

# Scientists analyze record storm surges to help predict future flooding

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Waves topping over the sea wall in Blackpool. Credit: Sally Brown

Researchers at the University of Southampton have conducted the most detailed spatial analysis to date of storm surges along the coast of the UK and Ireland.

The oceanographers found coastlines in the north of the Irish Sea experience the longest and largest surges, while those occurring around the southwest coast of England have the smallest geographical footprint and last the shortest amount of time.

Across all coastlines investigated, and over a period stretching four decades, the winter seasons of 1989/90 and 2013/14 stood out as having the highest number and most severe storm surge events.

[The study findings](#) are published in the June edition of the journal *Weather and Climate Extremes*.

A storm surge is an abnormal rise in seawater level during a storm, measured as above that of the normal tide height for the area. The surge is caused by wind pushing water onshore and is influenced by a storm's size, speed and where it tracks in relation to the coast.

The storm surge footprint is the extent of simultaneous flooding along a stretch of coastline, and influences the damage associated with coastal flooding.

"Storm surges are the most important driver of flooding in many coastal areas," explains Ivan Haigh a Professor at the University of Southampton and co-author of the study.

"If we can understand how the differing characteristics of storms affect surges in many different coastal locations, we can more accurately predict the impact they will have on those localities, how best to counter the effects and how they may increase with [climate change](#). Our research will help improve the accuracy of statistical models used to make these predictions."

The research, which also involved scientists in Spain, the U.S. and The

Netherlands, examines data on storm surges recorded between 1980 and 2017.

The team identified 270 extreme storm surge events over the study period, based on their duration, footprint size, severity and how frequently a similar event may reoccur. From this they classified eight distinct surge footprint types and linked them to the characteristics of the storms which caused them.

In the course of their research, they found the most extreme surge event was in the winter of 1989/90—caused by a storm on 26 February 1990 which affected sea levels along the north, east and west coasts. Remembered for extreme flooding in the towns of Towyn and Clwyd in Wales, the event forced five thousand people to be evacuated from their homes and businesses.

The stormiest season in the study period was the winter of 2013/14, which contained the most frequent severe flooding events. In total there were 13 flooding episodes, compared with five in 1989/90. This includes the [storm surge](#) of 5 December 2013, which saw some 36 flood warnings in East Anglia and resulted in the loss of properties along the coasts of Norfolk, Suffolk and Essex.

Lead author of the study, Dr. Paula Camus of the University of Southampton and Universidad de Cantabria (Spain), said, "It is crucial we learn lessons from past storm surges in order to help inform our response to future coastal flood risk. Changes to our climate will likely mean more frequent and extreme events, so having accurate data on which to base decisions about infrastructure and emergency response is crucial. We hope our study can better inform the assessment of risk and impacts."

The researchers acknowledge that their study doesn't take into account

astronomical influence on the height of tides, but say this can be incorporated in the future. They also say their method could be adapted and applied to any coastal region globally.

A timeline of historic [coastal flooding](#) events in the UK and other data can be found [here](#).

**More information:** Paula Camus et al, Tracking the spatial footprints of extreme storm surges around the coastline of the UK and Ireland, *Weather and Climate Extremes* (2024). DOI: [10.1016/j.wace.2024.100662](https://doi.org/10.1016/j.wace.2024.100662)

Provided by University of Southampton

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