

# Expect more extreme short-duration thunderstorms caused by global warming

March 3 2021

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Climate experts have revealed that rising temperatures will intensify future rainfall extremes at a much greater rate than average rainfall, with largest increases to short thunderstorms.

New research by Newcastle University has shown that warming temperatures in some regions of the UK are the main drivers of increases in extreme short-duration rainfall intensities, which tend to occur in summer and cause dangerous flash flooding.

These intensities are increasing at significantly higher rates than for winter storms. A study, led by Professor Hayley Fowler, of Newcastle University's School of Engineering, highlights the urgent need for climate change adaptation measures as heavier short-term rainfall increases the risk of flash flooding and extreme rainfall globally.

Publishing their findings in the journal *Nature Reviews Earth & Environment*, the international team analyzed data from observational, theoretical and modeling studies to examine the intensification of rainfall extremes, what drives these extremes and the impact on flash flooding.

The scientists found that rainfall extremes intensify with warming, generally at a rate consistent with increasing atmospheric moisture, which is what would be expected. However, the study has shown that temperature increases in some regions affect short-duration heavy rainfall extremes more than the increase in atmospheric moisture alone, with local feedbacks in convective cloud systems providing part of the answer to this puzzle.

Professor Fowler said: "We know that climate change is bringing us hotter, drier summers and warmer, wetter winters. But, in the past, we have struggled to capture the detail in extreme rainfall events as these can be highly localized and occur in a matter of hours or even minutes.

"Thanks to our new research, we now know more about how really heavy rainfall might be affected by climate change. Because warmer air holds more moisture, rainfall intensity increases as temperatures rise.

"This new work shows that the increase in intensity is even greater for short and heavy events, meaning localized flash flooding is likely to be a more prominent feature of our future climate."

## Management of surface water flooding

The findings are also highlighted in a Philosophical Transactions A issue on "Intensification of short-duration rainfall extremes and implications for flash flood risks" by the Royal Society, which was published on 1 March.

It is unclear whether storm size will increase or decrease with warming. However, the researchers warn that increases in rainfall intensity and the footprint of a storm can compound to substantially increase the total rainfall during an event.

In recent years, short but significantly heavy rainfall events have caused much disruption across the UK. Recent examples include severe flooding and landslides in August 2020 and damage to the Toddbrook Reservoir, in the Peak District, in August 2019.

Information about current and future [rainfall intensity](#) is critical for the management of surface water flooding, as well as our guidance for surface water management on new developments and sewer design.

**More information:** Hayley J. Fowler et al. Anthropogenic intensification of short-duration rainfall extremes, *Nature Reviews Earth & Environment* (2021). [DOI: 10.1038/s43017-020-00128-6](https://doi.org/10.1038/s43017-020-00128-6)

Provided by Newcastle University

Citation: Expect more extreme short-duration thunderstorms caused by global warming (2021, March 3) retrieved 11 May 2024 from <https://phys.org/news/2021-03-extreme-short-duration-thunderstorms-global.html>

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