Geophysical Research Abstracts
Vol. 19, EGU2017-7574, 2017
EGU General Assembly 2017
© Author(s) 2017. CC Attribution 3.0 License.

Microtopography of bare peat: an objective classification from high-resolution topographic survey data

Mark Smith (1) and Jeff Warburton (2)

(1) University of Leeds, School of Geography, Leeds, United Kingdom (m.w.smith@leeds.ac.uk), (2) Durham University, Department of Geography, Durham, United Kingdom

Peatlands globally are at risk of degradation through increased susceptibility to erosion as a result of climate change. For peatland restoration practices to be designed efficiently and evaluated effectively, quantification of eroded peat volumes is required alongside an understanding of the processes responsible for their degradation. Owing to the unique material properties of peat, fine-scale microtopographic expressions of surface processes are especially pronounced and present a potentially rich source of geomorphological information; providing valuable insights into the stability and dominant surface process regimes. Bare peat is highly responsive to changing environmental forces acting at the near surface and characteristic microtopographies emerge in response to rainfall, surface wash, wind action and fluctuations in surface temperature (both drying and freezing). Spatial and temporal variations in surface roughness reflect contrasts in the physical properties of the peat and key erosion processes acting in combination.

We present the first conceptual framework to rigorously describe bare peat microtopography and use Structure-from-Motion (SfM) surveys to quantify roughness for different peat surfaces. Through application of a survey-grade structured-light hand-held 3D imager (Mantis Vision F5-Short Range) which can represent sub-millimetre topographic variability in field conditions, we present the most reliable field validation of SfM at the plot scale (<1 m2). Peat microtopography is quantified using 26 roughness metrics that cover a range of surface features (including amplitude, spacing, hybrid, multi-scale and anisotropy parameters). SfM reconstructs peat microtopography effectively, although some smoothing is observed. Over 55 plots, the roughness of microtopographic types is quantified and an objective classification system derived from decision tree analysis. After training on 66% of the data, the decision tree correctly classified 85% of plots into microtopographic types using 5 roughness metrics each of which quantified a different aspect of the surface variability. We show that through a combination of roughness metrics, microtopographic types can be identified objectively from high resolution survey data, aiding the interpretation of sediment budgets and providing a much-needed geomorphological process-perspective to observations of eroded peat volumes.

Keywords: peat; microtopography; Structure-from-Motion; structured-light imager; roughness