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Growth mechanisms and dune orientation on Titan

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Dune fields on Titan cover more than 17 % of the moon's surface, constituting the largest known surface reservoir of organics. Their confinement to the equatorial belt, shape, and eastward direction of
propagation offer crucial information regarding both the wind regime and sediment supply. Herein, we present a comprehensive analysis of Titan's dune orientations using automated detection techniques on non-local denoised radar images. By coupling a new dune growth mechanism with actual wind fields generated by climate modelling, we find that Titan's dunes grow by elongation on a non-mobile substratum. To be fully consistent with both the local crestline orientations and the eastward propagation of Titan's dunes, the sediment should be predominantly transported by strong eastward winds, most likely generated by equinoctial storms or occasional fast westerly gusts. Additionally, convergence of the meridional transport predicted in models can explain why Titan's dunes are confined within plus or minus 30 deg. latitudes, where sediment fluxes converge.