METEOROLOGY
Research Excellence in weather and climate

DEPARTMENT RESEARCH CENTRES

Walker INSTITUTE

The Walker Institute pulls together many of the research activities in the Meteorology department and elsewhere within the university. Its focus has been on climate change and its impacts on fields ranging through Water, Agriculture, the Built environment, Energy, Biodiversity, Soil and Land, and Socio-economics. Current areas of focussed activity include Africa, Climate over the next 30 years, and Extremes and Variability. The Institute provides independent advice to government on many aspects of climate change impacts and it has made leading contributions to the Impacts chapter of the IPCC.
www.walker-institute.ac.uk

Institute for Environmental Analytics

The IEA is a commercially-focused centre of excellence, supporting the development of the environmental Big Data analytics market.

Working in close partnership with partners and clients undertaking pre-commercial R&D and development of proof-of-concept demonstrators across five sectors: Agri-food, Insurance & financial services, Infrastructure, Logistics, Utilities. Bridging the gap between world-leading scientific expertise in research and commercial applications delivered by industry.

The IEA is designed to be responsive and geared to delivering short near-market, applied projects. Find out more, including details of environmental data analytics training courses:
www.the-iea.org

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

The National Centre for Earth Observation (NCEO) is a research centre of the Natural Environment Research Council, embedded in several UK Universities. The Directorate of the Data Assimilation Division and several scientists of the Earth Observation and Model Evaluation Division are based in the Reading Meteorology Department. Its objectives are the assessment, combination and synthesis of (satellite) Earth Observation data with numerical models using state-of-the-art data assimilation techniques in order to understand the functioning of the Earth system, reproduce its evolution, and to forecast its behaviour.
www.nceo.ac.uk

National Centre for Atmospheric Science
NATURAL ENVIRONMENT RESEARCH COUNCIL

The Natural Environment Research Council supports the National Centre for Atmospheric Research (NCAS) embedded in several UK Universities. NCAS-Climate and NCAS-CMS (Computational Modelling Services) are based in the Reading Meteorology department. Together they support ~60 active research staff focussed on analysis and understanding of the processes that govern climate variability and change and how to numerically model them in General Circulation and Earth System models. A particular focus is on understanding and presenting uncertainties associated with climate change predictions. NCAS works closely with the Met Office on all aspects of model development and predictions.
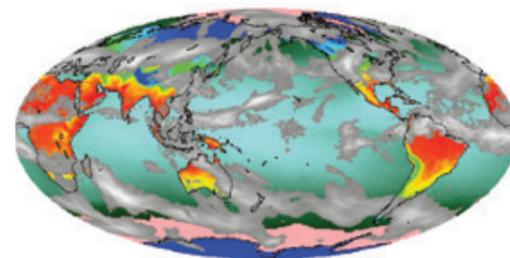**www.ncas.ac.uk**

Met Office

The department has excellent collaboration with the Met Office and is part of the Met Office Academic Partnership (MOAP). Many collaborations exist with the broader Met Office but there is a particularly close relationship with around 25 Met Office scientists hosted in the department collectively known as MetOffice@Reading.

A key feature of the work of MetOffice@Reading is the development and use of the Met Office's weather forecast and climate model at convective-scale. This includes work on assimilation of high-resolution data from a wide range of sources, advanced nowcasting research, and research into predictability and verification of small-scale weather phenomena. Major applications of this work include forecasting of severe convective precipitation and urban weather such as flash-flooding, heat-waves and fog. Work on data assimilation extends to the assimilation of new satellite data into the global forecast model.

MetOffice@Reading members also collaborate with the department on numerous aspects of climate science, including monitoring, attribution and prediction.
www.metoffice.gov.uk

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METEOROLOGY

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Athena SWAN Silver Award

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What we aim to do in our research

The department's research broadly groups into research themes identified as Weather, Climate, and Earth Observation. Our research is aimed at improved understanding and modelling of fundamental Earth system processes involving the Atmosphere. Our research helps to improve socio-economically valuable weather and climate forecasts over a wide range of lead times, for example:

• short-lead urban air quality forecasts

• forecasts of floods

• the development of mid-latitude depressions over several days

• seasonal and longer range climate forecasts used for agriculture

• energy

• financial services and climate-change projections for the 21st century

Research Collaboration

Our scientists collaborate extensively in cross disciplinary research within the University and also outside. The Centre for Past Climate Change is part of the School of Archaeology, Geography and Environmental Science. The Reading e-Science Centre focusses on visualisation of environmental data and works closely with the School of Systems Engineering. We have industrially sponsored partnerships with Willis Research Network and BMT, focussing on the Energy sector, Agriculture and Marine meteorological services. We work with the European Space Agency providing scientific leadership for the EarthCARE Explorer mission and for the Climate Change initiative programme on satellite sea surface temperature records. We also have many collaborations with the European Centre for Medium-Range Weather Forecasts (ECMWF) based nearby in Reading, as well as with other national weather and hydrological services around the world. Our scientists often advise government and provide extensive input to programmes such as the IPCC.

Funding

The gross research income of the department and research centres exceeds £11 million per year. This is obtained mainly through our successful bidding and participation in both national and international research projects and programmes. National support comes from government agencies such as NERC and the Met Office. International support comes from agencies such as the European Union and the European Space Agency. In addition we provide consultancy for industry, such as the agriculture, insurance, reinsurance, space, defence and transport industries.

Research Methods and Facilities

Our world-leading research includes

• atmospheric processes and measurements

• regional weather

• climate variability and predictability.

It is firmly based on our deep understanding of the fundamental physical and mathematical principles that govern the dynamics of the Earth's atmosphere and oceans.

NERC Satellite Receiving Station, Dundee University, Scotland www.sat.dundee.ac.uk

We use a hierarchy of models to understand key processes in the physical climate system. These include advanced state-of-the-art weather and climate prediction models, simpler numerical process models and powerful conceptual models. Our staff have access to the latest versions of the Met Office Unified Model used for operational weather and climate change forecasts. In addition, we use the Met Office Large Eddy Model to perform more detailed high-resolution simulations of boundary-layer processes, clouds and convection. The large amount of supercomputer time needed to run these models is provided by access to national high performance computing facilities. The department uses a specially designed local computer cluster for large data storage and processing of model and satellite data products.

The Atmospheric Observatory was refurbished in 2012 and hosts many new meteorological instruments, e.g. a new Cloud Lidar, and the department also runs an Urban Data observatory atop the BT tower in London. The modern laboratory includes a wind tunnel, used to study pollution dispersion and airflow over urban areas. We also make extensive use of measurements from specialized ground-based and plane-based systems, including the Chilbolton radar remote-sensing facility in southern England and the FAAM aircraft, which is used in atmospheric research campaigns, e.g. to study extreme weather events that can lead to flooding. In addition, we have access to global observation and analysis products from weather forecasting centres such as the Met Office and ECMWF. Our expertise in advanced data analysis and assimilation allows us to get maximum information from all these data.

THE DEPARTMENT OF METEOROLOGY

We are one of the largest and most renowned university departments of meteorology in the world. In addition to receiving the highest national grades for our unique and comprehensive range of undergraduate and postgraduate teaching, we have always achieved the highest possible rating in UK Research Assessment Exercises, ranking 3rd in 2014 for Research Power within the whole Earth Systems and Environmental Sciences area. We have around 50 Academic staff, 110 other research staff and 70 PhD students, pursuing research in many areas of Atmospheric and Climate Science, including air quality, oceanography, sea ice physics, hydrology, carbon cycle physics, space weather, earth observation and data assimilation.

The department hosts the Walker Institute for Climate Change, focussing on the impacts of climate change, as well as the National Centre for Atmospheric Sciences, NCAS-Climate, and a substantial number of staff within the National Centre for Earth Observation, NCEO. These are NERC-funded institutes, described in more detail on the back cover. The department is part of the Met Office Academic Partnership, and hosts a substantial number of Met Office staff. We therefore play a central role coordinating and collaborating with atmospheric and climate research activities in other UK universities. The department is part of the School of Mathematical and Physical Sciences and it works closely with applied mathematicians on subjects such as Data Assimilation theory.