Geophysical Research Abstracts
Vol. 20, EGU2018-10222, 2018
EGU General Assembly 2018

Applicability of geomorphometry in mapping beach and dune landforms

Emilia Guisado-Pintado (1), Derek Jackson (2), and David Rogers (2)

(1) Physical Geography & AGR, University of Seville. Seville, Spain (eguisado@us.es), (2) School of Geography & Environmental Sciences, Ulster University. Coleraine, Northern Ireland (d.jackson@ulster.ac.uk)

The inherent complexity of earth surface processes dictates the use of multiple environmental datasets for monitoring and quantifying morphological change processes. In this respect, the application of Geomorphometry for quantitative land-surface analysis has become a rapidly growing interdisciplinary subject, with applications in numerous fields including those within hydrology, planetary science, archaeology, natural hazards and land-use planning. Within complex and highly dynamic zones such as beach and dune environments, the advent of low-cost drone systems (UAV) and terrestrial laser scanners (TLS), now allows rapid acquisition of topographic datasets for monitoring process-response events at varying temporal and spatial scales.

The final quality of any 3D model generated through these techniques however, is largely dependent on the design of the experiment (area covered, deployment of devices, weather conditions), the terrain chosen (slope and roughness, presence of vegetation) and post-processing analysis (survey overlap, point cloud density etc.). Some of these issues can play an important role in coastal/dune environments and therefore affect the applicability of UAV and TLS. For instance, in north Atlantic coastal systems, dunes are usually densely vegetated which can influence the effectiveness of (single return) TLS in acquiring true bare earth surfaces of dune landforms. Similarly, meso to macro tidal beaches are characterised by a mid- to low angle slopes and an absence of surface undulations as well as the presence of water (moisture) which has been problematic in topographic data acquisition using UAVs.

Here we have examined the effectiveness of both TLS and UAV in acquiring topographic data (digital surface model-DSM) over a beach-dune complex at Five Fingers Strand in northwest Ireland. The study seeks to investigate which method performs better given particular types of coastal topography. Two areas were selected to provide a range of topographies and beach dune landforms, from high scarped dunes with a low angled flat beach (north site) to more undulating dunes and steeper sand/gravel beach beaches (south site).

Results show that the effectiveness of the UAV and TLS techniques in acquiring adequate information to create a DSM is largely dependent on the rugosity of the landform as well as vegetation density and height. However, the post-processing approach used also dictates the quality and accuracy of the DSM produced. In general, UAVs are less effective over flatter terrain such as sandy beaches where less surface undulations are present, whereas TLS is much more effective resulting in more accurate surface definition. Over more complex landforms where higher vegetation cover exists, UAV performance is better compared to TLS as in general, point height distribution is more uniform resulting in a more accurate DSM. Implications of using one or other techniques in the study of coastal geomorphic change are presented.