



AMS

American Meteorological Society

Supplemental Material

Bulletin of the American Meteorological Society

The Extremely Wet May of 2021 in the United Kingdom

<https://doi.org/10.1175/BAMS-D-22-0108.1>

© [Copyright 2022 American Meteorological Society](#) (AMS)

For permission to reuse any portion of this work, please contact permissions@ametsoc.org. Any use of material in this work that is determined to be “fair use” under Section 107 of the U.S. Copyright Act (17 USC §107) or that satisfies the conditions specified in Section 108 of the U.S. Copyright Act (17 USC §108) does not require AMS’s permission. Republication, systematic reproduction, posting in electronic form, such as on a website or in a searchable database, or other uses of this material, except as exempted by the above statement, requires written permission or a license from AMS. All AMS journals and monograph publications are registered with the Copyright Clearance Center (<https://www.copyright.com>). Additional details are provided in the AMS Copyright Policy statement, available on the AMS website (<https://www.ametsoc.org/PUBSCopyrightPolicy>).

1 **The extremely wet May of 2021 in the United Kingdom**

2

3 Nikolaos Christidis¹ and Peter A Stott¹

4 ¹Met Office Hadley Centre, FitzRoy Road, Exeter, EX1 3PB, United Kingdom

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24 Corresponding Author:

25 Nikolaos Christidis

26 Met Office Hadley Centre, FitzRoy Road, Exeter, EX1 3PB, United Kingdom

27 Tel: +44 (0) 330 135 1922

28 Email: nikos.christidis@metoffice.gov.uk

29

30 **Supplemental Material**

31

32 **Table ES1.** The CMIP6 models used in the analysis. The table shows the number of simulations with
33 (ALL) and without (NAT) anthropogenic forcings that each model provides. The ALL simulations are
34 extended to future years with the SSP2 4.5 scenario.

35

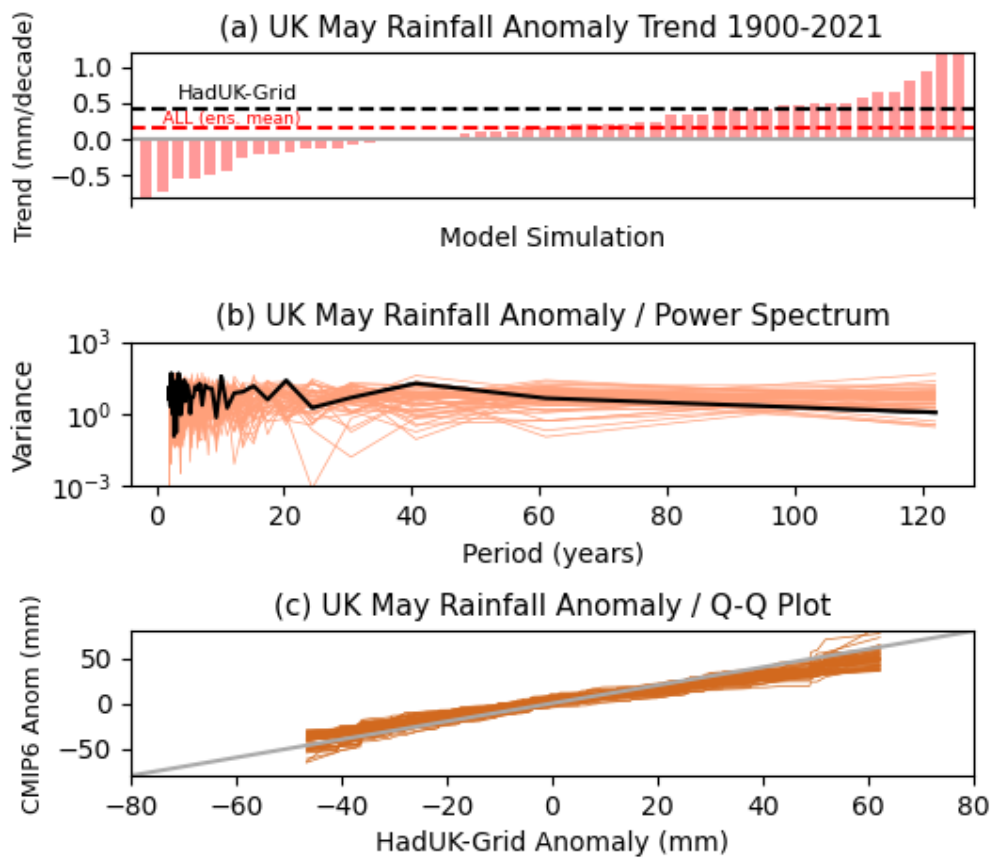
	Model	ALL + SSP2 4.5	NAT
1	BCC-CSM2-MR	1	3
2	CNRM-CM6-1	6	10
3	CanESM5	25	15
4	GFDL-ESM4	3	3
5	HadGEM3-GC31-LL	1	4
6	IPSL-CM6A-LR	9	10
7	MIROC6	3	3
8	MRI-ESM2-0	1	5
9	NorESM2-LM	3	3
	Total	52	56

36

37

Appendix ES1. Evaluating a multi-model ensemble.

Our multi-model ensemble is evaluated here as a whole, by comparing the sample of data from the historical simulations of all the models against the observational data. The aim is to test whether some main statistical characteristics of the relevant variable (in this case rainfall) constructed with the multi-model ensemble are overall consistent with the observations. Such evaluation tests have been developed and tried over years in event attribution studies and typically include an assessment of a) the simulated trend, pertinent to non-stationary distributions, b) the simulated variability at different timescales, and c) the representation of different parts of the distribution (main body and tails). Sampling noise due to short observational records means that these assessments offer only a broad, but still very useful indication of whether reliable probability estimates can be obtained by the modelled distribution. Models not fit-for-purpose appear to lie outside the range of the rest of the ensemble and can thus be screened out (no models needed to be eliminated in this study). While it is essential to ensure that statistical properties are simulated well, more detailed studies that consider mechanisms driving forced climatic changes, would also need to evaluate other aspects of the simulated climate, like dynamical factors, land-atmosphere interactions, etc.



38

39

40 **Fig. ES1** Model evaluation. (a) May rainfall trends in the UK since 1900 from individual ALL
 41 simulations (pink bars). Trends from HadUK-Grid and the mean of the ALL ensemble are marked by
 42 the horizontal black and dashed red lines respectively. (c) Power spectra from HadUK-Grid (black)
 43 and the ALL simulations (orange). (d) Quantile-Quantile plots comparing each of the ALL simulations
 44 against HadUK-Grid observations. The evaluation tests indicate that the models provide a realistic
 45 representation of the observed trends, variability and overall May rainfall distribution.