



Field evidence for barchan instability: dunes as waves versus waves on dunes

H. Elbelrhiti, **P. Claudin** and B. Andreotti

Laboratoire de Physique et Mecanique des Milieux Heterogenes, ESPCI, 10 rue Vauquelin, 75231 Paris Cedex 05, France. (claudin@ccr.jussieu.fr)

Field studies of barchans – crescent-shaped dunes propagating on solid ground under unidirectional wind – have long been focused on static aspects like morphology, as well as on kinematics. Because of the long time-scale involved, the dynamics and the interaction of these dunes have only been investigated by numerical simulations, which predict that barchans behave as stable solitary waves: in particular, two colliding barchans would cross through one another while still preserving their shape. On the basis of a three-year field study in the Atlantic Sahara (Morocco), we show here that barchans have a dynamical behaviour clearly distinct from that of solitons and turn out to be fundamentally unstable. In fact, their typical response to perturbations such as wind changes or collisions is controlled by the induction of surface waves, whose velocity and characteristic wavelength are determined by the flux saturation length. These waves play a fundamental role at the scale of the dune field as they can produce series of new barchans of elementary size by breaking the horns of large dunes.