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Press release

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Research projects
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Atmospheric circulation patterns contribute to extreme weather events

The sharp increase in heatwaves in southern Europe in recent years is not only due to the greenhouse effect. Climate change has made a particular type of atmospheric circulation pattern more common, and this has contributed to extreme weather and been the underlying cause of nine out of ten heat-related deaths. This is according to a new study by researchers from Uppsala University and CNRS in France.

Peer-review/Data/Statistical analysis.

“So far, there has been relatively little research on how changes in atmospheric patterns in our current climate affect the occurrence of extreme weather events, and how those in turn affect society. The fact that these circulation patterns leading to extreme weather in Europe have become much more common is both surprising and worrying,” explains Gabriele Messori, Professor of Meteorology at the Department of Earth Sciences at Uppsala University and one of the researchers behind the study.

Climate change affects all aspects of the climate system. It is relatively easy to measure the ongoing increase in temperatures and its effects. However, understanding how climate change affects atmospheric circulation, i.e. the large-scale air movements such as winds that determine weather patterns, has been a long-standing challenge for climate scientists.

In this study, researchers at Uppsala University, together with colleagues from the French CNRS, show how atmospheric circulation patterns that cause heat waves in Europe and more frequent storms in the north of the continent have become increasingly common in recent decades. During the summer, these circulation patterns reduce the supply of cool air from the North Atlantic to Europe. During the winter, they enable several Atlantic storms to reach the continent.

Over nine out of ten deaths due to extreme heat waves occurred during these increasingly common atmospheric circulation patterns. The same applies to more than a third of the severe windstorms in Europe.

“Even with our current climate, this is contributing to extreme weather events. With global warming on the horizon, even greater impacts can be expected. Changes in circulation must therefore be taken into account when trying to explain extreme events through climate change, for example,” notes Messori.

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