

# Can we forecast the climate of the next decade?

## Walker Institute research

### Decadal predictions—the economic and social benefits would be immense

Imagine the benefits of being able to forecast the climate for the next one or even two decades.

Water companies would be able to plan and prepare better for drought or flooding. Retail companies might be able to capitalise on new markets if they thought

there was more likelihood of hot, dry summers. The insurance sector would gain more accurate information about weather and climate risks.

The examples are endless and potential economic and social benefits immense.



*Water management is one sector where decadal forecasts would be particularly useful.*

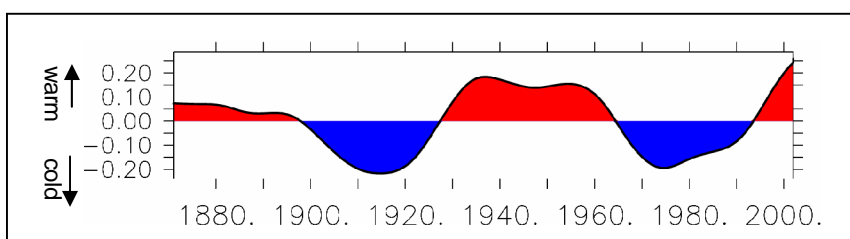
### The science is showing potential

Europe is one area where our research is showing real potential for decadal forecasts, because of the long term memory that exists in the North Atlantic Ocean.

The temperature of the North Atlantic varies naturally from colder to warmer periods over several decades. Work at the Walker Institute shows that these natural cycles are linked to changes in ocean circulation and that they influence climate over Europe and the U.S.

Potentially, we can measure the state of the Atlantic and use this information to tell us about the climate of Europe over the next 10 to 20 years. This gives us the basis for a decadal forecasting system.

In practice, decadal forecasts are probabilistic in nature. They give an indication of the chance of warmer or wetter conditions, for example.



*The North Atlantic temperature variation over the last 130 years.*

The climate of Europe over the next 20 years depends, to some extent, on the state of the Atlantic Ocean now.

This gives the potential for decadal forecasts, but climate change also needs to be factored into the picture.

## How does the North Atlantic affect climate?

The changing temperature of the North Atlantic affects climate over Europe, the U.S. and further a field. A warmer North Atlantic is linked to drier and warmer conditions over the U.S. and warmer conditions over Europe.

The North Atlantic has recently entered a warm phase, suggesting both the U.S. and Europe could be in for more hot sum-

mers, and the U.S. may be facing more summer droughts. A warmer Atlantic is also linked to a higher frequency of hurricanes.

Of course, year to year variability would be superimposed onto any decadal trend—so we could still experience cooler summers in a period where, on average, the North Atlantic is warmer than normal.



## What about human-induced climate change?

How will increasing greenhouse gases affect these naturally occurring variations in the North Atlantic? How do these naturally occurring cycles affect our forecasts of global warming?

Forecasts of man-made climate change to date have ignored information about the current state of the climate system (or “initial conditions”). These forecasts focus on longer timescales - looking out to 2050 or 2100 - by which time the influence of present climate conditions is no longer important.

Research at the Walker Institute is focusing on predicting climate for 10 to 20 years ahead. It is these time scales that are particularly relevant to business and government when considering how to adapt to a changing climate.

Our research shows that to forecast the climate for the next 10 or 20 years, we need to consider *both* increasing greenhouse gases *and* the present state of the North Atlantic and other aspects of the climate system.

To characterise the present state of the climate system, and hence improve decadal predictions, our scientists, together with the NERC Centre for Data Assimilation Research, combine Earth observations with our climate models to better reproduce the evolution of the earth system.

To generate the most accurate forecasts of climate for the next 10 or 20 years we need to take into account *both* the current state of the climate (the “initial conditions”) *and* increasing greenhouse gases.

## References

Sutton and Hodson, 2005: Atlantic Ocean Forcing of North American and European Summer Climate. *Science* 309, 5731.

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