

Spatial and temporal patterns of airflow across a foredune and beach surface under offshore winds: implications for aeolian sediment transport

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The input of aeolian sediment into foredune systems from beaches represents a key component of sediment budget analysis along many soft sedimentary coastlines. Where there are significant offshore wind components in local wind regimes this is normally excluded from analysis. However, recent work has shown that if the topography of the foredune is favourable then this offshore component is steered or undergoes flow reversal through leeside eddying to give onshore transport events at the back beach under offshore flow conditions. At particular distances from the foredune crest flow reattaches to the surface to continue its incident offshore direction. The location of this reattachment point has important implications for aeolian transport of sand on the back beach and foredune toe locations.

This study reports initial results where the positioning of the reattachment point is mobile and is driven by incident wind velocity (at the foredune crest) and the actual undulations of the foredune crest's topography, dictating heterogeneous flow behaviour at the beach. Using detailed field measurements (25 Hz, three-dimensional sonic anemometry) and computational fluid dynamic modelling, a temporal and spatial pattern of reattachment positions are described. Implications for aeolian transport and dune evolution are also examined.