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Coastal Challenges in the 21st Century

Shari Gallop
Research and Teaching Fellow
Ocean and Earth Science,
National Oceanography Centre,
University of Southampton
S.Gallop@soton.ac.uk

Time & Space Scales

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Beach Variability

Spatial Scales

MICRO Dm-mm	MESO m-km	MACRO Km-10's km	MEGA >100 km
Single waves Turbulence	Waves tides Storm surge Rivers Run-off	seasons summer winter atmospheric variability ENSO NAO Ocean currents	wave/surge climate change mean sea level variability and rise tidal modulations 18.6 yr

Temporal Scales

MICRO seconds-minutes	MESO hours-days	MACRO months-years	MEGA decades-centuries

Sea Level Rise & Coastal Flooding

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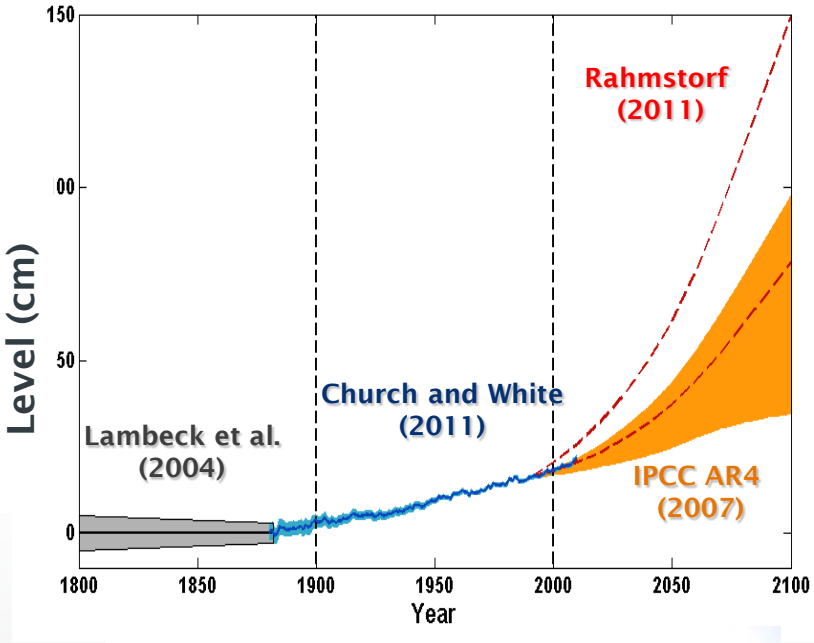

iGlass

Using interglacials to assess future sea-level scenarios

- 30 researchers,
- 8 university research groups

Sea Level Rise & Coastal Flooding

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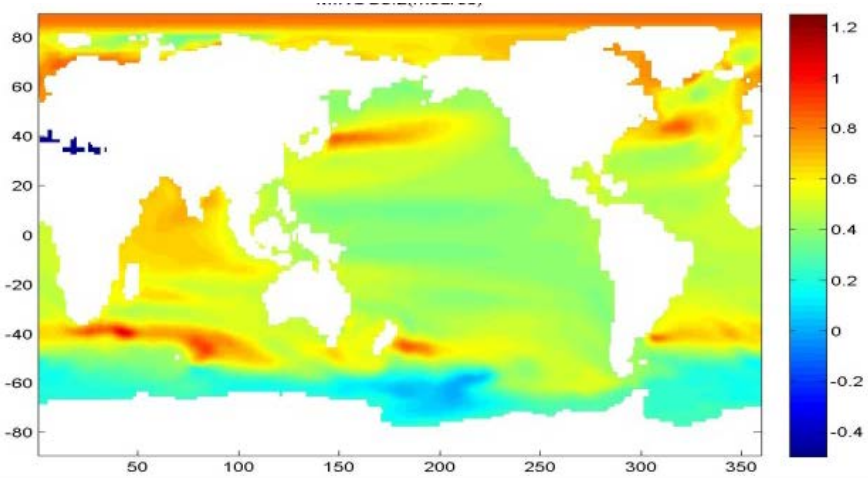

Sea-level rise by 2100 (m)

iGlass

Using interglacials to assess future sea-level scenarios

- 30 researchers,
- 8 university research groups

Sea level rise + land level change

How have sea levels changed in the past?

Generate new sea level rise scenarios

FLOOD Memory

20 researchers, 10 university research groups

Effects of temporal clustering of floods on natural, built and socio-economic systems

Impacts & Cost of Sea of Level Rise & Extreme Events

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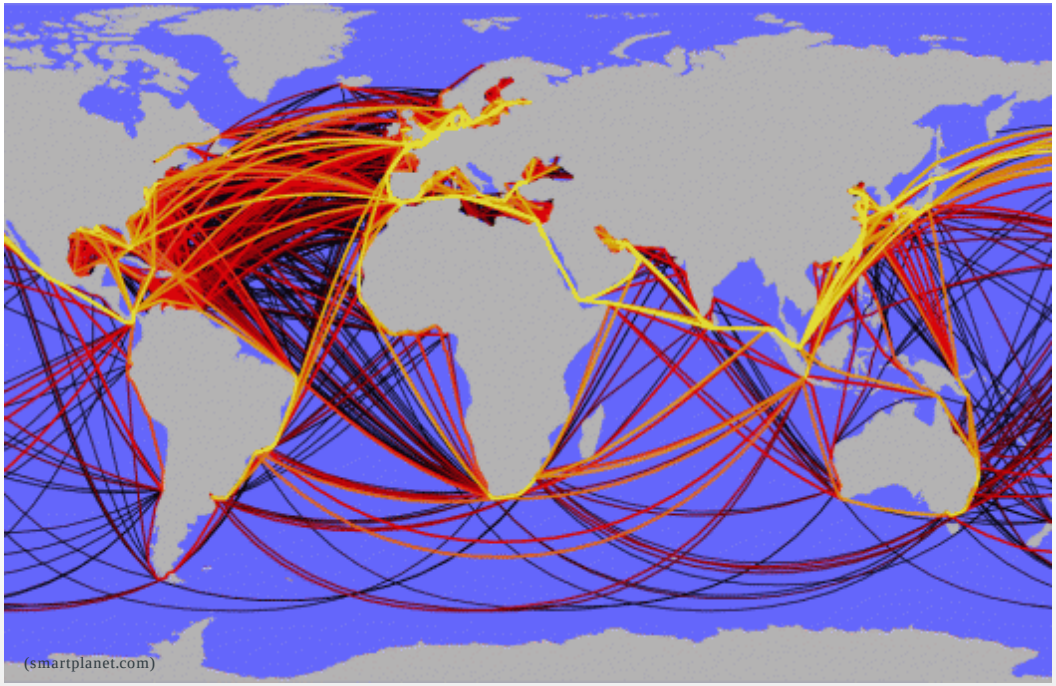
Global impacts and costs



shipping routes

Including exposure and risk on port cities, and critical infrastructure that could affect the UK

NATURAL ENVIRONMENT RESEARCH COUNCIL

Met Office

Department of Energy & Climate Change

THE WORLD BANK
Working for a World Free of Poverty

Impacts & Cost of Sea of Level Rise & Extreme Events

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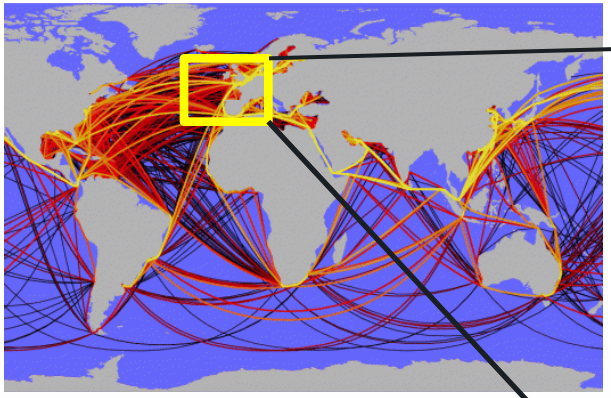
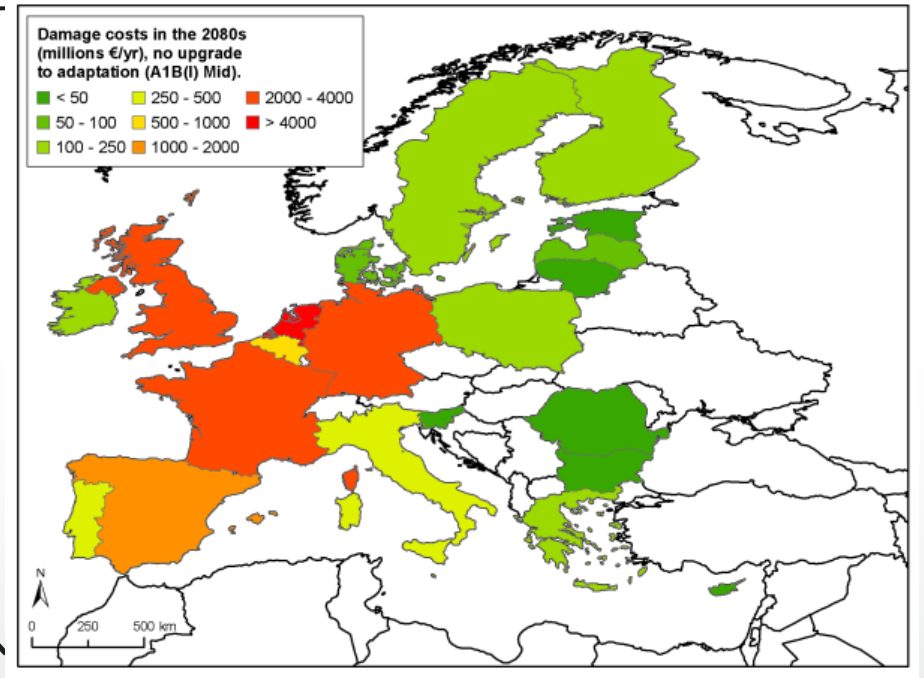


Regional impacts & costs



Dynamic Interactive Vulnerability Assessment (DIVA) model

Land loss, people at risk from flooding, wetland loss, and associated economic costs

Includes the European Union, Africa and South-East Asia

UNEP

ADB Asian Development Bank
FIGHTING POVERTY IN ASIA AND THE PACIFIC

Impacts & Cost of Sea of Level Rise & Extreme Events

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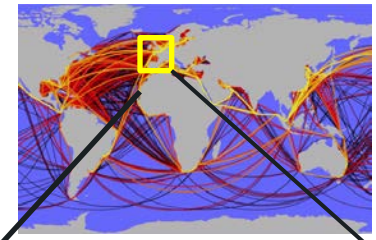
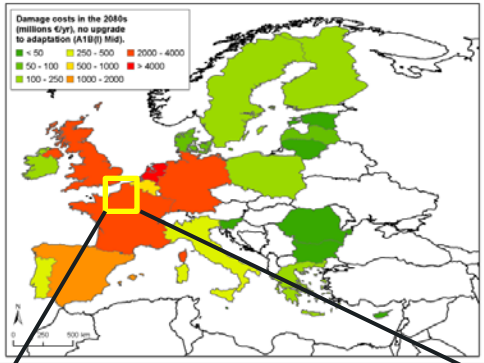
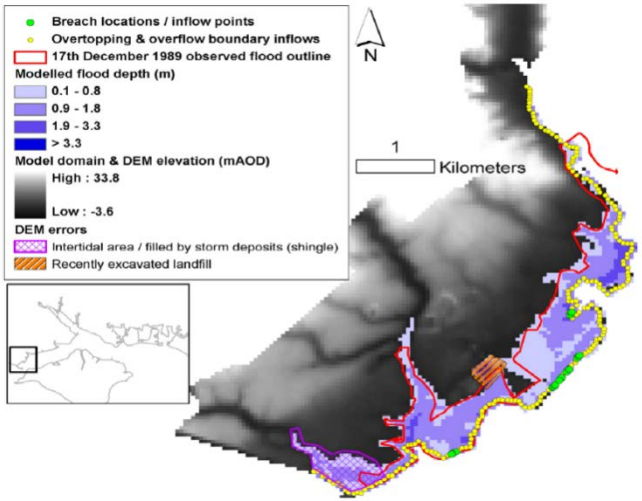




Winter Storm Xynthia, 2010, France
(Pep.per de Ré: WikiCommons)

Local impacts & costs



e.g. 1989 Flood simulation in the Solent. Wadey et al. (2012)

Prize-winning research through management of long-term coastal change via the Tyndall Simulator (North Norfolk)

EU funded project, THESEUS: inter-relatedness between human and natural systems and their exposure to flooding

Tyndall Centre for Climate Change Research

Oceanography & Morphology

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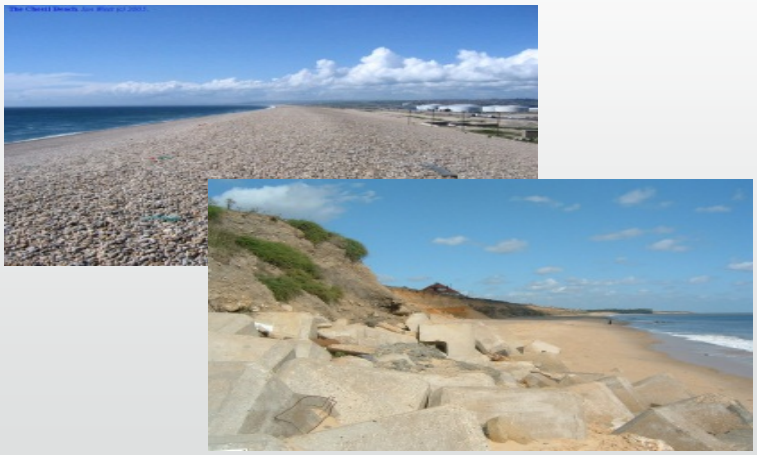
iCOASST
integrating coastal sediment systems

Universities, research laboratories, and consultants

Improve capability to predict mesoscale (10 to 100 km and 10 to 100 years) morphodynamic change in the UK

support erosion and flood risk management



Reefs & Islands

- use of satellite altimetry to investigate wave attenuation overs reefs

NATURAL ENVIRONMENT RESEARCH COUNCIL

ENVIRONMENT AGENCY

Oceanography & Morphology

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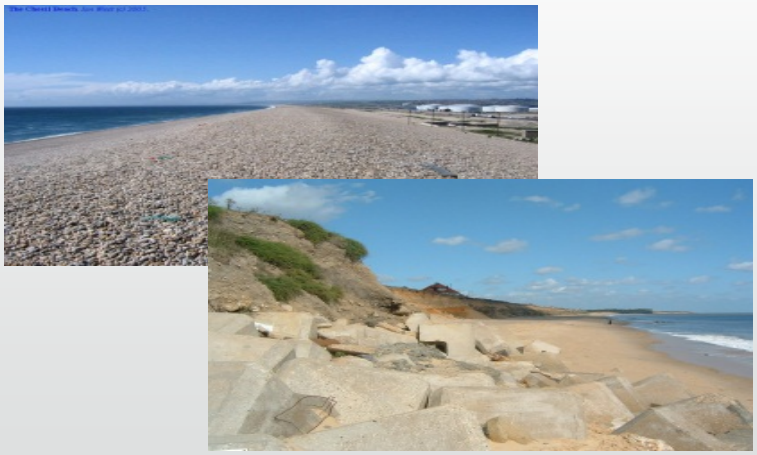
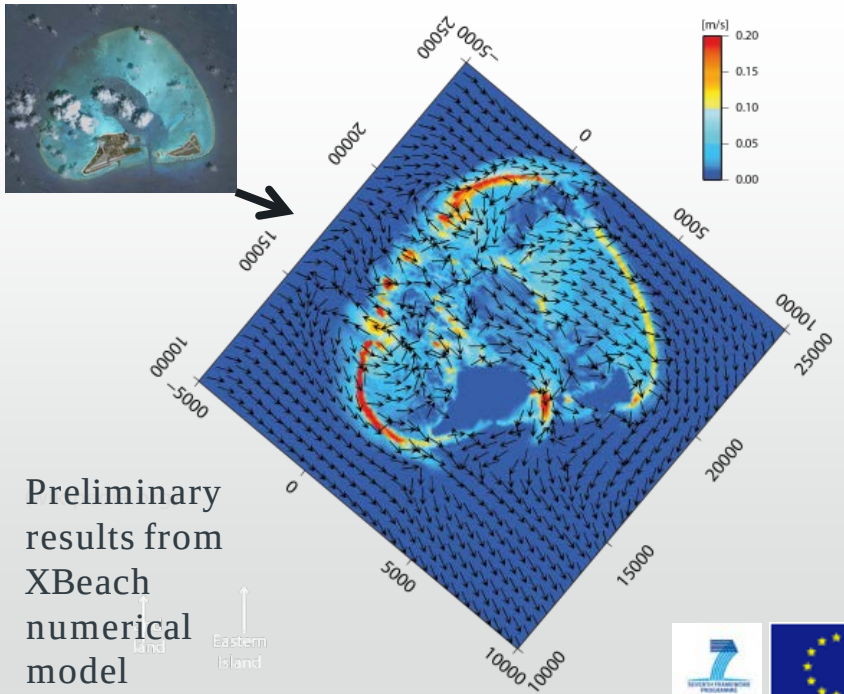


NATURAL ENVIRONMENT RESEARCH COUNCIL

ENVIRONMENT AGENCY

Reefs & Islands

- use of satellite altimetry to investigate wave attenuation overs reefs
- The effect of sea level rise and coral reef degradation on vulnerable atoll islands (e.g. Maldives)



Preliminary results from XBeach numerical model

Fluid & Sediment Dynamics

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BARDEX experiments

25 researchers, 6 international research groups

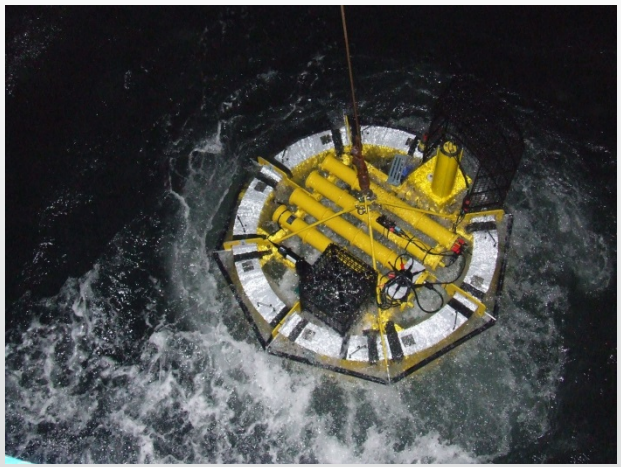
Large-scale flume experiments of barrier beach response to waves and sea-level

Coastal and Shelf Sea Resuspension

Sediment dynamics and biogeochemistry

Flume experiments : stability and nutrient fluxes of shelf sea sediments

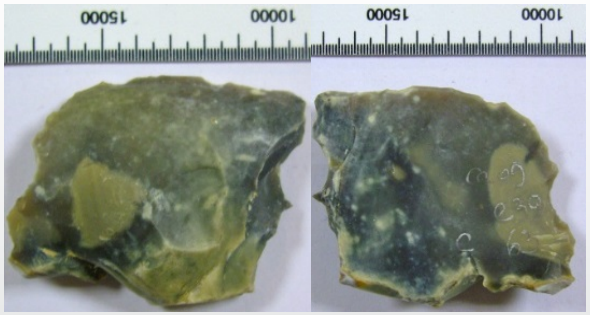
Effect of >resuspension due to storms & trawling



Micro-wear processes on submerged artifacts

Sediment dynamics, forensic science and archeology

Small-scale flume experiments investigate the impacts of mobile sediments on forensic and archaeological artifacts



>30,000 coastal archeological sites are at risk of erosion in the UK

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