



Open Archive TOULOUSE Archive Ouverte (OATAO)

OATAO is an open access repository that collects the work of Toulouse researchers and makes it freely available over the web where possible.

This is an author-deposited version published in : <http://oatao.univ-toulouse.fr/>
Eprints ID : 10566

<p>To cite this version : Laval, Vincent and Charru, François Determination of the sand flux over a barchan dune under a water flow. (2012) In: 9th Euromech Fluid Mechanics Conference, 09 September 2012 - 13 September 2012 (Rome, Italy).</p>
--

Any correspondence concerning this service should be sent to the repository administrator: staff-oatao@listes-diff.inp-toulouse.fr

Determination of the sand flux over a barchan dune under a water flow

V. Laval*, F. Charru *

December 17, 2013

The modelling of sand transport by fluid flows is crucial in many environmental as well as industrial problems. The present work investigates an important and yet unsolved issue: the relationship between the particle flux and the shear stress exerted by the fluid flow at the bed surface. It is now recognized that over a spatially varying bottom, the particle flux is not in equilibrium with the shear stress: there is some lag related to the particle inertia or particle settling. However, a confident modelling of these relaxation phenomena, and the corresponding length scales, is still lacking. We report experiments on the determination of the sand flux at the surface of a barchan dune under a closed-conduit water flow (Fig. 1a). The evolution of the dune is visualized with a high-speed camera allowing the tracking of a small fraction of marked particles. A tracking algorithm has been developed, which then allows the local particle velocity, particle flux, and particle trajectories to be determined over the dune surface (Fig. 1b). From these measurements, the relationship between the measured flux at the dune brink and the dune velocity can be assessed, in connection with Bagnold's theory (1941). Second, the relationship between the local particle flux and local shear stress (estimated from previous studies) can be analyzed, as well as the relaxation length that emerges from this analysis.

*Institut de Mcanique des Fluides de Toulouse, Allée du Professeur Camille soula, 31400 Toulouse

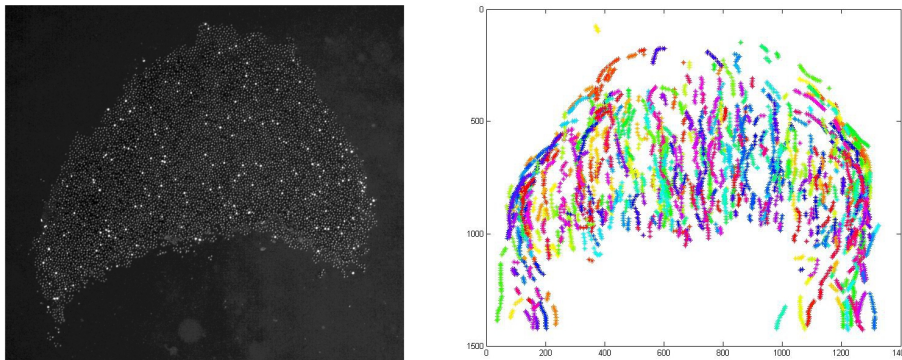


Figure 1: (a) Barchan dune seeded with white beads (b) Trajectories of the white particles.