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User-friendly tool to predict coastal storm hazards

Researchers have developed a prototype system to predict the impact of storms on European coastlines. The MICORE Early Warning System aims to improve civil defence and coastal evacuation plans and could pave the way for an autonomous early warning system to save countless lives and protect infrastructure worldwide.

Storms can have a devastating impact on coastal areas, causing extensive beach erosion, destruction of infrastructure and flooding. Using advanced weather circulation models, scientists can forecast storms up to 48-72 hours in advance. However, different physical characteristics of the coastline will influence how waves and tides behave once they reach the shore, which makes it difficult to predict the correct level of emergency response in each case.

Under the EU-funded MICORE[1] project, scientists from across Europe developed a prototype model to combine the warning signs of an upcoming storm with specialist knowledge of a coastal area to predict the precise emergency response actions required.

The MICORE scientists identified nine coastal areas throughout Europe and collected data for more than a year on the impact of storms on the living and non-living features of the coastline. This included measuring wave height, flow velocities, beach and dune erosion and the impact on coastal communities of near-shore flooding. Based on their case study data and a historical analysis of significant storm events, the scientists developed a generic model linking the extent of the physical impacts on coastlines with indicators of storms detectable offshore, such as increased waves, wind, tides and currents.

By combining the model with advanced weather forecasting tools, the scientists developed an Early Warning System to translate the intensity of an upcoming storm into a series of 'Storm Impact Indicators (SIIs)' specific to each of the nine locations, such as the risk of flooding or dune and dyke breaching. These were then interpreted into a risk status (high, medium or low) and practical recommendations to aid local decision-making, i.e. the level of evacuation needed.

Part of the MICORE project consisted of a historical analysis of European extreme weather events to investigate whether they were becoming more common or more intense under climate change. For the existing data, they could not establish a link with global climate. However, this is likely to be caused by the different timescales of climate cycles and the historical analysis performed.

A primary objective of the MICORE project was for the warning system to be easy to use and fully accessible online by all interested parties, thus overcoming issues of data access common in multi-partner projects. The researchers envisage that once an early warning system is established for a region, it could run indefinitely without further scientific intervention. Colour coded warnings and visual images of the most 'at risk' areas could be sent automatically to fire departments, civil defence authorities, policymakers and even directly to the public via the internet.

So far, the nine locations have been used to demonstrate the potential value of the MICORE forecasting system. According to the researchers, the generic concept of combining specialist coastal knowledge and a robust physical model can be applied anywhere. They recommend that EU Member States improve coastal and offshore monitoring to further develop and validate the MICORE warning systems.

1. Morphological Impact and Coastal Risks induced by Extreme storm events (MICORE) is supported by the European Commission under the Seventh Framework Programme. See: www.micore.eu

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