



Morphometric Analysis of Spatial and Scale Variations in Roughness Indices of Foreshore Topography

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The paper outlines the results of the analysis of roughness indicators and their relationships to geomorphic landforms and erosional processes on the foreshore using a uniquely extensive dataset of foreshore topography collected from the North East Coast of England. Foreshore topography was collected using a TopEye II helicopter mounted LiDAR system, in parallel to capture of 0.03 m GSD colour photography. The data structure collected by this Palmer scanner system allows data capture on near-vertical surfaces, so data coverage on rocky coasts is generally continuous. Average point densities on the foreshore are c.45 ppm², and local dGPS positioned control surfaces allow plan and elevation errors in the survey data to be constrained to within 0.05 m. Data was captured during an extreme low tide along a 25 km section of the coast west of Whitby, in a swath that extends from inland of the cliff crest to the seaward limit of the foreshore platform, a distance of between 50 m and 400 m. Flightlines are processed in Terrascan and aligned to give a continuous dataset for the coast in the form of a point cloud. This is georeferenced to OSGB'02, using the dGPS control on the helicopter, which allows the data to be directly overlaid with GIS data on geological exposures and geomorphological processes such as rates of erosion from monitoring. Using a subset of this data, the paper uses a range of roughness indices to analyse the nature and magnitude of variations in foreshore topography between different lithologies as well as using the roughness indices to identify and quantify variations in foreshore topography at different scales. Overlaying this analysis with user-defined foreshore landforms in a GIS, the association between quantifiable indicators of surface change and the development of distinct geomorphic entities on the foreshore will be analysed. More speculatively, the potential relationships between variations in the nature and intensity of erosional processes on the foreshore and their association to roughness indices will be explored.