Walker Institute
for Climate System Research

Developing the next-generation of climate models

Walker Institute research

The benefits of higher resolution climate models

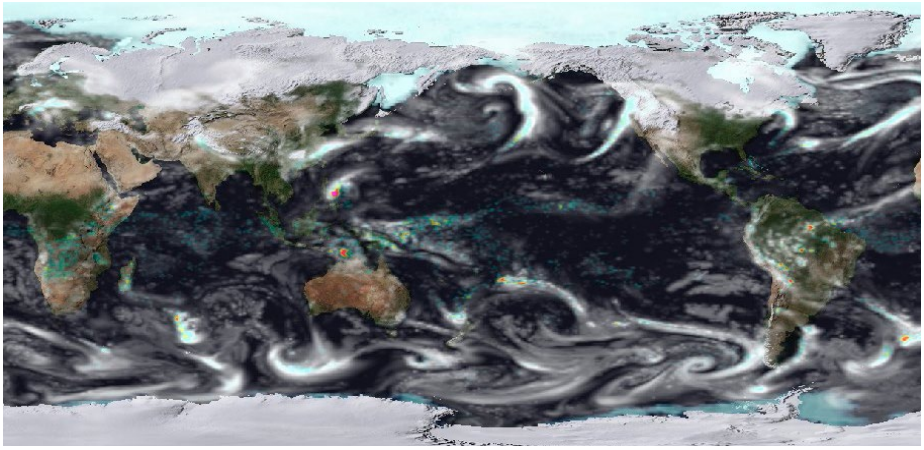
The Walker Institute aims to increase stakeholder's understanding of the climate system, extreme weather events and projected climate change, through scientifically sound, client tailored information and advice.

Improved understanding can act to reduce vulnerability to the impacts of climate-related shocks across society as a whole. Extreme weather events, such as floods, can have significant impacts and are relevant to numerous stakeholders including businesses, policymakers and development organisations.

However, the relatively course resolution of current climate models limits our ability to provide predictions of local climate change, including the statistics of extreme events and high impact weather, which are required for global and local adaptation strategies.

Scientists from the Walker Institute are leading the way in developing higher resolution global climate simulations. These climate models can resolve the weather systems, such as storms, that bring some of the greatest impacts. Climate modelling and observational studies combined are helping to improve seasonal forecasts and climate change projections both of the mean climate and climate extremes.

This work is led by scientists from the climate directorate of the National Centre for Atmospheric Science as part of the NERC High-Resolution Climate Modelling programme, working with the UK Met Office and other partners.



Our high resolution climate models are simulating climate with unprecedented detail.

Building better models with higher resolution and improved use of observations will allow climate prediction to be improved on all time scales.

These improvements in climate modelling are heavily reliant on the computing power provided by supercomputers, such as the Earth Simulator in Japan.

National Centre for Atmospheric Science
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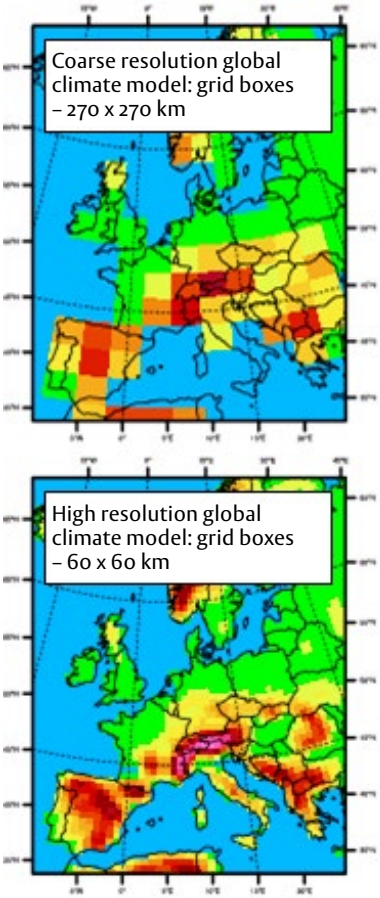

Greater computing power allows much higher model resolution and vastly improved spatial detail.

World-leading simulations of climate using supercomputing power

We collaborate with the UK Met Office, the Natural Environment Research Council's National Centre for Atmospheric Science and other research centres to access some of the most powerful supercomputers in the world. Our work to develop climate models at unprecedented levels of resolution is only possible through such collaboration and the growing power of computers.

We work with groups at Japan's Earth Simulator Centre and the University of Tokyo to run climate simulations on the Earth Simulator computer - a highly parallel vector supercomputer capable of 40 Teraflops (40,000,000,000,000 numerical operations per second!)

Our scientists also have access to the HERMIT supercomputer in Stuttgart, Germany (as part of the EU Partnership for Advanced Computing in Europe) and we have access to the UK Research Council high performance computer. HERMIT is a top class (petaflop and beyond) supra-national European high-performance computing facility. Working with the UK Met Office through the NERC Joint Weather and Climate Programme (JWCRP) a series of simulations will be carried out on HERMIT at 25km horizontal resolution to study future climate. Current coarse resolution climate models typically have a resolution of order 200km, so 25km represents a major step forward in our ability to simulate the regional and local processes that bring extreme events such as floods and droughts.

Improving climate prediction on all time and space scales

Climate models divide the atmosphere, ocean and other components into a grid of boxes. The smaller the box, the more spatial detail is represented, but the more computing power is required.

Our access to greater computer power means that we can run global climate simulations with much finer resolution than ever before. As a consequence, we are now able to the study weather systems and extreme weather events, such as tropical cyclones, wind storms, droughts and heatwaves, in global climate models – a major step for climate science.

Weather systems are the building blocks of climate. So, improving the representation of weather in global climate models will lead to improved climate prediction on all time and space scales.

Using these high-resolution simulations, climate scientists at the Walker Institute are addressing important questions, such as the impact of climate change on the location, frequency and severity of potentially catastrophic weather events. This research will allow the Walker institute to provide our stakeholders with more relevant climate information.

For more information, please contact:

Kathy Maskell

Walker Institute
Communications Manager
University of Reading
Agriculture Building
Earley Gate
Reading RG6 6AR, UK

k.maskell@reading.ac.uk
Tel +44 (0)118 378 7380

www.walker-institute.ac.uk

This work is led by:

Prof Pier Luigi Vidale

National Centre for Atmospheric Science – Climate Directorate and Department of Meteorology

p.l.vidale@reading.ac.uk

climate.ncas.ac.uk/HRCM

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