

## Beach slopes from satellite-derived shorelines

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The slope of the beach face is a critical parameter for coastal scientists and engineers studying sandy coastlines as it can dictate the way a beach interacts with the incoming ocean waves. However, despite its importance for coastal applications (engineering formulations, coastal flood modelling, swimming safety), it remains extremely difficult to obtain reliable estimates of the beach-face slope over large spatial scales (hundreds to thousands of km of coastline). This presentation describes a new technique to estimate the beach-face slope exclusively from spaceborne observations: shoreline positions derived from optical imaging satellites and tide heights from altimeters. This method uses a frequency domain analysis to find the slope that minimizes high-frequency tidal fluctuations in the natural shoreline signal. The satellite-derived slope estimates are compared against field measurements at eight locations spanning a range of tidal regimes and sediment grain sizes, resulting in a good agreement ( $R^2= 0.93$ ) between satellite and in situ estimates. To demonstrate how this technique can be applied over large spatial scales, the automated algorithm is applied across hundreds of beaches in eastern Australia and California, USA (data available at <http://coastsat.wrl.unsw.edu.au/>).