

# Hottest days in some parts of Europe have warmed four times more than the global average

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Some of the hottest days and coldest nights in parts of Europe have warmed more than four times the global average change since 1950, according to a new paper by researchers from the Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science and the University of Warwick, which is published today (11 September 2013) in the journal *Environmental Research Letters*.

The researchers translated observations of weather into observations of [climate change](#) using a gridded [dataset](#) of observations stretching back to 1950. The hottest 5 per cent of days in summer have warmed fastest in a band from southern England and northern France to Denmark. By contrast, the average and slightly hotter than average days have warmed most in regions further south in France and Germany. In eastern Spain and central Italy there has been broad warming across all types of days, but in most places those days which are cooler than average have not warmed so much.

The paper points out that some locations and temperature thresholds have seen little change since 1950. The authors suggest that the results highlight the scale of the difference between [global change](#) and the local climate changes felt by individuals.

Dr. David Stainforth, the lead author on the paper, said: "Climate is

fundamentally the distributions of weather. As climate changes, the distributions change. But they don't just shift, they change shape. How they change shape depends on where you are. In Britain, climate change will feel very different if you live in Northumbria to if you live in Oxfordshire; different again in Devon."

He added: "Our results also illustrate that the international goal of limiting the increase in global [average temperature](#) to 2°C would involve far greater changes for some places and for some aspects of climate, and therefore for particular individuals, communities and industries."

This paper presents maps of the [changing shape](#) of such climatic distributions for summer and winter, daytime and night-time temperatures, across Europe. It uses a new method developed by this interdisciplinary team and reported in a paper by the same authors which was published in the journal '*Philosophical Transactions of the Royal Society*' earlier this year.

Professor Sandra Chapman, another author of the paper, said: "It is common to discuss climate change in terms of changes in global average temperatures but these can be far from people's perceptions of climate change. The results in this paper begin to provide a picture of how local climate has been changing across Europe. It is a picture which is closer to that experienced by individuals."

Dr. Stainforth described the relevance of the work: "Changes in local climate pose challenges for decision makers across society not just when preparing for the climate of the future but even when planning for the climate of today. We need to design buildings so that they don't overheat, decide which are the best crops to plant, and even plan for variations in large scale productivity. These would all benefit from knowledge of how the climate distribution has changed at particular locations. This work begins to provide such information."

The authors expect the research to be of great value for 'climate services', the provision of information which helps organisations prepare for a climate which is already different from the past and will inevitably change more in the future. The World Meteorological Organisation and many national organisations, such as the UK Met Office, are investing substantially in the provision of such information.

In addition to their value for planners making climate sensitive decisions, these results should help researchers understand the way large scale changes in climate can be related to changes at local scales. As part of that process they will provide a valuable reality check when evaluating the results of complicated computer models of the [climate](#) system.

The paper also present the results for changes in the frequency of nights which fall below freezing in winter and days which rise above 28 degrees in summer. These are two thresholds which are important for many impacts such as the availability of snow in ski resorts, building design, and labour productivity.

Other regional highlights from the paper include:

- A band from southern England / northern France, across the low countries and northern Germany, to Denmark has experienced the greatest increase in temperatures in the hottest summer days. In this band, the hottest 5 per cent of days have got hotter by more than 2°C in many places.
- The region of greatest change in average summer daytime temperatures is further south in central France and Germany.
- Most regions of Europe have seen little change in the temperatures of the coolest summer days although in eastern Spain and central Italy these days have warmed along with all other types of summer days. Average temperature days in these regions of eastern Spain and central Italy have warmed by more

than 2°C in many locations.

- The results show little warming in summer daytime temperatures for most locations in Norway and Sweden, for all types of summer days – hot, average and cool.
- In Europe, the coldest 5 per cent of winter nights have warmed most in eastern France, western Germany and Belgium where changes of over 2 or even 2.5°C are not uncommon. The coldest 5 per cent of winter days have not changed as much in these regions but in northern Italy and the Balkans changes of over 1.5 or 2°C are seen in the data.
- In Spain and much of Italy there has been little change in winter night time temperatures of all types – warm, average and cool.
- In Norway and Sweden many regions have seen large (> 2°C) changes in winter night time temperatures for average and colder than average nights. Warmer than average nights in this region have warmed less.
- In the United Kingdom the frequency of nights which fall below zero has decreased most substantially in the north east where reductions of at least 10 per cent are seen in the observations for some locations.

**More information:** 'Mapping climate change in European temperature distributions', *Environmental Research Letters*, 2013.

Provided by University of Warwick

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