Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Self-similar evolution of 2D aquatic dunes over an erodible bed DELPHINE DOPPLER, LMFA-Université Lyon 1, Université de Lyon, PIERRE YVES LAGRÉE, Institut Jean Le Rond d'Alembert - CNRS, PHILIPPE GONDRET, MARC RABAUD, FAST - Université Paris Sud, Orsay — Scale invariance of shape is a common feature of erosion patterns, such as barchan dunes, sand ripples under shoaling waves or scour holes. Due to their universal and fascinating crescentic shape, barchans dunes have received much attention and scaling laws have been deduced from field observations, satellite images and laboratory experiments. On the other hand, the dynamical long term evolution of ripples and dunes formed over an erodible bed has been far less studied while the temporal behavior of erosion patterns contains substantial information on the physical processes involved. Here, we present experimental results obtained in a linear, quasi-2D closed water channel. When a granular bed is submitted to a uniform shear flow, periodic sand ripples appear all along the channel. We found that the first ripple near the channel inlet exhibit unreported long-term scale-invariant growth. The self-similar dune shape and power-law growth exponent are extracted by image processing for several flow velocity. A simple linear model is built using mass conservation and a granular flux law, so that the bed form is described by a self-similar order 2 linear system. Experimental data fit nicely with the model results.

Delphine Doppler
LMFA-Université Lyon 1, Université de Lyon

Date submitted: 29 Jul 2015 Electronic form version 1.4