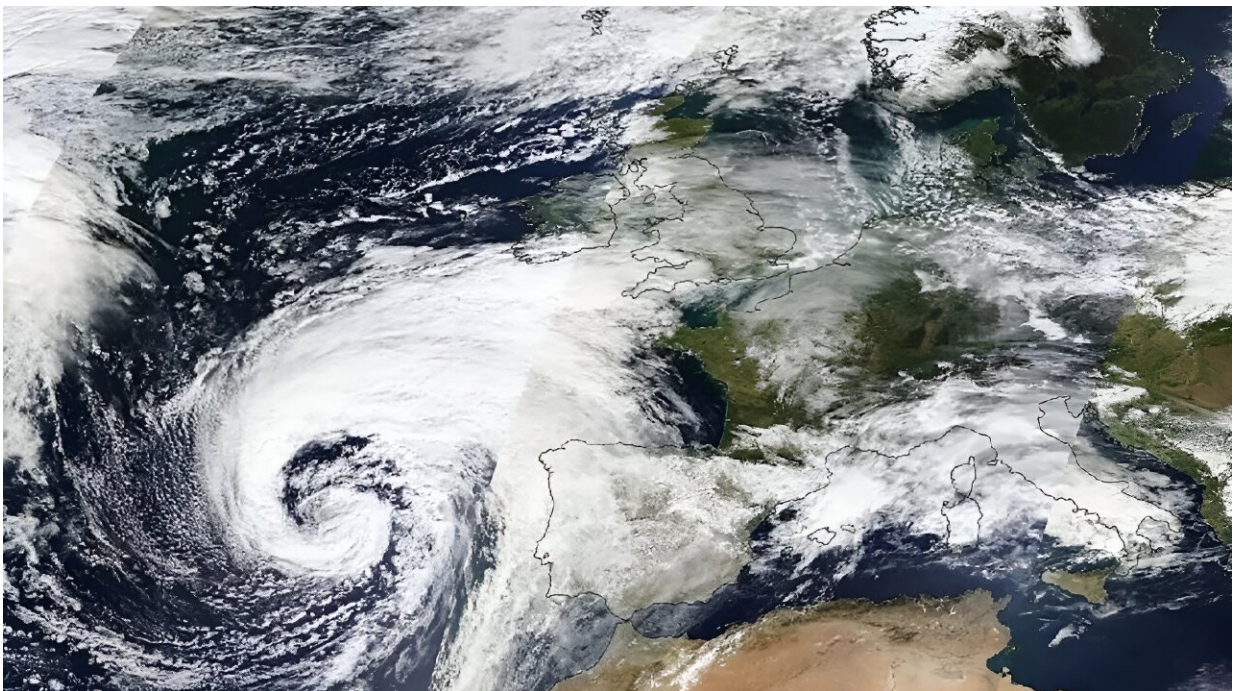


Storm Babet caused dangerous floods as the 'dry side' of Scotland isn't used to such torrential rain

October 23 2023, by Linda Speight



Babet off the coast of Portugal on October 16, the day it was named. Credit: NASA / EOSDIS

Storm Babet has caused havoc across the UK, with strong winds and [rough seas](#) along the east coast, record breaking rainfall and [river levels](#) in Scotland, [overtopped flood defenses](#), closed roads and railways and

sadly at least [two deaths](#). The impacts are not over as further rain is expected.

The risk was clear well before the event. Storm Babet was [officially named](#) by the UK Met Office on Monday October 16 and a rare [red weather warning](#) was issued on the Wednesday, 32 hours before the heaviest rain started.

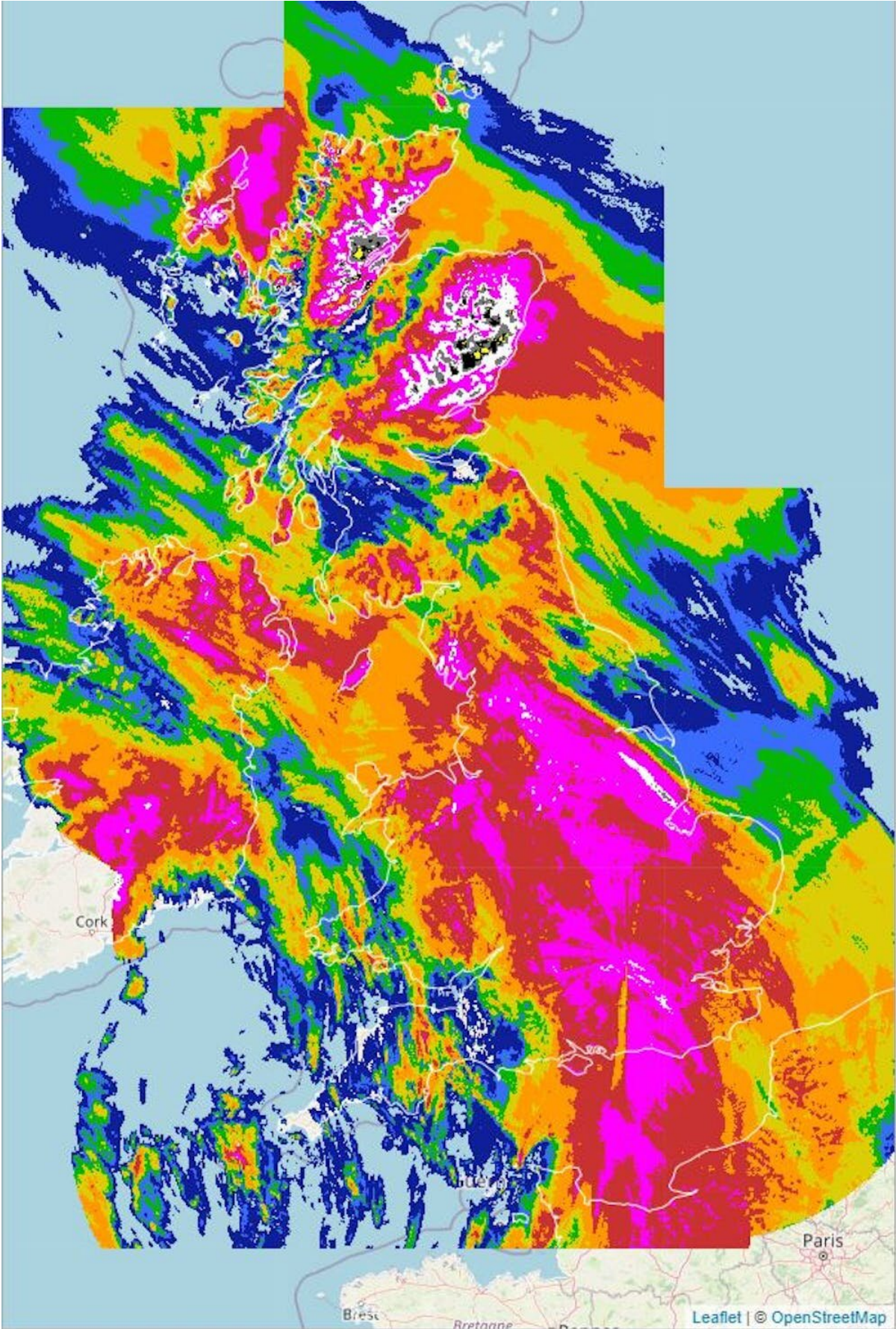
Red weather warnings are [used by the Met Office](#) to communicate [extreme weather events](#) that pose a risk to life. This was only the fourth time a red [warning](#) had been issued for rainfall.

The Scottish Government's Resilience Operation was [activated](#), [flood defenses were closed, roads and bridges](#) shut, households evacuated and emergency rest centers opened. These advance warnings undoubtedly kept many people safe.

How did forecasters know it was coming?

Meteorologists were tracking the storm using satellites and weather observations. Every day they became more confident about when and where the heaviest rainfall would land.

Storm Babet is an [unusual weather system](#). Storms that hit the UK in the autumn and winter normally come from the west across the Atlantic, but Babet instead traveled from Portugal, picking up moisture from the Bay of Biscay before being trapped over the UK by a hard-to-budge high pressure system across Scandinavia. This resulted in a prolonged period of wet and windy weather and widespread flooding.



Babet causes rain across almost the entire British Isles at once. Map shows rainfall from 6pm October 19 to 6am October 20 2023: the white and black colours show the areas of heaviest rainfall. Credit: [Starling Roost Weather integrated radar \(Data: Met Office\)](#), [CC BY-SA](#)

The heaviest rainfall has been over the Angus hills in eastern Scotland, visible in white and black in the map below. As UK weather systems tend to come from the west, dumping their rain over the first hills they encounter, the eastern side of Scotland is usually protected from the worst of the weather. That is why forecasters were particularly concerned.

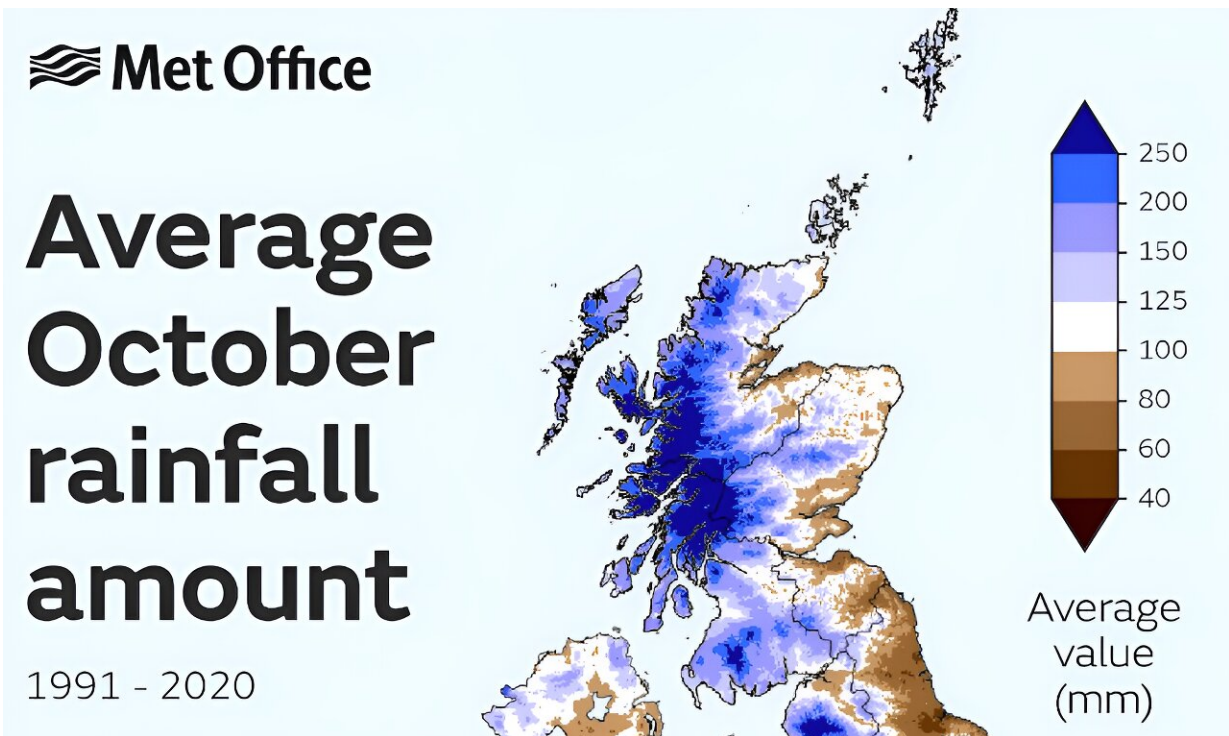
The previous highest 24-hour rainfall in the area was 100mm recorded in November 2022, with 60mm-70mm recorded during Storm Frank in 2015. The rainfall from Storm Babet is already [over 160mm](#). Unlike those in western Scotland, rivers in the region are simply not big enough to carry that much rainfall without bursting their banks.

What hydrologists knew

[Hydrologists](#) such as myself study how water moves across and through the landscape, which is key to forecasting floods. Alongside the exceptionally high rainfall, other factors made Angus and south-east Aberdeenshire particularly vulnerable. The hills funnel water into steep rivers that rise quickly and rush towards the sea, so towns and villages along them are [no strangers to floods](#).

In this instance, heavy rain ten days ago meant that the ground was already saturated. Instead of soaking into the ground, any rain that fell

during Storm Babet would quickly have flowed into the streams and rivers causing them to overflow.



Scotland has a rainy side and a dry side. Credit: Met Office, [CC BY-SA](#)

A storm like this is far beyond anything experienced in living memory of those in the region. Without any first hand knowledge to rely on, computer models help forecasters identify where the biggest floods will be. With Babet, hydrological models were able to pinpoint the area of concern (the red [weather](#) warning) to the rivers draining off the Angus hills.

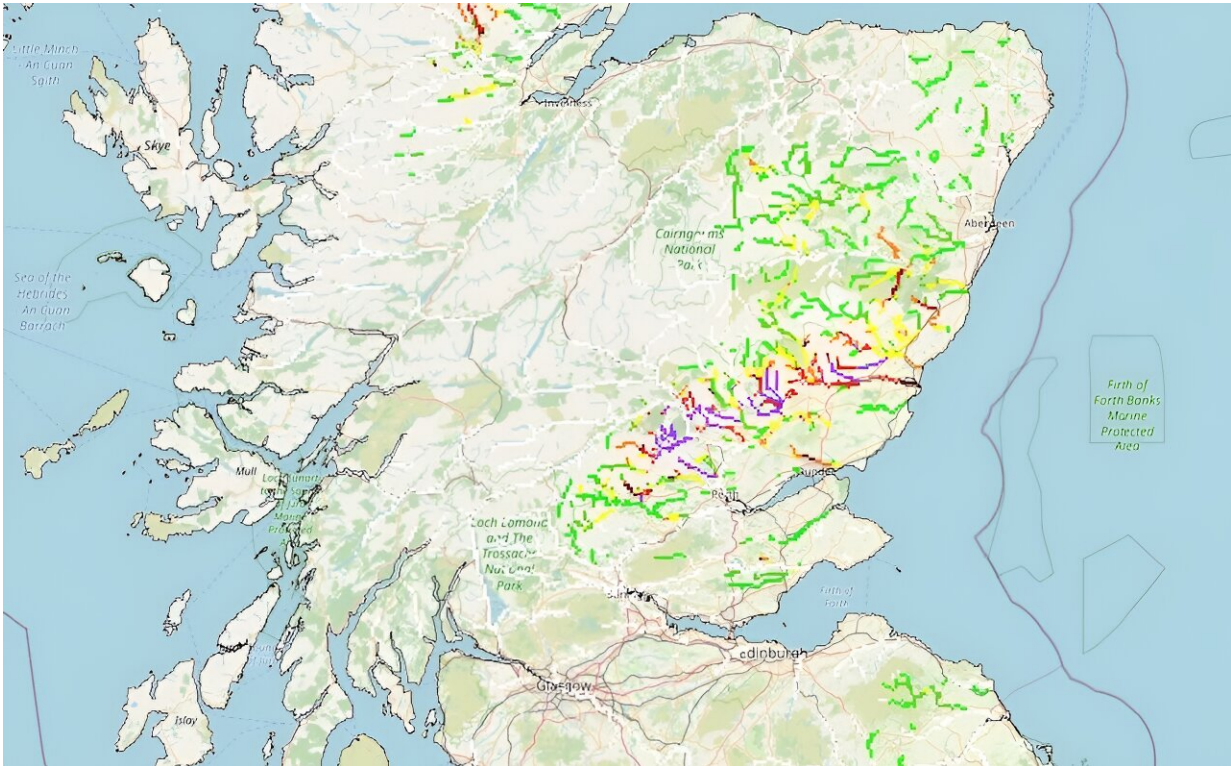
Similar models predicted that the South Esk river would rise above its flood defenses in the town of Brechin, meaning [flood](#) warnings could be

issued and the difficult decision to [evacuate 400 residents](#) to safety could be made on Thursday afternoon rather than in the middle of the night. It turned out to be good decision, as by Friday morning the river in Brechin was at its highest level on record, and had indeed [breached its defenses](#).

Preparing for more extreme events in the future

This is yet another reminder that the climate is changing and we will see more extreme rainfall, putting more people at risk. The "Clausius-Clapeyron" relationship states that for every 1°C increase in air temperature there is 7% more moisture—meaning that there is more [rainfall](#) in a given downpour.

The relationship between this and flooding is [more complex](#) since it also involves interactions with the landscape (How have urban areas expanded? Are there many trees? What sort of farms are there? Are rivers forced into embankments or allowed to meander through floodplains?).



Flood forecasting model from the day before the storm peaked. The purple and red colours show the rivers expected to see the highest flows. Credit: [Scottish Environment Protection Agency \(SEPA\) / UKCEH, CC BY-SA](#)

But understanding these interactions is urgent. The [Brechin flood defenses](#) were completed in 2016 and designed to protect the town from floods up to a 1-in-200-year event. No one expected them to be topped less than ten years later.

Despite the devastation evident today, the value of advance warnings for Storm Babet for saving lives, property and infrastructure is clear. To help the UK be better prepared for floods, many hydrologists—including me—are working together through the new [UK Flood Hydrology Roadmap](#) to further improve the science and data underlying those warnings.

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