Coastal processes schools case study: Slapton Sands

Working for the South West Regional Coastal Monitoring Programme, the Plymouth Coastal Observatory measures and records detailed information on more than 2,000km of England's coastline from the Severn Estuary to Portland Bill

PLYMOUTH COASTAL OBSERVATORY

Explanatory notes

The actions of the sea and the weather are the major causes of changes to the coastal landscape of the South West of England, leading to both erosion, where material is worn away, and accretion, where it is deposited.

A major cause of coastal erosion is the power of waves. When a wave hits a cliff face or Sea defence, any weaknesses can be gradually expanded, destabilising the structure. Waves also carry sand and pebbles and these can wear away cliffs and man-made defences. The stormier the weather, the bigger the effects. In calmer weather, the sea can deposit sediment, causing beaches to grow.

Beaches themselves are a strong defence against erosion: put simply the further a wave has to travel up a beach the weaker it becomes.

The Plymouth Coastal Observatory (PCO) is the data-gathering arm of the South West Regional Coastal Monitoring Programme, which was founded in 2006 to provide a standard, repeatable and cost effective method of monitoring the coastal environment in the region.

The programme operates from Portland Bay in West Dorset to Beachley Point in Gloucestershire on behalf of the region's maritime local authorities and coastal groups, as well as the Environment Agency and Defra, and is managed by Teignbridge District Council.

Slapton Sands is a shingle barrier beach located on the south Devon coast running between Strete in the north and Torcross in the south. Together with the beaches of Blackpool Sands, Beesands and Hallsands it makes up Start Bay. The bay is in an exposed position and faces southeast, meaning the influence of incoming waves on sediment levels and transport is large. Offshore bars and headlands bend and channel waves, however the predominent trend is for waves to come from the south pushing sediment northwards.

At the southern end of the beach the village of Torcross has seen its sea defences become ever more important as the beach has become narrower and steeper allowing waves to break further landwards. Further north the road which runs along the top of the beach is being undercut and eroded by the retreating beach. In order to keep the village habitable and road open continual maintenance of the sea defences is needed.

The longer term trend is often intensified during storm events when large volumes of sediment can be redistributed exposing already fragile sea defences. The sequence of large storm events that occured in January and February 2014 had a particularly devastating affect dramatically lowering beach levels in Torcross and rasing them at Strete.

The PCO's data is freely available. See the observatory's website southwest.coastalmonitoring.org for more information.

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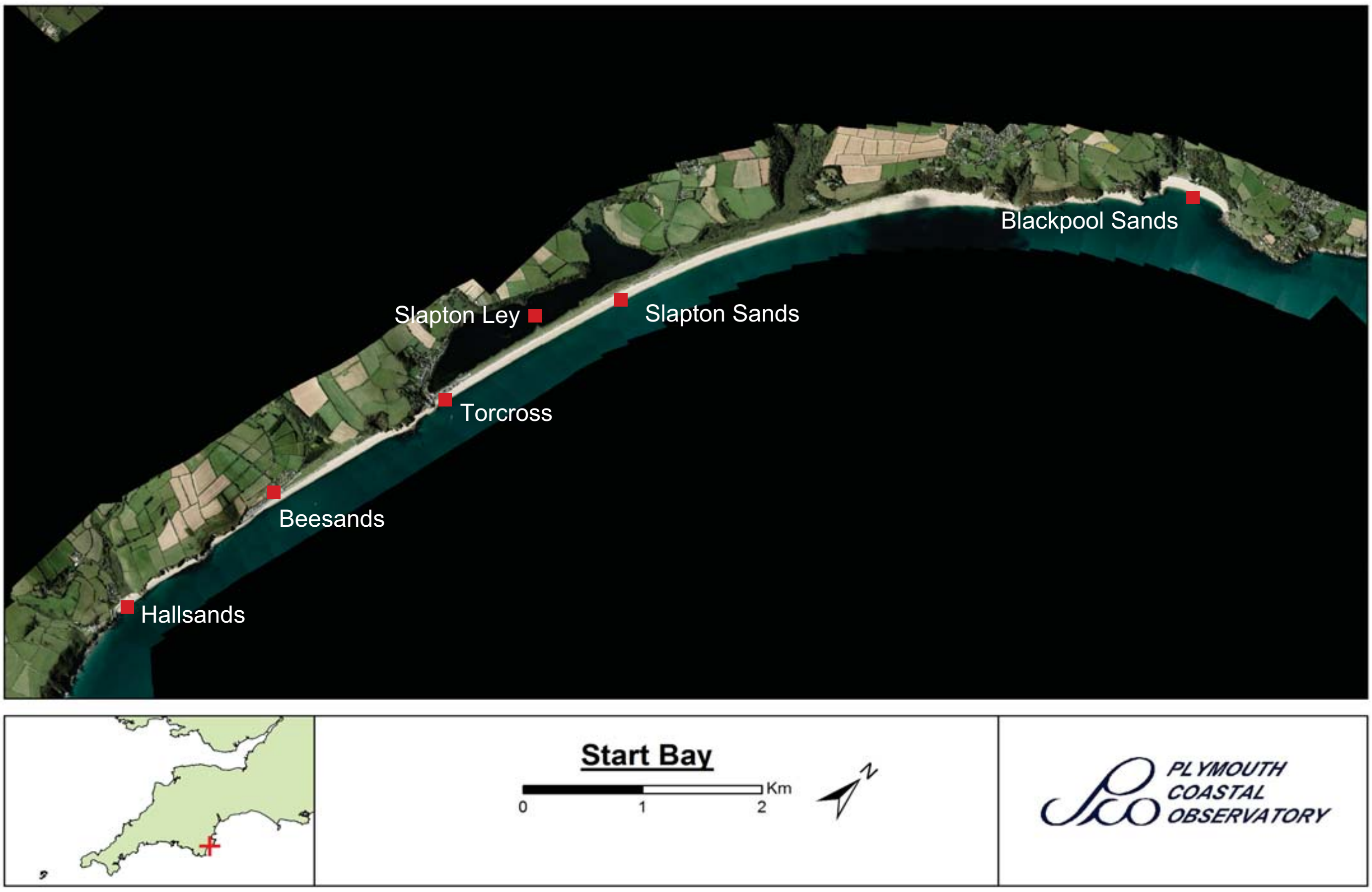
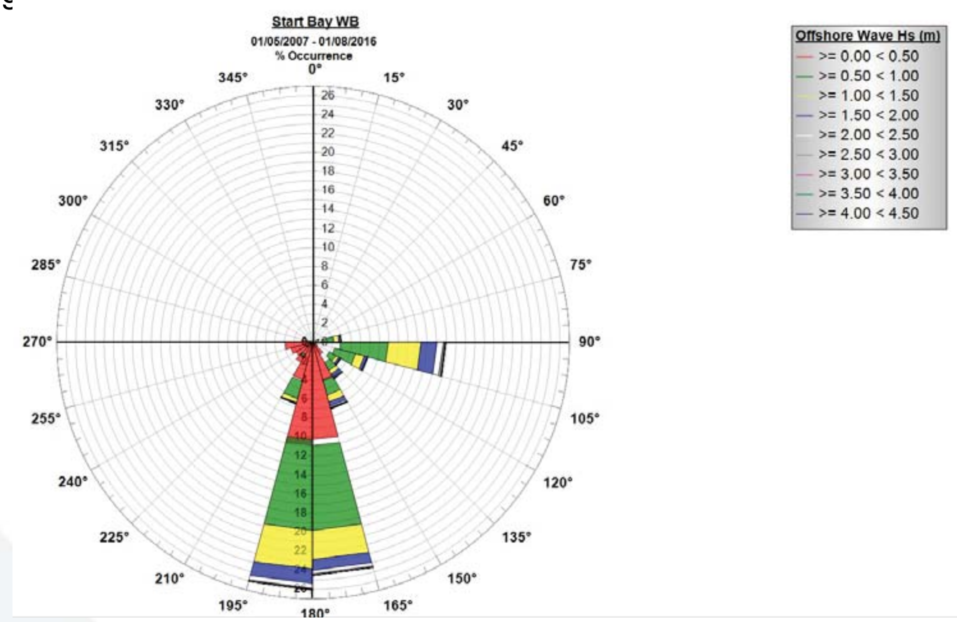


1 Slapton Sands is a shingle barrier beach, which along with Blackpool Sands, Beesands and Hallsands, makes up Start Bay on the south coast of Devon (above). The village of Torcross is located at the southern end of the beach and Slapton Ley, a large lake and nature reserve, is located behind the beach and road. From looking at the wave rose (below), which is the most common direction for waves to approach Slapton from and what is the most common height of these waves?



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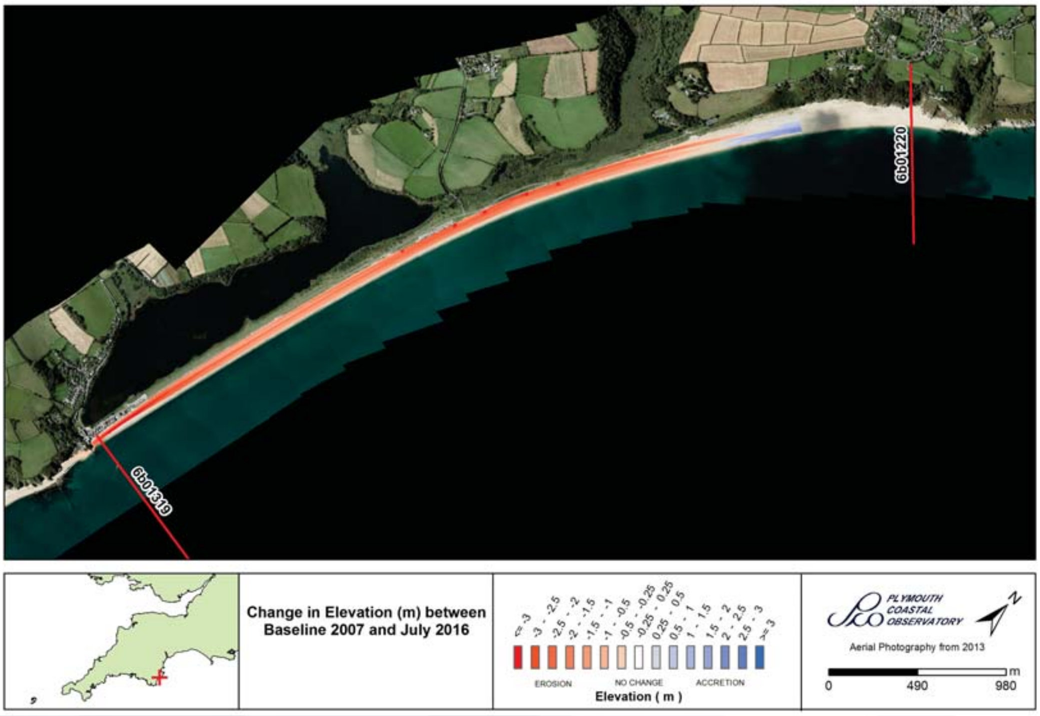
2

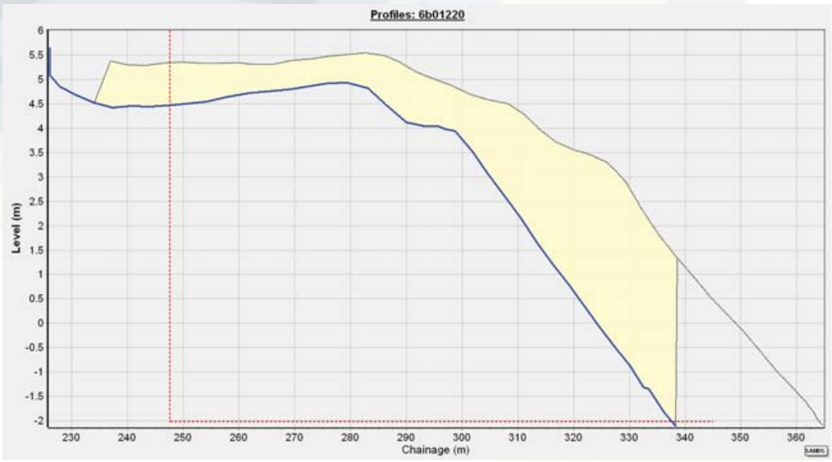
Beach material, such as the shingle at Slapton, can be transported by waves approaching from different angles. Considering your answer to Question 1, in which direction do you think the material at Slapton will be moved by the incoming waves?

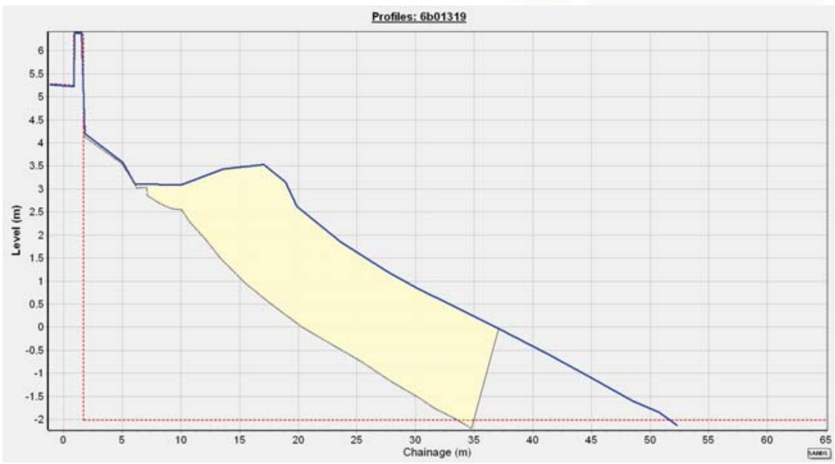
This first figure is a difference model which shows the change in beach height over a certain period. Red indicates erosion (where material has been lost) and blue indicates accretion (where material has been gained). Does the difference model, along with the profile charts below (which show the cross-sectional area of the beach), confirm your answer?



Torcross 1907

Torcross 2016



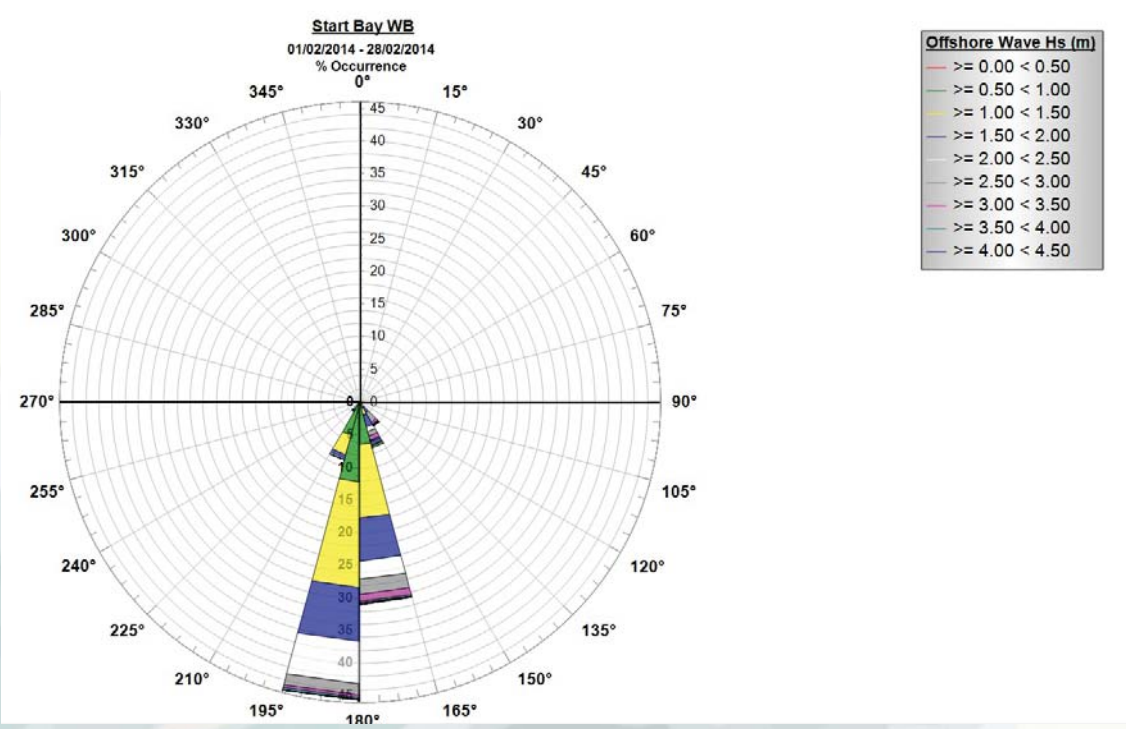


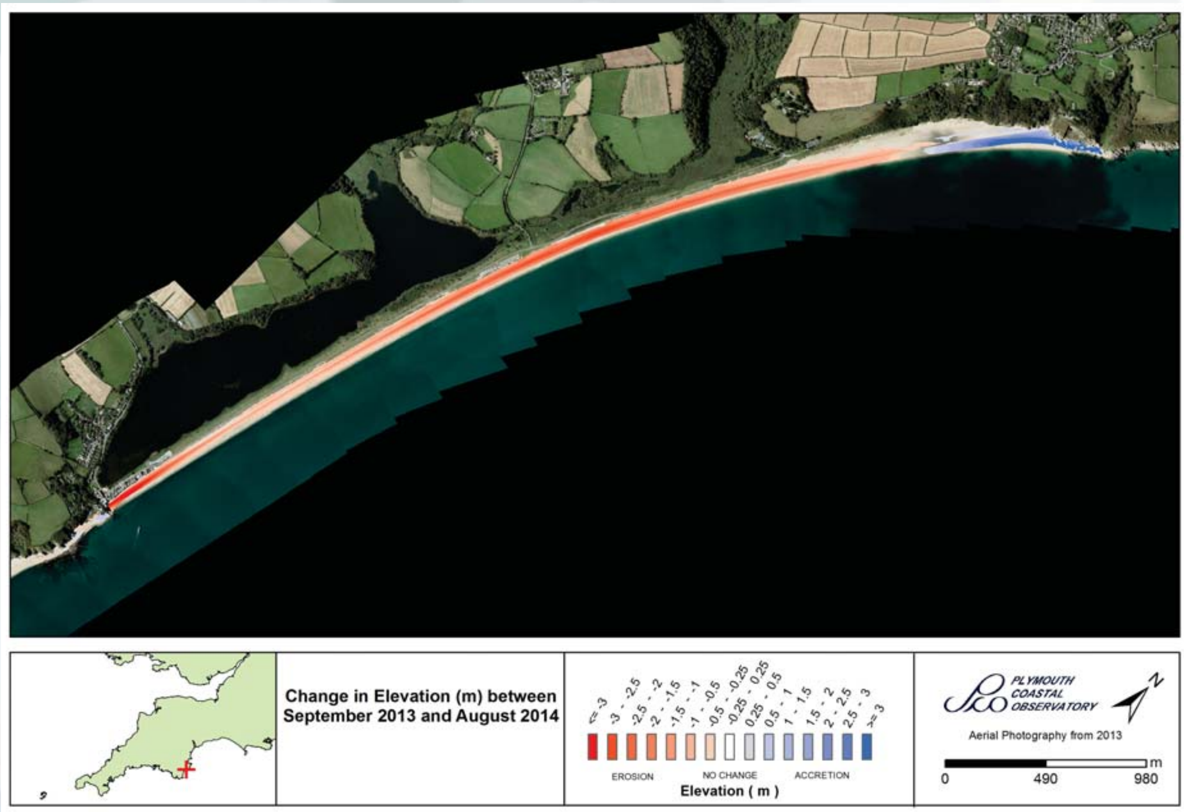
--- 2016 --- 2007

3 The profile charts on the previous page show how the beach shape changed between 2007 and 2016. What is the greatest amount by which the beach has changed height and how has the lowest point on the beach changed position horizontally?

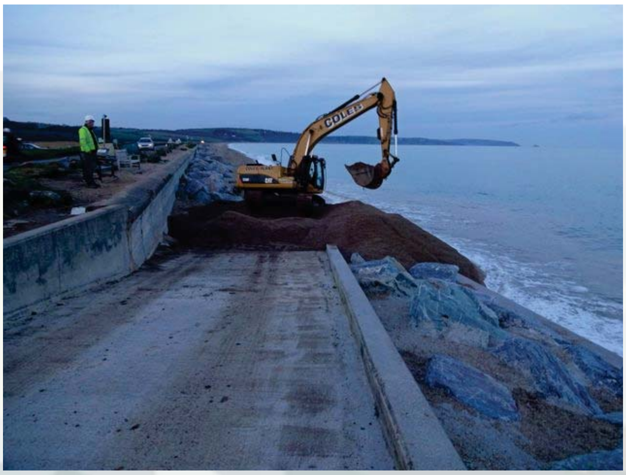
4 Beaches act as a natural sea defence, causing waves to break and absorbing the impact. What effect will having less material and a thinner beach have on the impact of the waves?

5 The images above show some of the impacts of the storms which struck the southwest in January and February 2014. Notice how the bottom of the seawall infront of Torcross becomes uncovered whilst further north the road gets covered in material. Compare the wave rose on the next page (which shows the storm conditions) with the previous one (which shows the average conditions), how do the heights of the waves differ?





6 Above is another difference model, this time showing the impact the storms had on Slapton Sands. A similar pattern to the 10 year model is visible with sediment being eroded at the southern end and accreted at the northern end. By roughly how much did the beach change height at either end of the beach?



Putting extra material back onto the beach, known as beach nourishment.

Collapse of the seawall at Torcross

Road closures are becoming more regular at Slapton

7 As well as the road along the beach being important for access to Devon, the beach is very popular with tourists and the buildings at Torcross provide incomes for many families. Considering all your answers to the previous questions, do you think that work should continue to protect the beach from further erosion?