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The use of time-series LIDAR to understand the role of foredune blowouts in coastal dune dynamics, Sefton, NW England.

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Coastal dunes are natural buffers against the threat of climate change-induced sea level rise. Their evolution is largely controlled by sediment exchanges between the geomorphic sub-units of the nearshore, beach, foredune and dune field. Coastlines characterised by multiple blowouts at the beach-dune interface may be more susceptible to coastline retreat through the enhanced landwards transport of beach and foredune sediment.

This study, based in Sefton, north-west England, exploits an unprecedented temporal coverage of LIDAR surveys spanning 15 years (1999, 2008, 2010, 2013 and 2014). Established GIS techniques have been utilised to extract both the coastline (foredune toe) and the foredune crest from each LIDAR derived DTM (Digital Terrain Model). Migration of the foredune toe has been tracked over this period. Analysis of differentials between the height of the dune toe and dune crest have been used to locate the alongshore position of blowouts within the foredune. Dune sediment budgets have then been calculated for each DTM and analysis of the budgets conducted, with the coastline being compartmentalised alongshore, based on presence of blowouts within the foredune.

Results indicate that sections of the coastline where blowouts are present within the foredune may be most vulnerable to coastline retreat. Temporal changes in the sediment budget within many of these sections also provides evidence that, if blowouts are present, coastline retreat continues to be a possibility even when the dune sediment budget remains positive.