Impact: NERC and the Met Office in partnership

The Met Office is a world leader in weather and climate forecasting and is projected to deliver £56 billion of UK benefits over the next decade

Long-standing NERC investment in research, observations, infrastructure and training, in partnership with the Met Office, has played a crucial role in this success

UK benefits worth £56 billion

- More resilient communities and businesses
- Avoided costs, harm, disruption
- Less pressure on public services and infrastructure

"Partnership with NERC is key to the value we deliver"
Simon Vosper, Met Office Director of Science

Partnership outcomes

Cutting-edge science
Including long-term observations e.g. ocean conditions, and advances in modelling e.g. atmospheric chemistry, that together deliver more accurate simulations of the weather and climate system

World-class digital capability
Including joint high performance computing capable of complex climate simulations, and breakthroughs enabling faster and more efficient model calculations

Skilled people
Including weather and climate scientists and scientific software engineers

Powering the Met Office's world-leading services

Impacts

More accurate weather forecasts and climate predictions
e.g. winter conditions can now be predicted 1-3 months ahead, climate change can now be modelled for UK regions

Climate change decision support tools
Providing detailed, localised information to support planning and adaptation e.g. UK Climate Projections, Local Authority Climate Service

Space weather forecasts
Providing early warning of extreme space weather events that can disrupt critical infrastructure e.g. power grids, satellites, aircraft

More information on the outcomes of NERC funding and Met Office partnership

"Partnership with NERC is key to the value we deliver. It enables us to continue improving our service by tackling the biggest scientific challenges, and to draw on the latest science when providing climate advice to government and industry customers". Simon Vosper, Met Office Director of Science

Examples of cutting-edge science outcomes

Improvements to the Met Office Unified Model, which is the basis for weather and climate predictions:

- Atmosphere-land interactions: the world-leading Joint UK Land Environment Simulator (JULES) model is the core terrestrial component of the Unified Model. Developed by the UK Centre for Ecology and Hydrology (UKCEH), Met Office and partner universities, JULES simulates flows of energy, water, carbon and nitrogen between the land, atmosphere and soil at different timescales
- Atmospheric chemistry: atmospheric aerosol particles have a substantial effect on climate. The Global Model of Aerosol Processes (GLOMAP) was developed by the University of Leeds and replaced a much simpler earlier aerosol model
- Atlantic ocean and jet stream conditions: a global ocean model co-developed by the National Oceanography Centre and the Met Office substantially improved predicted sea surface temperatures, delivering unprecedented forecast accuracy for the North Atlantic and Arctic Oscillations and enabling prediction of mean winter conditions 1-3 months ahead
- Sea ice: a more accurate representation of how the atmosphere interacts with sea ice delivered more realistic predictions for wind, te mperature and humidity in the lower atmosphere which improved the accuracy of weather and climate forecasts. Developed by the University of East Anglia in collaboration with the Met Office
- Urban heat: the MO-Reading Urban Surface Exchange Scheme (MORUSES) models how buildings exchange heat with the atmosphere. Co-developed by the University of Reading and the Met Office, it has enabled more accurate urban heatwave predictions and is improving the capability of city authorities to plan for future climate change

Other science outcomes:

- Flooding: the Flood Forecasting Centre, a partnership between the Met Office and the Environment Agency, uses UKCEH's Grid-to-Grid model to provide near real-time detailed forecasts which enable communities, authorities and businesses to prepare for flooding
- Space weather: the Met Office, which owns space weather risk on behalf of the UK government, uses the British Antarctic Survey's radiation belt model and British Geological Survey data on geomagnetism and geomagnetically-induced electrical currents in its space weather forecasting and nowcasting system

Examples of world class digital capability outcomes

- Monsoon2: high performance computer capable of complex climate simulations, enabling joint NERC -Met Office work on modelling challenges such as the representation of aerosols and ozone, the prediction of storms and increasing the resolution of climate models
- Faster model calculations: novel multigrid solvers developed by the University of Bath with the Met Office reduce average model runtime by 13%, enabling higher resolution forecasts and better utilisation of computer resources, saving the Met Office an estimated £300k per year
- Faster data refinement: a new method for estimating observation error statistics developed by the University of Reading in partnership with the Met Office has increased the accuracy of forecasts and the cost-effectiveness of observations without loss of computational efficiency
- Faster data processing: new ways of structuring peta-scale environmental datasets developed by the University of Reading, the National Centre for Atmospheric Science and partners have been replicated by the Met Office and underpin weather and climate research

Investing for the future

The partnership continues to push the boundaries of weather and climate science, and to develop new tools for governments, businesses and communities. Recent joint investments include the UK National Climate Science Partnership, the UKRI Strategic Priorities Fund Climate Resilience, Clean Air and SWIMMR (space weather) programmes, and a digital twin programme (TWINE).