Desert dynamics and stability

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Wind-blown sand dunes are ubiquitous on Earth and other planetary bodies with an atmosphere (Mars, Titan) and play a significant role in the sediment and dust budgets. Many studies have investigated the shape of isolated dunes as a function of wind regime and sand supply, generally focusing on the equilibrium shape. However, dunes are not isolated within a field, they are numerous and interact. This interaction can lead to a self-organised pattern, even though individual dunes and the field are out of equilibrium. Here, we propose to experimentally study the field pattern, its stability and reorganisation dynamics when subjected to changes in wind forcing and/or of boundary conditions. This subject lies at the intersection of geomorphology and nonlinear physics, covering topics such as pattern formation, instability and dynamics of out-of-equilibrium systems.

This work may be experimental and/or numerical, and theoretical. Experiments will be carried out underwater (where the dunes are downscaled) in an already developed setup. A good knowledge of fluid mechanics and the fundamentals of nonlinear physics would be advantageous. Ideally, the internship will be followed by a PhD.



dunes in the lab