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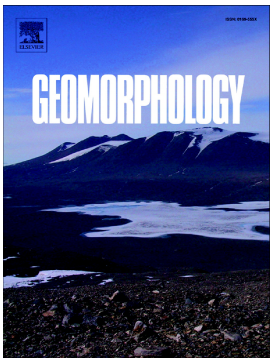

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CLASSIFICATION OF BEACH RESPONSE TO EXTREME STORMS

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Abstract

Extreme storms are responsible for rapid changes to coastlines worldwide. During the 2013/14 winter, the west coast of Europe experienced a sequence of large, storm-induced wave events, representing the most energetic period of waves in the last 60 years. The southwest coast of England underwent significant geomorphological change during that period, but exhibited a range of spatially variable and complex morphological responses, despite being subjected to the same storm sequence. Here, we use the 2013/14 storm response along the southwest coast of England as a natural field laboratory and explain this variability in storm response through the introduction and evaluation of a new classification of how sandy and gravel beaches respond to extreme storms. Cluster analysis was conducted using an unique data set of pre- and post-storm airborne Light Detection and Ranging (LiDAR) data from 157 beach sites based on the net volumetric change (dQ_{net}) and a novel parameter, the longshore variation index (LVI) which quantifies the alongshore morphological variability in beach response. Four main beach response types were identified: (1) fully exposed beaches that experienced large and