Abstract Submitted
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A dynamical model of a quasi-2D dune corridor[1] KAROL BACIK, DAMTP, University of Cambridge, COLM-CILLE CAULFIELD, BP Institute/DAMTP, University of Cambridge, NATHALIE VRIEND, BP Institute, University of Cambridge — Sand dunes often form larger collectives known as dune fields. Notwithstanding significant progress in our understanding of single dune dynamics, the morphology of dune fields is still poorly understood. Previous models abstracted migrating dunes as independent agents colliding with each other, but recent experiments in our laboratory revealed that two subaqueous dunes, one directly upstream of the other, can interact at large distances even if they are not in direct contact. The turbulent fluctuations associated with the wake of the upstream dune enhance sediment flux over the downstream dune and thus increase its migration rate. They also impact the exchange of sediment between neighbouring dunes, which may lead to a dune starvation. Here, we present a data-driven dynamical model of a quasi-2D periodic train of hydrodynamically interacting dunes, which is the first step towards a realistic reduced-complexity model of a dune field that would incorporate the wake-induced feed back. We identify the steady states of the system, probe their stability, and make predictions about the long-time evolution of a quasi-2D dune corridor. We also discuss the stochastic aspects of the dynamics and compare theoretical predictions with the laboratory experiments.

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