

Extending the UK Gridded Rainfall Dataset HadUK-Grid to 1836 with Citizen Science Data Recovery

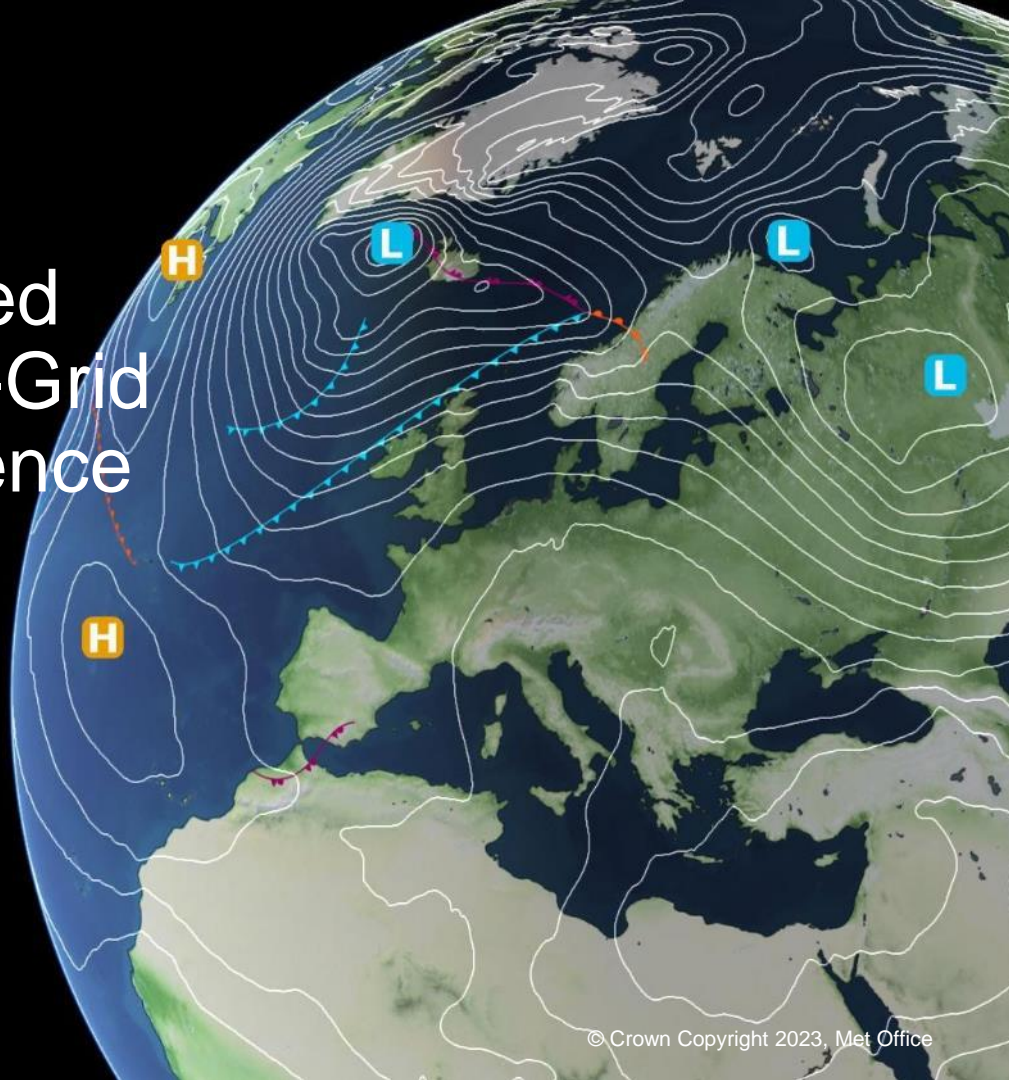
Mark McCarthy

Ed Hawkins (University of Reading)

Dan Hollis, Mike Kendon, Tim Legg

+

Thousands of members of the public



History of British Rainfall

VI. *A Letter from Richard Townley, of Townley in Lancashire, Esq; containing Observations on the Quantity of Rain falling Monthly, for several Years successively: Communicated to the Royal Society.*

Townley, Jan. 9. 169 $\frac{3}{4}$

S I R,

I Have now compleated this last Year's Observations, which I was very desirous should accompany the others I now also send you; and I hope you will be pleased



*The British Meteorological Society
From the Author.*

BRITISH RAINFALL.

ON

THE DISTRIBUTION OF RAIN

OVER THE

BRITISH ISLES,

URING THE YEARS

1860 AND 1861,

AS OBSERVED AT ABOUT 500 STATIONS IN GREAT BRITAIN
AND IRELAND.

COMPILED BY

G. J. SYMONS,

Member of the British and Scottish Meteorological Societies.

LONDON:

EDWARD STANFORD, 6, CHARING CROSS.

1862.

Ten-year Rainfall Books

- Collection of rainfall observations collated over a period of about a century in a scheme devised by Symons (1871)
- Monthly rainfall (Inches) in 10 year blocks.
- Basic metadata, plus commentary.
- Full collection has been scanned and available online from the Met Office digital archive: [Ten Year Rainfall | Met Office UA](#)

Durham c 1/2 150
 Long. 6° 19' 75" W. Lat. 54° 46' 6" N
 Imp. Pat. No 11

Obs: At Marth Cop gauge on drian 338' + ground
 + Sea Level

YEAR --	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859	MEANS.
January --	2.54	1.84	1.62	1.87	4.45		2.50	2.42	.33	.58	
February --	.62	.64	.63	4.26	1.26		1.09	1.02	.66	.60	
March --	.44	2.12	.38	1.54	.41	3.79	.32	2.26	.46	1.27	
April --	1.60	1.78	.70	.75	.54	.26	2.28	2.46	.54	2.41	
May --	1.30	1.39	1.69	.88	2.26	1.81	4.40	2.00	1.39	.26	
June --	1.91	2.38	3.38	.95	2.53	3.13	2.49	2.16	1.17	2.08	
July --	4.07	2.64	3.37	2.62		2.98	1.75	1.10	3.55	3.08	
August --	1.21	3.53	4.07	2.01	1.95	3.27	4.12	4.86	2.27	1.16	
September --	1.04	3.62	5.22	2.26	.02	0.29	5.01	3.95	2.48	2.32	
October --	2.81	.28	3.04	3.02		4.12	1.44	1.55	2.19	2.28	
November --	2.37	.80	3.87	.11	3.29	2.60	1.41	2.60	2.12	2.62	
December --	.35	.20	3.38	6.70	.38	1.83	2.84	0.17	1.27	2.91	
TOTALS --	20.26	21.22	31.55	26.97			29.66	26.53	18.73	21.57	

6-8 in 10 year block. Means correctly

Observations before 1850 not reliable

* In 1850 (Symons) { 130 164 } 11 inches
 1938 - (re 1850) - Aug - Sept misprint. The total given as one by
 Symons, but 1850. July & Oct entirely missing
 (1850) - 4 inches missing. April & Oct little "blanketed".
 (1853) - The total maybe approx, so means are all even finer.
 * I should detect any record from Durham Observatory from
 1815 to 1849 inclusive, although from 1818 on 8 pages was missing

Data Recovery



RAINFALL RESCUE HAS FINISHED BUT YOU CAN VOLUNTEER FOR THE [WEATHER RESCUE](#) PROJECT TO CONTINUE IMPROVING OUR UNDERSTANDING OF HISTORICAL WEATHER AND CLIMATE

Great work! Looks like this project is out of data at the moment!
[See the results](#) or [dismiss this message](#)

Help climate scientists
understand past rainfall
variations

@ed_hawkins

[RAINFALL RESCUE STATISTICS](#)

100% Complete

16,951

Volunteers

3,717,313

Classifications

761,983

Subjects

761,983

Completed Subjects

And then.....

• 23rd March 2020



Alex Salmond: not guilty

Scotland's former leader cleared of sex charges

'You must stay at home'

● PM declares national emergency ● Meetings of more than two banned ● Fines for flouting new curbs

Boris Johnson
Steven Swinford Deputy Political Editor

Boris Johnson declared a "moment of national emergency" last night as he finally imposed a near full lockdown of Britain to protect against the spread of coronavirus.

Police will enforce new quarantine rules under which people will be allowed to leave their home only for essential supplies, one form of day-to-day exercise, medical care or "absolutely necessary" work.

The prime minister closed all shops selling "non-essential goods", playgroups, libraries and churches. The World Health Organisation (WHO) has warned that the coronavirus pandemic is accelerating around the globe.

He said that police would have the power to enforce the rules, which include a ban on public gatherings of more than two people. Anyone caught flouting the measures faces a fine of between £130 and £1,000 from Thursday, when a bill containing new legislation to deal with coronavirus is expected to become law.

The regulations, which bring Britain largely into line with most big European nations, will last at least two weeks and could be renewed, or even toughened, depending on the progress of the disease.

"From this evening I must give the British people a very simple instruction — you must stay at home," the prime minister said in a televised address.

"Without a huge national effort to halt the growth of this virus, there will come a moment when no health service in the world could possibly cope because there won't be enough ventilators, enough intensive care beds, enough doctors and nurses."

"To put it simply, if too many people become seriously unwell at one time, the NHS will be unable to handle it, meaning more people are likely to die, not just from coronavirus but from other illnesses as well."

People were urged to reduce shopping trips to a minimum and use food delivery services where possible.

All social events, including weddings, are now banned, with only funerals allowed. Public gatherings of more than two are outlawed unless they are members of the same household.

"At present there are just no easy options. The way ahead is hard and it is still true that many lives will sadly be lost," Mr Johnson said, adding that "no prime minister wants to enact measures like this. Images of crowds visiting open spaces across many parts of Britain over the weekend had fuelled calls for Mr Johnson to restrict it in France, Italy and Spain."

Those promises appeared to stay open include supermarkets, pharmacies, pet shops, hardware stores, petrol stations, banks, post offices, laundries and undertakers. Roads and rail links will remain open to allow key workers to travel.



Boris Johnson said from Downing Street last night that the NHS would not cope without a national effort to contain the virus

The measures were announced as the coronavirus death toll in Britain rose by 54 to 35 and recorded infections went up by 83 to 6,650.

Mr Hall's death toll slowed for the second consecutive day to 660, with the number of new infections also falling.

A consortium of manufacturers promised to deliver 5,000 ventilators within a fortnight as part of efforts to meet a target of 20,000.

The FTSE 100 index dropped below 5,000 for the first time in more than eight years, it has lost 33 per cent of its value since the sell-off began.

Traveling abroad were urged to take the first available flight home as air travel started to shut down.

The limit on contactless payments was lifted to 145 from next month to reduce the number of cash transactions and risk of transmission.

Schools kept open for the children of key workers demanding clearer safety advice including on whether pupils needed masks.

The government used emergency legislation to effectively nationalise the railways temporarily to ensure that services kept running.

Senior government sources said that data, including on public transport use, retail, hospital and park use, showed that compliance rates were well below the 75 per cent deemed necessary to stop the NHS from being overwhelmed.

Mr Johnson said that the new rules would "buy time" for the health service. Ministers are under intense pressure to explain shortages of testing equipment and protective clothing, especially for frontline staff.

Jeremy Corbyn, the Labour leader, tweeted: "The prime minister is right to call for people to stay at home, protect our NHS and save lives. He added: "This is the right response to the coronavirus pandemic, and one we have been calling for. There now needs to be clear guidance as employers and

Continued on page 2, col 5

He spoke on a matter of life and death

Quentin Letts
Political Sketch

Most, must, must. The imperative chafed like a knife through the prime minister's evening address to the nation. "From this evening," said Boris Johnson, clenching his fists, wringing the air with his urgency, "I must give the British people a very simple instruction — you must stay at home."

A flurry of sentences began "you should not". Should not meet friends. Should not shop, save for essentials. We were conjoined to a common cause and we must — that word again — stay "this invisible killer".

He spoke swiftly, without the sort of gaudy panache one always imagined this sort of crisis might require. How comprehensively imagination's worst excesses have been suppressed by the mundane, deadly reality of all this. No martial music, no military uniform, and just a single Union Jack behind him, but this was modern democratic subtlety dragging us to the colours.

We have reached the point when our PM must speak to us from a desk in Downing Street, trimming flourishes to save few happy thousands of lives. The pace of his delivery, rattling it out, accentuated that this was a leader working in overdrive.

There was no time to lose. The absence of melodrama, paradoxically, made it all the more striking and urgent.

The Commons had spent much of its day passing the Coronavirus Bill, the legislation strengthening

Continued on page 2, col 3



Quality Control checks – Rainfall Rescue

- Removing values that were estimates
- Check the sum of monthly values equalled the annual total
- Rain gauge moves
- Removing duplicate values
- Resolving values where transcriptions disagreed

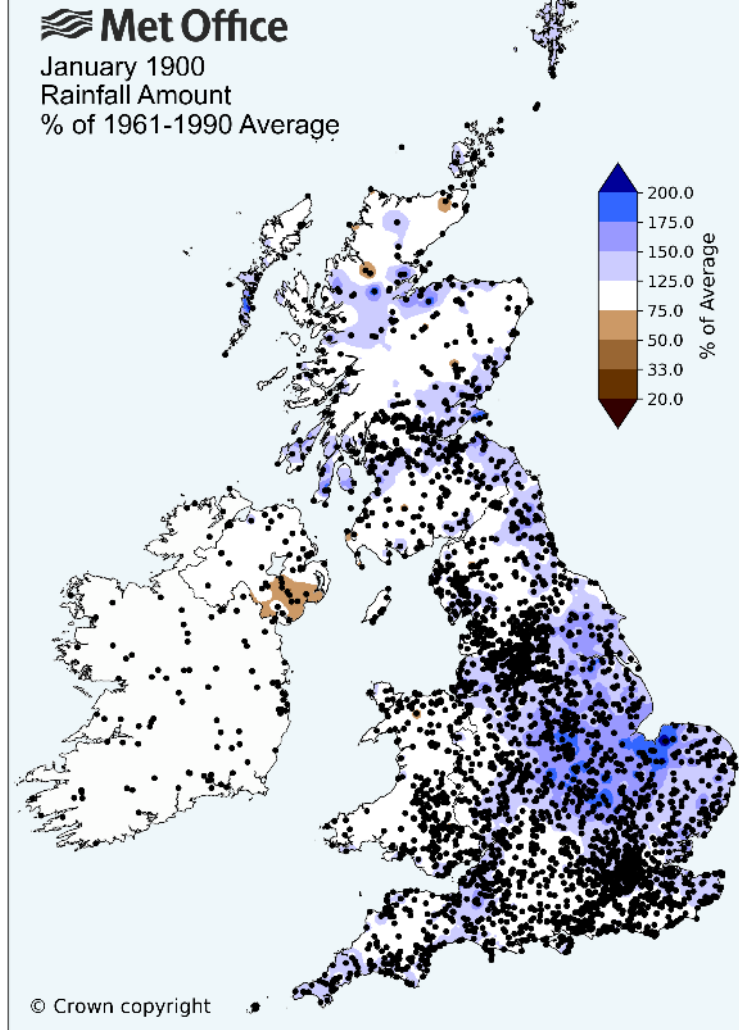
Hawkins et al (2023) <https://doi.org/10.1002/gdj3.157>

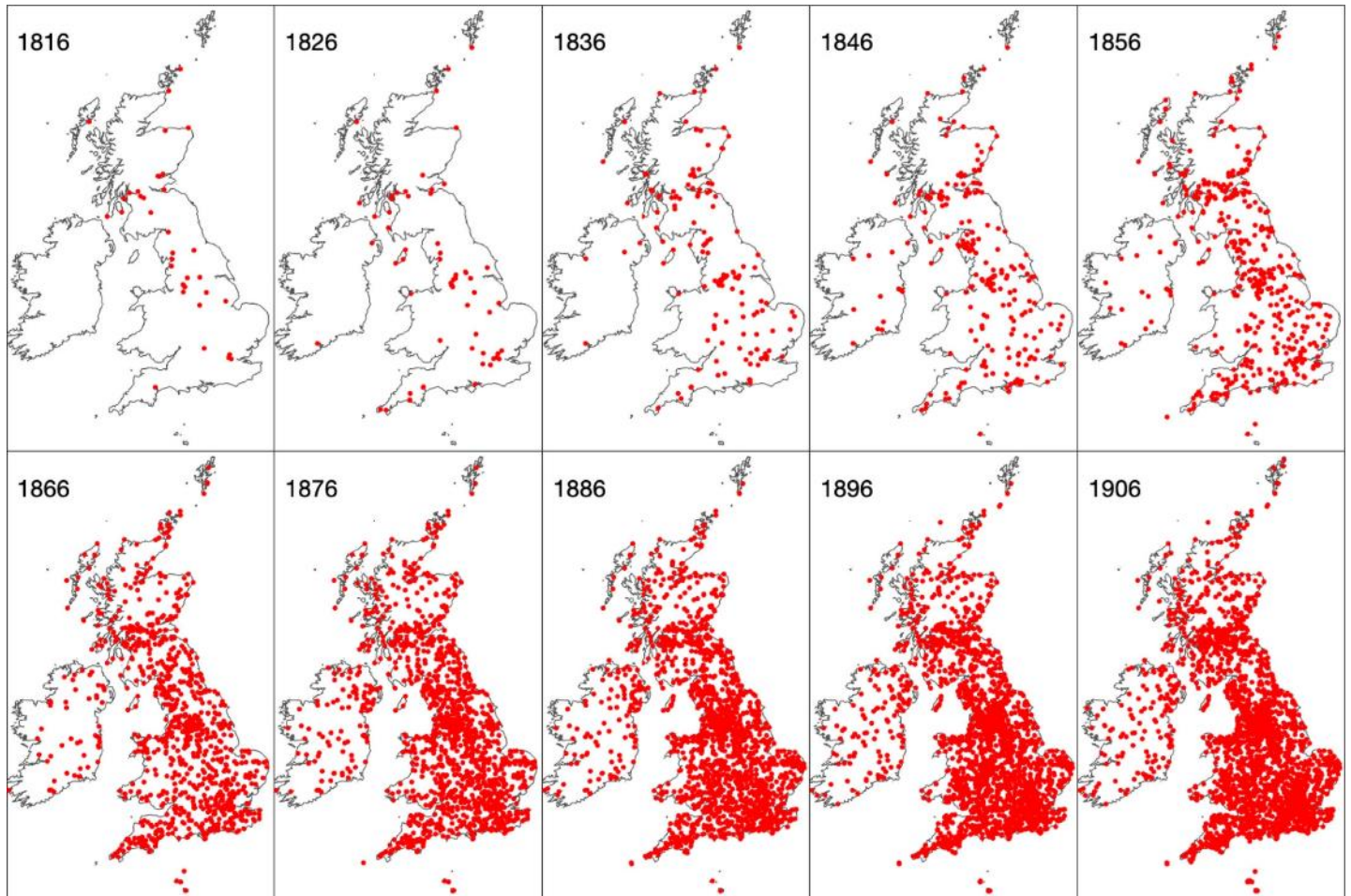
Gridded Dataset

What is HadUK-Grid?

- Gridded in situ observations
 - 1km resolution
 - UK coverage
 - Monthly Rainfall 1836-present
 - Other variables various start dates
 - Open data
-
- For climate monitoring, research, services

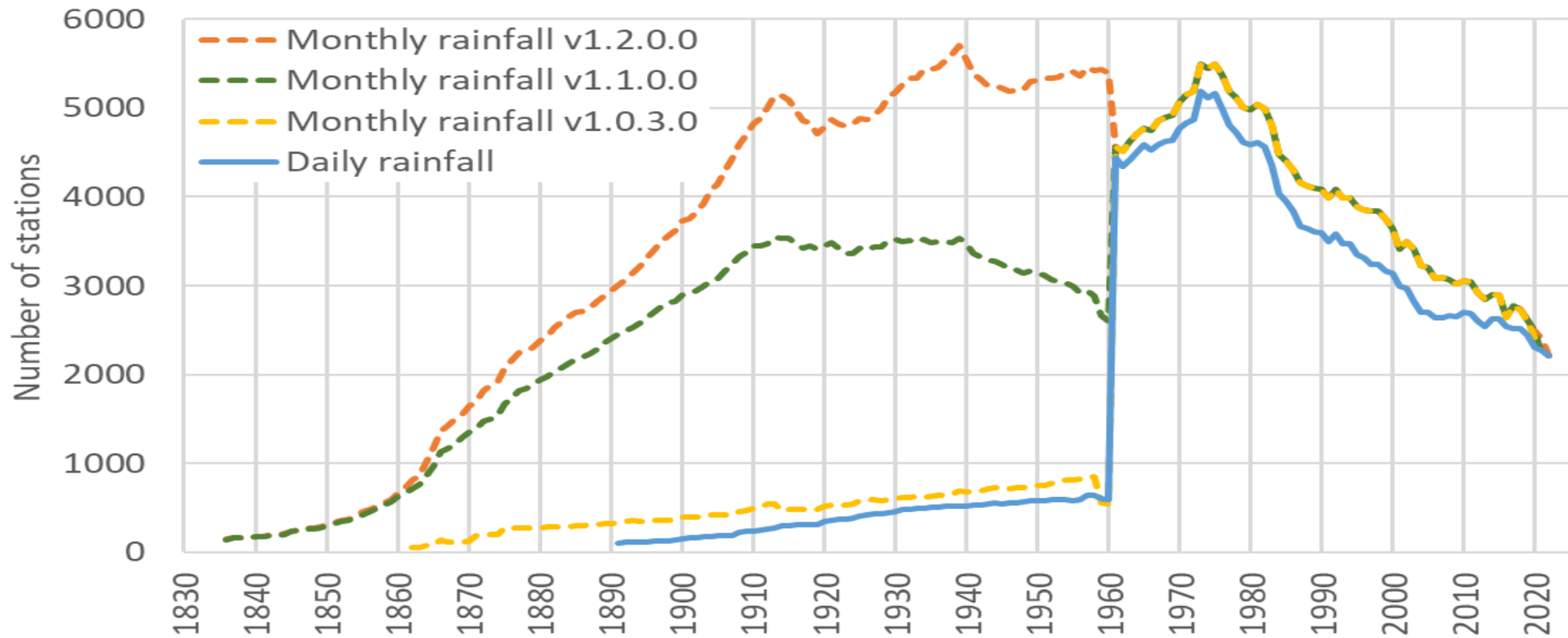
Hollis et al. (2019): <https://doi.org/10.1002/gdj3.78>





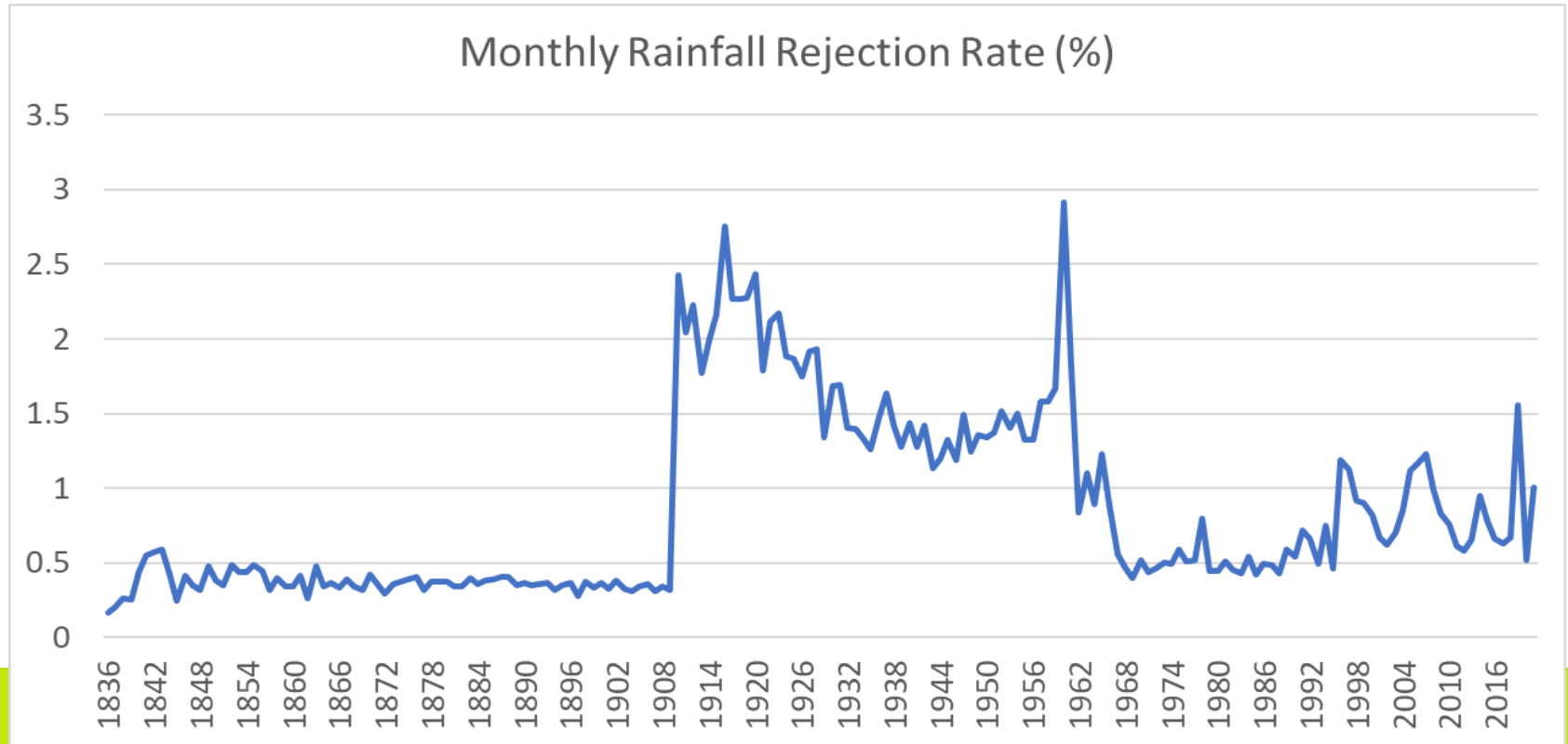
- From Hawkins et al (2023) <https://doi.org/10.1002/gdj3.157>

HadUK-Grid – Station Count

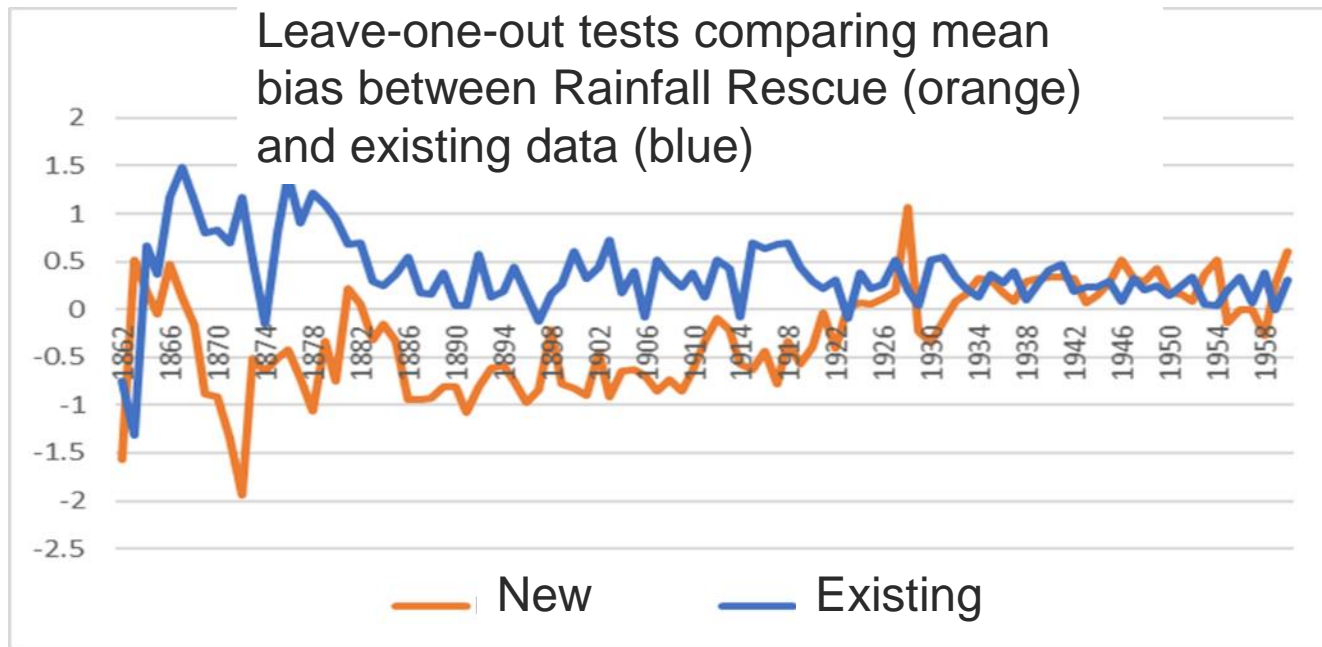


Quality Control

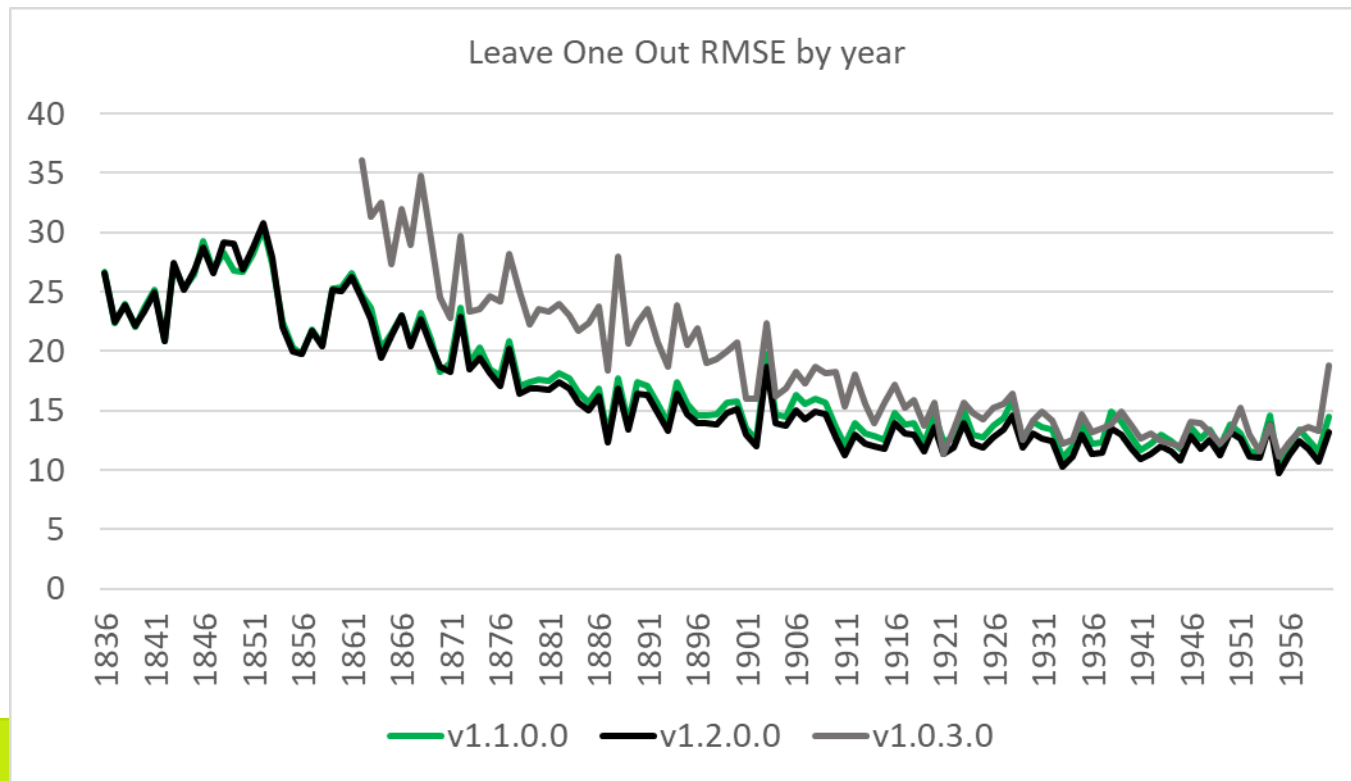
HadUK-Grid QC



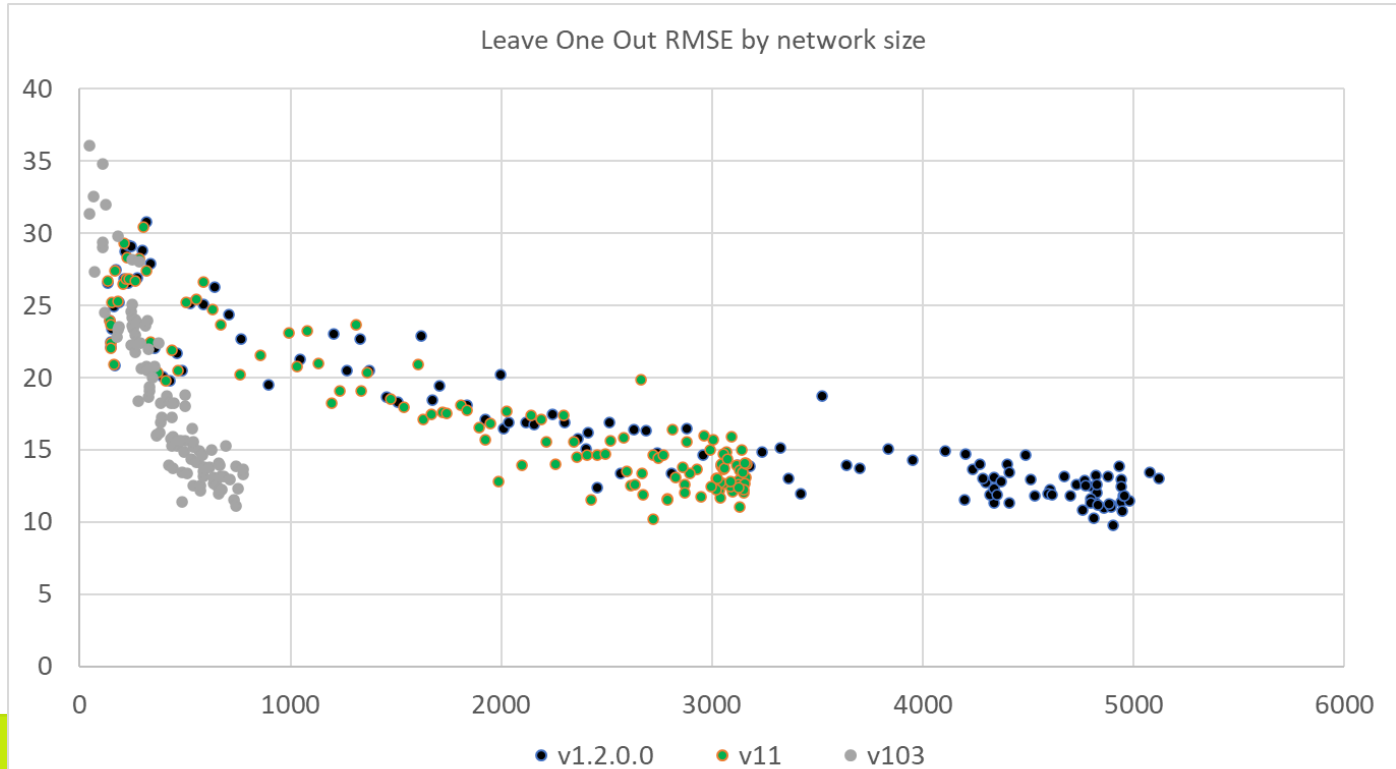
Rainfall Rescue data slightly drier pre 1920



RMSE all stations HadUK-Grid by year

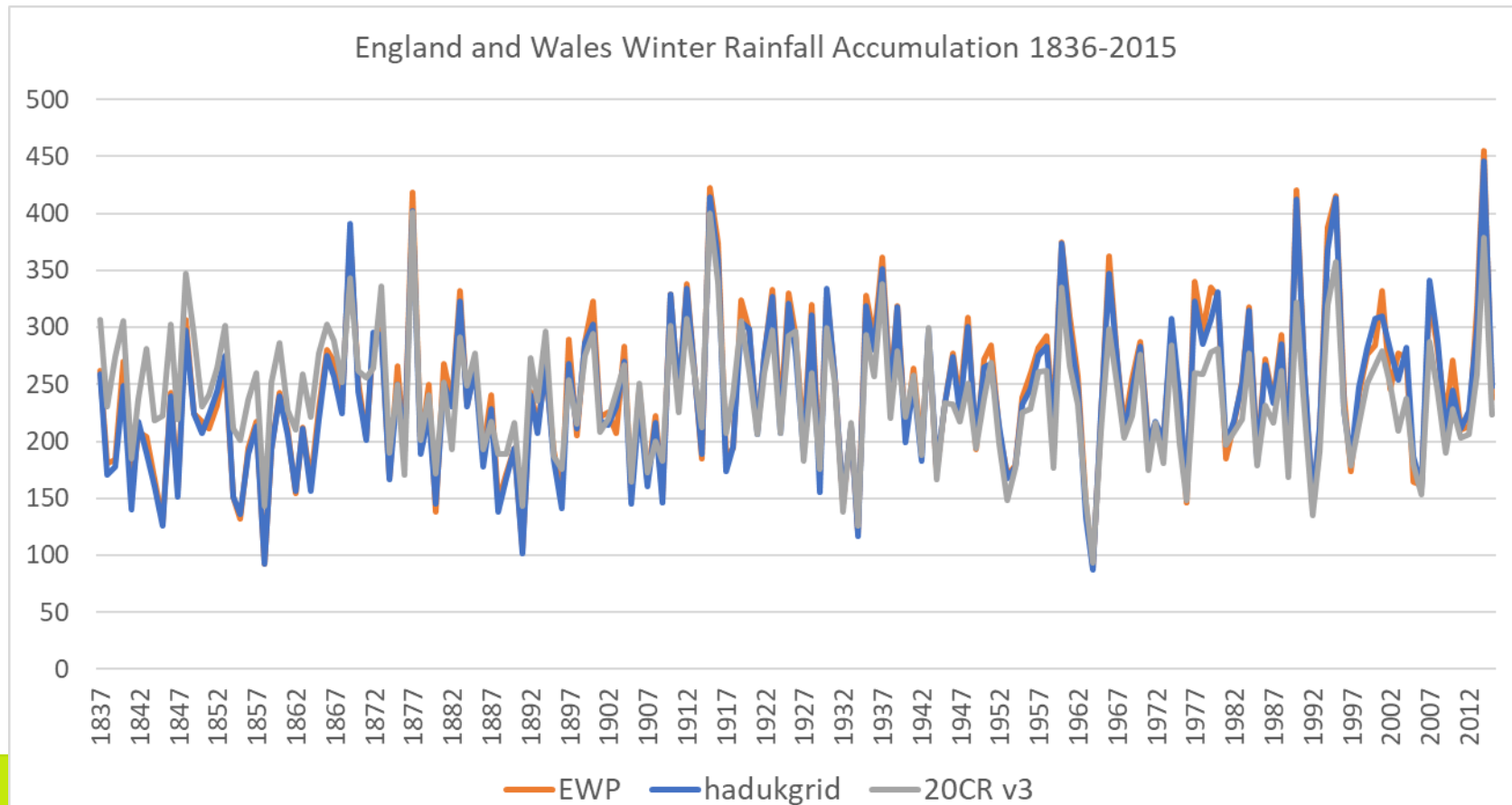


RMSE all stations by network size



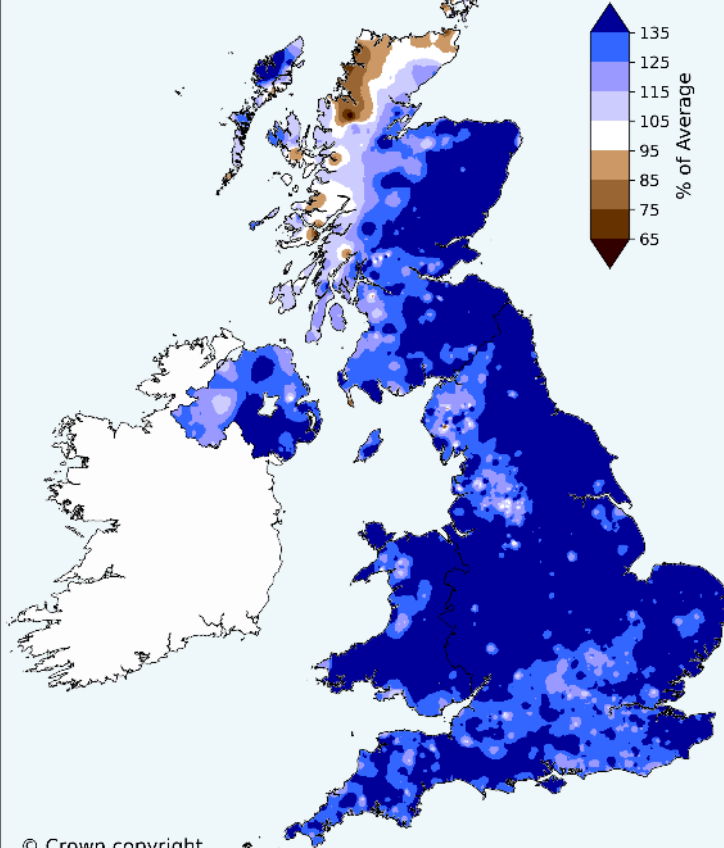
Trends and Extremes in British Rainfall

Time Series Comparison

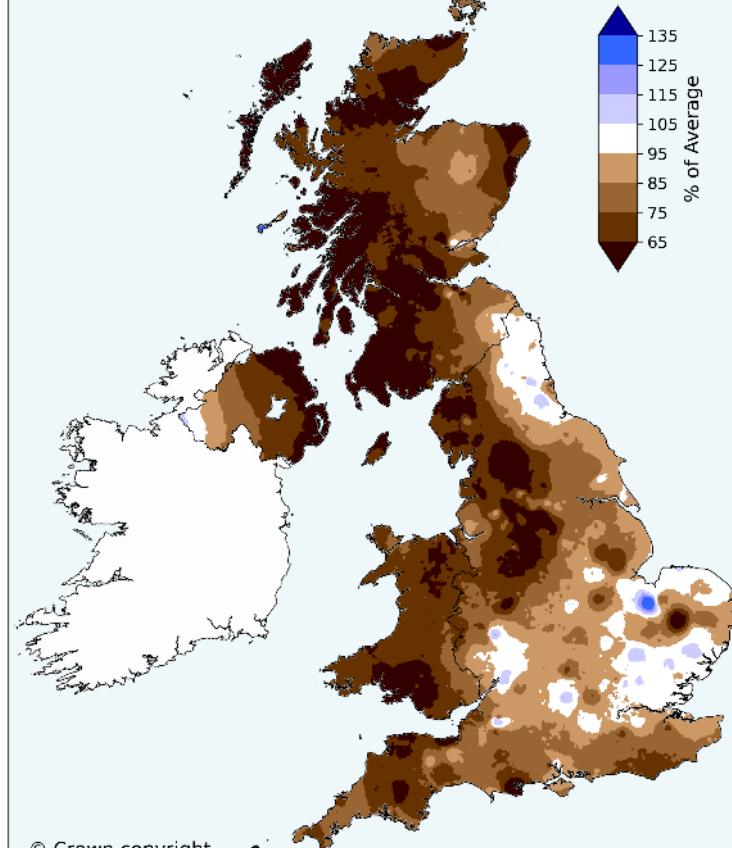


Map products

 **Met Office**
Year 1872
Rainfall Amount
% of 1961-1990 Average

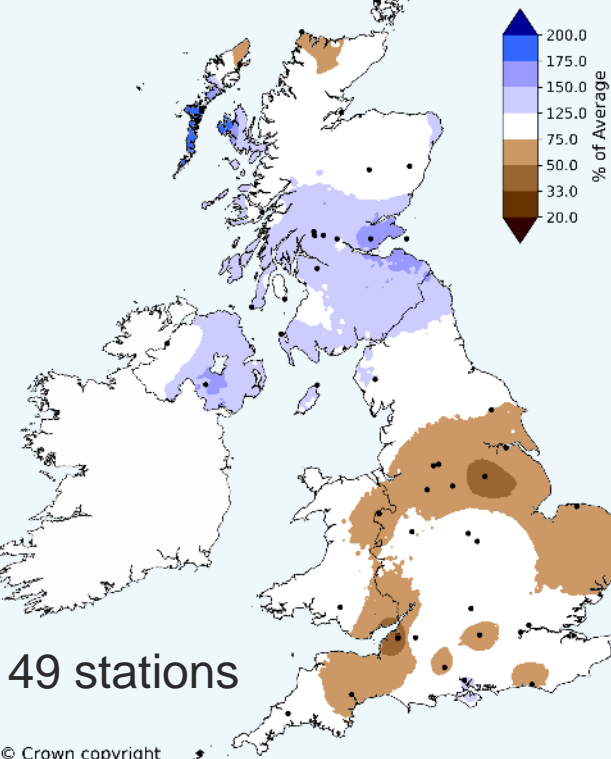


 **Met Office**
Year 1855
Rainfall Amount
% of 1961-1990 Average



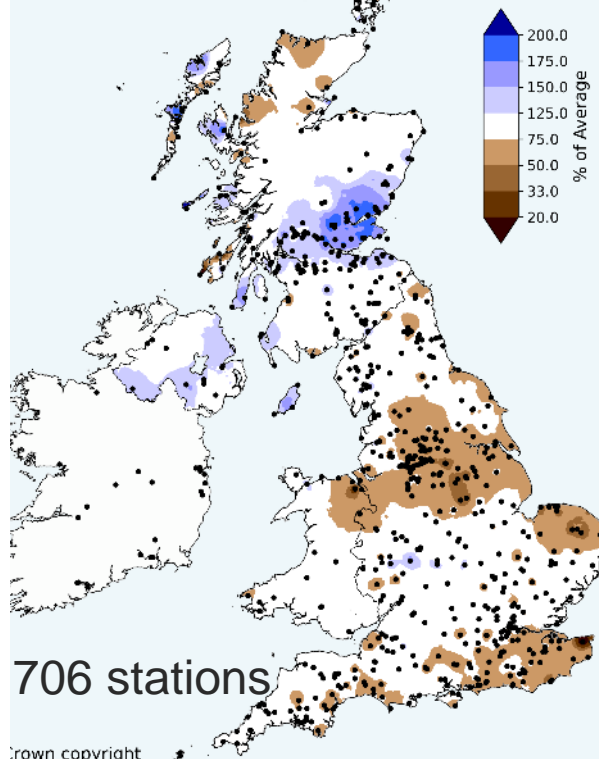
 **Met Office**

January 1862
Rainfall Amount
% of 1961-1990 Average



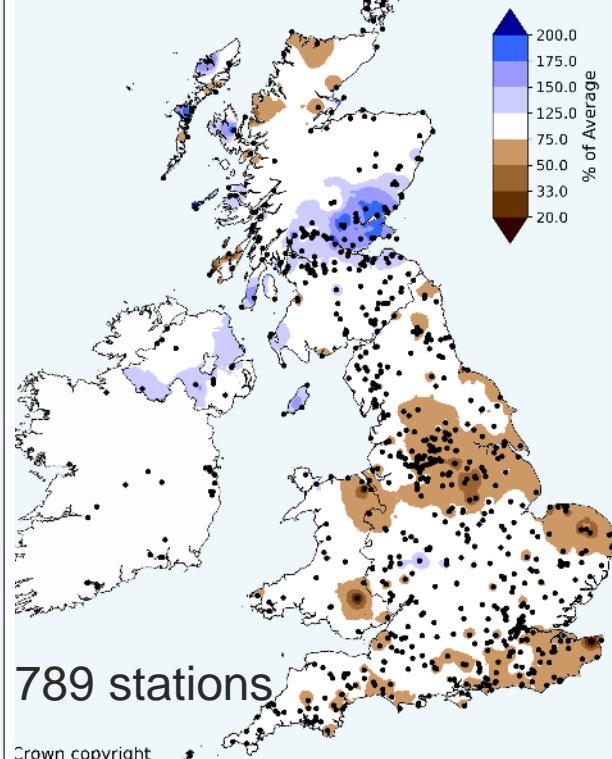
 **Met Office**

January 1862
Rainfall Amount
% of 1961-1990 Average



 **Met Office**

January 1862
Rainfall Amount
% of 1961-1990 Average



Summary

- Citizen Science Data Recovery has provided >5million monthly rainfall observations 1836-1960
- Consistent representation of national rainfall 1836-present
- Major hydrological extremes in the 19th Century mapped

Future Steps:

- Improved automated Quality Control checks for HadUK-Grid
- Homogeneity testing for rainfall series
- Potential applications of earlier rainfall series

References

- Hawkins et al (2023) <https://doi.org/10.1002/gdj3.157>
- Hollis et al. (2019): <https://doi.org/10.1002/gdj3.78>
- Rainfall Rescue Dataset: <https://zenodo.org/record/7554242>
- HadUK-Grid Dataset:
<https://catalogue.ceda.ac.uk/uuid/4dc8450d889a491ebb20e724debe2dfb>