all the morphological and dynamical parameters (height, length, spacing, migration speed, ...) reach steady values. The equilibrium values increase with increasing $Q_{in}$ but are independent of the roughness of the bottom.

Concerning the barchan dunes, additional experiments at different water flow rates are needed to determine whether the critical incoming sand rate for the morphological transition between barchan dunes and transerve dunes depends on the flow conditions.