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This is the world's hottest autumn on record – and it's impacting the climate system and human society

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We are still getting used to a “new normal” of devastating summer heatwaves. But the effects of a warming climate are being felt throughout the year, and recent autumn months have been further off the charts than ever.

In fact, climate change and an El Niño have both contributed to the world in 2023 having its hottest autumn since records began in 1850. September was 0.93°C above the 1991-2020 average, and a whole 1.75°C above the 1850-1900 pre-industrial reference period. October was also the hottest on record, at 0.85°C above the recent average.

This hot autumn has already meant stronger storms and more intense rainfall and droughts. And this in turn affects farming, energy, tourism and other sectors that depend on reliable seasons.

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September smashes monthly temperature record:

Earth had the hottest September on record – and by a record-breaking margin, according to a leading international dataset used in our [#StateOfClimate](#) reports.

 public.wmo.int/en/media/news/...

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A global system but local effects

Warmer oceans have been linked to intensification of storms in the Atlantic. One of these, Storm Babet, recently broke UK rainfall records dating back to 1881. Babet was soon followed by Storm Ciarán, bringing more extreme winds and heavy rainfall to still-saturated lands.

The UK is no stranger to Atlantic storm systems, but they primarily occur during the winter months. The fact that these severe storms are occurring in autumn is unusual.

Partly this is because an abnormally warm Atlantic Ocean is generating stronger storms (in 174 years of data, August and September 2023 were the two months where sea surface temperatures were furthest above the long-term average). Warmer oceans release more moisture into the atmosphere and carry more energy which effectively acts as fuel for storms.

When the tropical Atlantic is warm, storms generated there also change direction, tending to track northward across the ocean before bending to the east. In future, warmer autumns are likely to mean more of these storms sustaining themselves across the Atlantic to hit Western Europe.



Fishing boats in India drop anchor and await Cyclone Tej. EPA-EFE/DIVYAKANT SOLANKI

Storms are getting stronger elsewhere too. Hurricane Otis recently devastated the Mexican city of Acapulco, for instance. Otis developed from a regular storm into a huge hurricane in record time, and was the first time in history that a hurricane in the Eastern Pacific made landfall and sustained itself as the strongest “Category 5” storm. Tropical Cyclone Tej hit the Arabian Peninsula the week before with 480mm of rainfall in the Al-Ghaydah region in Yemen – eight times the annual average.

Problems for farms and energy generation

In unusually warm autumns, extended periods of heat and low rainfall can impact late-season crops such as apples, pears, berries and brassicas. In November 2022, warm and dry weather resulted in the early emergence of some winter crops across many European regions. In 2022, China experienced a shock to its autumn yields of wheat and some vegetables following an extended period of drought and elevated temperatures into the Autumn harvesting season.

Energy generation is also increasingly vulnerable to autumn heat. In 2022, a warm autumn meant Europeans used less natural gas for heating, and instead used electricity for cooling. Drought adds a compounding challenge, as less power can be generated through hydroelectric dams, while less reliable reservoir levels make it harder to schedule generation in advance to coincide with periods of peak demand. In late summer and autumn last year in France, rivers became so warm they were less able to cool down nuclear reactors.

Autumn as the new summer?

Tourism is just as vulnerable to unseasonal temperatures. While numbers are often dictated by external factors such as school holidays, extreme summer temperatures will increasingly see people going away in spring and autumn instead.


 White church surrounded by autumn coloured trees

Colourful autumn in New England. Don Landwehrle / shutterstock

Yet even autumn destinations are finding things are changing. New England in the US is known for its spectacular colourful trees at this time of year, yet warming conditions are changing the timing and vibrancy of its leaf fall. Autumn heat variation could impact the volume of visitors, threatening a billion dollar tourism industry.

Something similar is being observed in Japan, where leaves are staying on trees until later in the year. This can create further hazards, as when trees have more leaf surface area they're more exposed to destructive wind storms.

These are just some of the effects of an unusually warm autumn, even by current standards. But with summers being extended and more storms and extreme weather in the autumn months seemingly the new norm, we need to start rethinking what weather we can expect at this time of year.

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