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The geomorphic effect of recent storms – Quantifying meso scale abrasion across a shore platform

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Boulder abrasion trails (BATs) are lineations on the surface of rock platforms formed by the movement of traction-load clasts by waves. They have been observed on a variety of platform lithologies, including limestone, granite and basalt. Despite previous reporting of these features, the abrasion styles and geomorphic work done by boulder transport has not been quantified.

We present the first quantitative measurement of shore platform erosion by boulder transport during extreme storms that occurred in the winter of 2015-2016. Following two storm events in 2016 we mapped and measured 33 individual BATs on a sandstone platform on the west coast of Ireland. The total (minimum) abraded surface area was $10m^2$. The total (minimum) volume of material abraded was $0.2m^3$.

In order to test the efficacy of this process during non-storm conditions we conducted field experiments on the same platform. We identified two sites on the platform that were similar, but differed in their intertidal roughness. We installed an RBR solo wave pressure transducer (PT) at 0m OD at both locations to record wave data. We measured platform roughness, determined as the fractal dimension of the platform profiles at both sites. We deployed an array of boulders of known dimensions and mass, parallel to the shoreline at 0.5m intervals from the PTs. The experiments were conducted 1. during relatively calm conditions and 2. during higher energy conditions. Data was collected for one tidal cycle. Any boulder displacement distance and direction was measured and geomorphic effects were documented.

We find that BATs are formed under a range of wave energy conditions. Our observations indicate that along the North Atlantic coastline, BATs can occur at a high frequency, only limited by sediment supply. Our data show that abrasion by boulder transport is a potentially significant geomorphological process acting to abrade platforms under contemporary climate conditions.

In addition, our preliminary findings suggest that platform roughness exerts a strong influence on wave energy and potential boulder transport.

We find that abrasion of the platform surface is a fundamentally important process which contributes to lowering of the platform surface over time.