

UKCP09 Marine and coastal projections summary

Introduction

The latest projections of the UK's future climate, UK Climate Projections 2009 (UKCP09), were launched on June 18th, 2009. UKCP09 represents a significant advance from its predecessor, UKCIP02. For the first time a standalone marine and coastal report is included, and marine data is included in the user interface.

The marine and coastal projection information in UKCP09 includes:

- Sea-level rise. 'Absolute' estimates of mean sea level rise are provided based on a number of international climate models. Estimates of 'relative' sea level rise, which include effects from local estimates of land uplift or subsidence, are also provided. An extreme, low probability, 'high++' sea level rise scenario is included, based on previous high sea-levels inferred from the geological record.
- Storm surges (short lived increases in the local water level above that of the tide), as well as estimates of changes in extreme high water level. Both of these are produced under a standard IPCC (Intergovernmental Panel on Climate Change) emission scenario (A1B), and for a model based on a 'high++' scenario.
- Multi-level ocean data. This includes information on water temperatures, salinity, the stability of the water column (stratification) and ocean currents around the UK.

The marine and coastal variables covered in UKCP09 are explained in more detail in our ['Key UKCP09 marine and coastal variables explained'](#) document

It is important to note some key differences between the methodology used to produce the atmospheric and marine projections in UKCP09. The atmospheric projections (including the atmosphere 'over' the sea) are based around a particular climate projection methodology that enables a probability of changes to be estimated. The marine scenarios do not attempt to quantify a probability of future changes and cruder estimates of the minimum uncertainty range are made (together with some discussion of a low probability, high impact scenario range, H++) where possible.

There are several reasons for this. Firstly, gaps in our understanding of marine processes (e.g. deep ocean mixing processes, which affect ocean circulation and mean sea level) mean that current models may not simulate the full range of possible futures. Secondly, even where we might estimate the range of possible futures there is an insufficient number of model simulations (e.g. of climate driven changes in waves) to credibly fill in the range between the projected highest and lowest values. Finally, insufficient work has been carried out in the marine community on suitable observational constraints for projections of global and local marine and coastal climate change. By the next UKCIP assessment it is hoped that progress will have been made in these areas.

Some key messages from the Marine and Coastal Projections report

Average UK temperature has risen since the mid 20th century, as have average sea level and sea surface temperature around the UK coast. Over the same time period, trends in precipitation and storminess are harder to identify.

- Projections of UK coastal absolute sea level rise (not including land movement) for 2095 are in the range from approximately 12–76 cm.
- A low probability High++ sea level range has been defined to assess vulnerability to an extreme, low probability rise in sea level rise. For the UK this absolute sea level rise estimate is 93 cm to 1.9 m by 2100.
- Around the UK the size of storm surge expected to occur on average about once in 50 years is projected to increase by less than 0.9 mm per year (not including relative mean sea level change) over the 21st century. In most locations this trend cannot be clearly distinguished from natural variability. Thus our assessment suggests that this component of extreme sea level will be much less important than was implied by UKCIP02, where corresponding values exceeded 5 mm per year in places.
- Seasonal mean and extreme waves are generally expected to increase slightly to the SW of the UK, reduce to the north of the UK and experience little change in the North Sea. There are large uncertainties especially with the projected extreme values.
- Changes in the winter mean wave height are projected to be between –35 cm and + 5 cm. Changes in the annual maxima are projected to be between –1.5 m and +1 m. Projections of longer return period wave heights will reflect the same pattern but with larger error bars.
- Seasonal stratification strength (layering of the water column which limits ‘mixing’ between surface and deeper waters) is projected to increase everywhere but substantially more in the deep seas than the shelf sea regions. It is projected to start ~5 days earlier across the whole of the UK shelf seas and breakdown ~5–10 days later across much of the region each year, hence extending the ‘stratified’ period.
- The seas around the UK are projected to be 1.5–4 °C warmer, depending on location with warming most pronounced in the Celtic, Irish and southern North Sea areas. The seas are also projected to become slightly fresher (less saline) by the end of the 21st century, particularly in the North Sea areas. The change in salinity is particularly dependent on the projected change in the storm tracks (which is not well understood) owing to the latter’s effect on precipitation.

Find out more...

The 'Marine and Coastal Projections' report details the modelling approaches used to develop the marine projections and the levels of uncertainty associated with this, along with more key messages. The report is available online at the UKCP09 website <http://ukclimateprojections.defra.gov.uk> or as a CD from the UK Climate Impacts Programme (www.ukcip.org.uk). All the data (excluding waves) are available through the UKCP09 website which also comprises a user interface and extensive guidance including worked examples illustrating how the new data can be used.

A UKCP09 Helpdesk is available on the UKCP09 site to respond to queries on the use of UKCP09. Information about the availability of training on the use of UKCP09 is available at: <http://ukclimateprojections.defra.gov.uk/content/view/1365/685/>

New developments of existing components, and additional tools and products are expected to become available over UKCP09's lifetime and the user guidance will be developed to incorporate these changes as new resources become available.

This document is adapted from an MCCIP News summary provided by Jo Sampson (Defra), Kate Lonsdale and Paul Bowyer (UKCIP) for MCCIP