Meteorology and Climate

Researchers within this area have a unique international reputation for a broad range of pure and applied atmospheric research, including significant knowledge transfer to the international meteorological market place. Modeling is a particular strength of the group from small scale street canyon turbulence models (used for revealing the key mechanisms that affect urban climate and pollution level) to global circulation models (used for predicting future climate change). These models are used to quantify the impact of weather and climate on the economy, society, and the built environment.

Researchers in the group work extensively with other areas of the school and there are many collaborative research links across the **Environmental Health Sciences (/research/activity/environmental-health/index.aspx)**, **Geosystems (/research/activity/geosystems/index.aspx)** and **Water Sciences (/research/activity/water/index.aspx)** research themes.

There are presently four key areas of research within the group:

Open all sections

Urban climatology

The study of urban areas is a key area of research across much of the school and forms a significant component of atmospheric research. The School of Geography, Earth and Environmental Sciences (GEES) is home to the **Birmingham Urban Climate Laboratory (/schools/gees/centres/bucl/index.aspx)**, a unique network of over 200 air temperature sensors and 30 weather stations across the city. The laboratory is the centrepiece of urban climatological research in the school and is used to quantify the impact of the urban heat island (UHI) effect in Birmingham and beyond.

Modelling research in this area includes meso-scale modelling of UHI and large-eddy simulations of turbulent flows in the urban atmospheric boundary as well as smaller scale urban canyon processes. There are many collaborative projects in this area evaluating the impact of urban heat on human health and air pollution which requires the coupling of chemistry and turbulence models at both the city scale and the street scale.

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Infrastructure meteorology

Weather forecasting and climate prediction for industry is a major strength of the group. A portfolio of projects exist between the group and colleagues in civil engineering which look at the impact of weather and climate on infrastructure, often with the long-term aim of making hard infrastructure more resilient to the future effects of climate change. Examples of work include novel forecasting for road and rail networks (e.g. winter road maintenance, railway buckling), investigating the impact of urban heat on electricity supply and demand and assessing the impact of climate change on surface transportation networks.

Key Staff: **Dr Lee Chapman (/staff/profiles/gees/chapman-lee.aspx)**, Professor John Thornes

Extreme events

Other applied research investigates meteorological and climatological extreme events with the estimation of natural hazards damage potentials. Examples of ongoing work include the analysis of storm tracks and associated impacts for the insurance industry and the impact of heat waves in urban areas for use by city planners.

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Associated project: **Extreme Events Variability over Europe (EVE) (/research/activity/environmental-health/projects/extreme-events.aspx)**

Past and future climate change

This collaborative research with the Geosciences Group includes numerical modelling of past global climates, analysis of proxy data, statistical downscaling (in order to derive regional climate change from large-scale changes), as well as regional climate modelling. Combining these methods leads to innovative, statistically rigorous consistency tests between climate simulations and proxy data, which are needed for reducing uncertainties in climate reconstructions as well as for testing climate models that are used for predicting future climate change. Geoengineering solutions, hydroclimatology and teleconnections across Europe and North America are also being investigated.

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