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A NOVEL METHODOLOGY TO MAP GRAVEL BEACHES ACROSS THE UK USING SATELLITE SYNTHETIC APERTURE RADAR (SAR) DATA

Sophie Mann, Alessandro Novellino, Andres Payo Garcia, Doug Pender, Ekbal Hussain, Stephen Grebby and Stuart Marsh

University of Nottingham, British Geological Survey, JBA Consulting

Gravel beaches and barriers act as natural coastal defences, providing protection for many coastal communities across the UK. Under changing climate conditions, rising sea levels and more frequent, intense storms are expected to occur. Gravel beaches are therefore instrumental in combatting future coastal erosion, as they are more dynamic than traditional rigid coastal defences and so can adapt more readily to these changing conditions.

However, despite their importance, the extent and distribution of gravel beaches across the UK is not fully understood. To address this, we present a novel methodology which uses satellite Synthetic Aperture Radar (SAR) data to identify and map the locations of three gravel beach typologies: pure gravel, composite sand and gravel, and mixed sand and gravel beaches. By exploiting differences in Sentinel-1 C-band SAR backscatter responses between the different beach typologies, we are able to characterise cross-shore profiles and determine the beach typology of each profile with the aid of machine learning. To evaluate the overall accuracy of the methodology, we compare the resultant mapped beach typologies to beach slope and ground truth validation data.

The use of satellite data and machine learning facilitates large scale national mapping, and the use of SAR data permits the mapping and monitoring of beach sediment composition during cloudy conditions, rivalling the use of optical satellites.

It is envisaged that this methodology will allow for near-continuous monitoring of gravel beaches, allowing us to monitor changes in their sediment composition and assess their resilience to changing climate conditions.