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Periodicity in elongating dune fields

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Dune fields usually exhibit periodic patterns, which are commonly associated with the destabilization of a flat sand bed. This instability occurs at 20-metre wavelengths, but the periodicity thus generated is preserved by the coarsening process up to the large scales observed from satellites. However, although this dune formation mechanism only occurs in areas of high sand availability, periodic bedforms can be observed in areas of low sediment availability. For example, a unidirectional wind breaks transverse dunes into barchans, whose spacing directly depends on the height of the initial transverse dune through another instability induced by their migration. Under multidirectional winds, oblique and longitudinal dunes reorient through defects such that the fluxes perpendicular to the crest cancel each other. The dunes can then elongate along the resultant flux direction. Here, we show that this elongation mechanism neither impose a periodicity nor select a wavelength. Hence, elongating dune fields that exhibits a periodicity are in fact a collection of isolated objects that are controlled by a periodic boundary condition.