

## Full details

All details held on the selected case study are shown below.

Went live on	Title	Reference
15 Feb 2011	Clouds-to-coast prediction of flood risks	SID0264
<p><b>Synopsis</b> By modelling atmospheric conditions, waves, surges, tides, beach profile changes and sea defence response, this project is creating new ways of predicting extreme coastal flooding in the UK.</p>		
<p><b>Description</b> In England and Wales, four million people and properties are threatened by flooding. An estimated £132 billion of assets are at risk from flooding by the sea, and a further £7.8 billion from coastal erosion. In the future, these figures could increase as the climate changes and sea levels rise.</p> <p>Interactions between the atmosphere, oceans and coasts have been poorly understood in the past. This has made it difficult to predict coastal flood risks, and how well sea defences would stand up to extreme conditions. However, a team of scientists have been working together to improve the situation. They are seeking better ways of quantify the risk of sea defence failures. They are also developing a greater understanding of the processes that cause flooding when defences fail.</p> <p>The research is part of NERC's Flood Risk from Extreme Events (FREE) programme, and has brought together a group of meteorologists, oceanographers and coastal engineers. Dr Qingping Zou of the School of Marine Science and Engineering at the University of Plymouth has led the research.</p> <p>The group also includes Professor Dominic Reeve and Dr Shungqi Han at the University of Plymouth, Professor Ian Cluckie, Pro-Vice-Chancellor of Science and Engineering at Swansea University, and Dr Dawei Han at the University of Bristol. The collaboration also involves work with the Proudman Oceanography Laboratory, New Forest District Council and Halcrow Group, a specialist consultancy providing planning, design and management services for infrastructure development.</p> <p>"Whilst of prime importance for coastal risk management, prediction of coastal flooding under the combined influence of waves, water levels and beaches is particularly challenging," says Professor Andrew Bradbury of the New Forest District Council (Professor Bradbury is also Director of the Channel Coastal Observatory, based at the National Oceanography Centre in Southampton). "New techniques are required to deal with these complex combinations."</p> <p>The project uses an 'ensemble' approach to improve predictions. This is a common technique in weather forecasting, but has been little used in the field of coastal engineering. It involves running models with a number of different starting conditions. This provides estimates of the probability of different outcomes and a measure of the uncertainty associated with predictions.</p> <p>"In the UK, coastal flood defences are usually designed to withstand extreme events with a return period of between 50 to 200 years, taking account of sea level rise. Currently, there is a lack of a robust and integrated 'cloud-to-coast' framework for assessing coastal flood risk. The interactions between the atmosphere, oceans and coasts are poorly understood. There are large uncertainties in the performance of sea defences and predictions of coastal flood risk in extreme conditions," says Dr Zou. "A key aim of the project has been to integrate meteorological modelling, regional scale wave, tide and surge modelling and surf zone hydrodynamic and morphological modelling to construct an ensemble prediction framework of coastal flood risk."</p> <p>To make global climate change predictions relevant in the UK, the researchers have been developing a linked set of numerical models. These are intended to show, for example, what happens when waves and surges hit seawalls. With a better understanding of these questions, it will be possible to determine the suitability of current coastal defence designs and plan in advance for extreme events.</p> <p>The research was supported by NERC's FREE programme.</p>		

References and links	
<b>Hyperlinks</b>	<ol style="list-style-type: none"> <li>1. <a href="#">NERC - Clouds to coast</a></li> <li>2. <a href="#">Planet Earth Online - Flood risk from extreme events</a></li> <li>3. <a href="#">Planet Earth Online - Modelling water from clouds to coast</a></li> <li>4. <a href="#">Proudman Oceanographic Laboratory - Home</a></li> <li>5. <a href="#">Swansea University - Professor Ian Cluckie</a></li> <li>6. <a href="#">University of Plymouth - Staff details: Qingping Zou</a></li> <li>7. <a href="#">University of Southampton - Professor Andrew Bradbury</a></li> </ol>

<b>Impacts</b>	
<b>Key outputs</b>	Computer model
<b>Research and funding</b>	
<b>Funding type</b>	Research Programme
<b>Date of research</b>	May 2007 - September 2011
<b>Partners</b>	Local authorities (such as, New Forest District Council) Other private sector - (such as, Halcrow Group)
<b>Researchers at Universities</b>	
<b>Grant reference</b>	<a href="#">NE/E002129/1</a>
<b>Investigator</b>	Dr Q Zou University of Plymouth, Sch of Marine Science & Engineering
<b>Co-investigator</b>	Dr S Pan University of Plymouth, Sch of Marine Science & Engineering
<b>Co-investigator</b>	Professor D Reeve University of Plymouth, Sch of Marine Science & Engineering
<b>Researchers at Universities</b>	
<b>Grant reference</b>	<a href="#">NE/E00217X/2</a>
<b>Co-investigator</b>	Dr D Han University of Bristol, Civil Engineering
<b>Co-investigator</b>	Mr Y Xuan University of Bristol, Civil Engineering
<b>Co-investigator</b>	Professor I Cluckie Swansea University, School of Engineering
<b>Research and Collaborative Centres</b>	
<b>Centre</b>	Proudman Oceanographic Lab
<b>Classification</b>	
<b>Science themes</b>	Climate system, Natural hazards
<b>Science areas</b>	Atmospheric, Marine
<b>Policy areas</b>	Climate/environmental change and impacts, Natural processes, Planning
<b>Keywords</b>	Coastal, Extreme events , Risk, Sea level