

Project title: Storms & sea level: What's the future for mixed sediment beaches?

Ref: OP2419

Keywords: coastal processes, storm response, remote sensing

One Planet Research Theme:

Climate & Climate Change | Earth System Processes | Anthropocene | Environmental Informatics

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Key Research Gaps and Questions:

1. What natural variability (seasonal or decadal) variability exists in mixed sand gravel (MSG) beach systems?
2. How do MSG beaches respond to storms, and what controls their subsequent recovery?



Blast Beach, Co. Durham, where you will undertake monthly fieldwork and targeted field surveys in response to storm events.

Project Description: MSG beaches are globally common, but extremely poorly understood due to complexities of characterising heterogenous sediment distributions ([Mason and Coates, 2001](#)). Despite this, they are becoming increasingly important in coastal defence due to the ability of gravel to absorb higher wave energies ([Guest and Hay, 2019](#)). On beaches where both sand and gravel sediments coexist, we don't yet understand the complex hydrodynamics at play. In a storm, is the sand stripped away first leaving more resilient gravels to absorb wave energy? How quickly does sand or gravel return to the beach post storm?

This project will investigate the dynamics of how complex MSG beaches change on event-driven, seasonal, and decadal timescales. The key objectives will be to (i) undertake the first comprehensive review of these systems since seminal work by [Kirk \(1980\)](#); (ii) quantify the sedimentological (sand versus gravel) and morphological response of these beaches through monthly topographic and sedimentological surveys, augmented with targeted storm/post-storm fieldwork; and (iii) synthesise these findings to propose a conceptual model of MSG response pathways that will be useful to coastal managers.

The successful candidate will receive a commercial drone licence so that they can undertake monthly surveys of MSG sites of interest. Storm deployments typically take the form of multi-day experiments where you will deploy wave sensors, LiDAR scanners, cameras, and undertake topographic surveys to build a complete picture of the whole system response. The project has partnered with National Trust, who manage MSG beaches along the Durham Coast (e.g. Blast Beach), and therefore your findings will have a direct ability to inform the management of these unique landscapes. Conversation with external partners such as these will help you tailor the project to meet both your interests but also directly address their management needs.

Prerequisites: This project would suit someone with a background in physical geography, earth science, geology, or a related discipline, who is motivated by the ability to spend time in the marine environment on fieldwork. For more information, please contact **Seb Pitman** (seb.pitman@ncl.ac.uk).