



## **Sand availability control on dune shape and orientation**

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An increasing body of evidence indicates that sand availability does not only control dune type but also the underlying dune growth mechanism. Consequently, the same wind regime can produce different bedform orientations. Here, we use numerical simulations with different conditions of sand availability to predict dune shape and alignment in asymmetric bimodal wind regimes. In zones of abundant sand supply, linear dunes grow in height and propagate selecting the orientation for which the normal to crest components of transport reaches a maximum. In zones of limited sand supply, linear dunes grow by extension in the direction of the resultant sand flux. Considering these two independent dune growth mechanisms, we find good agreement between numerical and analytical models, and estimate the magnitude of wind velocity acceleration up the dune stoss slopes. In the extensional mode of linear dune formation, there is no abrupt change in dune trend when the divergence angle between the two winds crosses  $90^\circ$ . Instead, there are systematic transitions in dune type from linear to barchan for critical values of the divergence angle that depend on the transport ratio. We show how the growth rates of the two dune growth mechanisms may be used to infer the dune field morphology in zones of low sediment availability.