

Orencio Duran Vinent

Formation of sand ripples under randomly forced flows

It is commonly assumed that the formation of sand ripples, which are ubiquitous on sand flats across the solar system, requires the preexistence of coherent surface flows that destabilize the surface in a preferential direction. In that context, recent observations of sand ripples under randomly driven high-frequency water flows were puzzling and suggested a different formation mechanism. Here we show that these ripples are part of a wide class of patterns arising from linear instability analysis that include ripples and dunes formed under either oscillatory or uni-directional flows for arbitrary planetary conditions. Our analysis points to a single and robust formation mechanism for sand ripples and suggests a general explanation for ‘frozen’ hexagonal sedimentary patterns formed under shear flows such as Martian TARs.