

FAQ on Issue with UKCP Local (2.2km) published in 2019

1 Who is this document for?

The following provides guidance for those who have already used or are planning to use UKCP Local. It includes information on an issue recently identified in the UKCP Local (2.2km) dataset published in September 2019. Due to this issue, we will be producing an updated set of data for publication in early 2021.

You will find a summary of the issue and advice on what you should do if you have already used or are planning to use UKCP Local. An in-depth analysis and description of the issue can be found in the Technical Note available [here](#).

For many, we expect little impact on existing or planned analyses but there are a number of situations (described below) where you should stop your analysis and wait until the update is published before carrying out further work. The issue does not affect any other UKCP product, i.e. the Probabilistic Projections, UKCP Global, UKCP Regional (12km), Derived Projections and Marine Projections.

2 What is the issue?

We have recently found that the climate model used to generate UKCP Local included an error in the computer code that determines how much of the solid precipitation falls as snow and how much as hail. In turn, this could affect other variables (e.g. the amount of lying snow which leads to colder winter temperatures).

We find that fixing the error can lead to differences that are significant, i.e. when the differences are larger than the spread (i.e. standard-deviation) across the 12-member UKCP Local (2.2km) ensemble. This can be seen in some variables in some seasons, and especially in some locations. A detailed breakdown of this is available in the Technical Note and reproduced here in Table 1 in the Appendix.

3 Which existing UKCP documents and datasets does the issue affect?

This issue only affects the UKCP Local datasets available on the UKCP User Interface and the CEDA Archive. It does not affect any other dataset in the latest set of UK Climate Projections published in November 2018.

On the existing documentation that include UKCP Local results:

- **UKCP Headline Findings** – this includes statements about changes in temperatures and precipitation based on UKCP Local results (i.e. statements 3.1.5, 3.1.6 and 3.2.4 to 3.2.7). The issue does not affect the statements qualitatively, but we will be revising the numbers quoted when the updated dataset is available.
- **UKCP Local (2.2km) science report** (i.e. UKCP Convection-permitting model projections: Science report) - the figures and numbers quoted in the report will change, but not the overarching key conclusions. The report will be revised once the updated results are available.
- **Factsheet on Snow** – the UKCP Local results will need to be revised once the updated data are available.
- **Factsheet on UKCP Local (2.2km) Local** – this will not be affected by the updated data.

All the above documents are available on the [UKCP web page on Guidance and Science Reports](#), except the Headline Findings which is available on the [Key Results](#) page. We have placed suitable warning messages and a link to this document and the Technical Note on the [UKCP web pages](#), [UKCP User Interface](#) and [CEDA Archive](#).

4 When will the updates to UKCP Local (2.2km) be ready?

We are re-running the climate model with a planned release for Spring 2021. Both sets of data will remain available on the CEDA Archive, with the old UKCP Local data potentially removed at a later date but only in consultation with users. The UKCP User Interface will switch to the updated data once it is ready.

5 Can I still use the current UKCP Local (2.2km) datasets?

You should still use the current UKCP Local dataset (available from both the UKCP User Interface and CEDA Archive) if your analysis includes:

- summer temperatures including extremes (e.g. heat waves)
- summer precipitation, mean values (i.e. not extremes)

If your analysis includes the following variables, then you should use the current UKCP Local dataset with caution, and we recommend you assess the sensitivity of your decision to using the UKCP data:

- winter precipitation
- winter and summer hourly precipitation extremes (note that projected changes in the updated data could be 5-10% larger)
- winds at the surface including extremes (note that differences in the projected changes in the updated data could be significant over the Cairngorms; whilst present-day winds may be significantly different more widely over the ocean, Ireland, the Cairngorms and some north-western coastal regions)

See Table 1 in the Appendix for a detailed summary and you can find explanations for the above advice in the Technical Note.

The advice above is based on 19 years of data from one member of the 12-member UKCP Local ensemble.

6 When should I stop using the current UKCP Local (2.2km)?

You should stop your analysis with the current data and wait for the update if it requires:

- snow variables (i.e. lying snow amount)
- winter temperatures (especially in Scotland)

However, you may also wish to use the existing datasets to help set up your analysis (i.e. set up computer code rather than use the numbers) before the updated data are available.

Note that lightning was not made available when the original dataset was released. On fixing the issue, we find that the simulation of lightning is considerably improved and so we plan to add it to the updated dataset.

You can find explanations for the above advice in the Technical Note.

7 What should I use instead of UKCP Local (2.2km)?

UKCP Local (2.2km) is one product from the suite of information in the latest UK Climate Projections. While the high spatial resolution allows more realistic representation of atmospheric processes, the dataset currently only provides data for three 20-year time slices, for one emissions scenario (RCP8.5) and one climate model (twelve variants of the Met Office Hadley Centre model are downscaled). If you wish to explore a larger range of outcomes, we advise using the probabilistic projections in the first instance and UKCP Global (60km) and Regional (12km) should you require unavailable variables (e.g. relative humidity, snowfall and lying snow), a larger spatial domain, spatial coherence and/or sub-monthly data (see [UKCP18 Guidance: How to use the UKCP18 Land Projections](#)). However, we do find larger differences (or biases) when comparing UKCP Global and Regional with observations than for UKCP Local.

If you specifically require UKCP Local or hourly/3-hourly data and have the use cases described in 6 above (and identified as “use with caution” in 5, depending on your sensitivity), you should wait for the update.

8 What should I do if I've already used UKCP Local (2.2km)?

If you have already used the dataset and both this document and the technical note do not provide enough information for you to proceed, please contact the UKCP Helpdesk for further advice at <https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/contact>.

9 How different will the updated datasets be?

As stated in FAQ 3, we expect the projected changes to be qualitatively the same but there will be differences in data values between the updated and original model datasets. The size of these differences depends on the variables, season and location and a summary is presented in Table 2 in the Appendix (as well as the Technical note). The sizes of the differences have informed the above advice which is based on testing on just one member of UKCP Local. The differences on fixing the error could be larger or smaller in the other members (which we will only be able to assess once the new dataset is available). However, we expect the other members to respond similarly, although there may be larger impacts for cold members that could have more snow.

10 When will FUTURE-DRAINAGE outputs be available?

We are aware that many organisations are awaiting the results of the FUTURE-DRAINAGE project. This project uses UKCP Local and will provide revised rainfall uplifts and new guidance for UK urban drainage design and urban flood resilience. We will work directly with the project team to ensure that the new UKCP Local data become available to them as soon as possible.

11 Will this guidance change on further analysis?

The guidance stated here is unlikely to change. However, the effects of the error reported here are based on 19 years of data from one member of the climate model used for UKCP Local. As more data becomes available, we will be able to make more confident statements about the size of the impact, including for other metrics such as precipitation extremes (i.e. higher return periods).

We have analysed the impact of the error on temperature, precipitation, snow, lightning and wind. We do not plan to include any further analysis until the new dataset is available.

Appendix

The following tables are taken from Technical note: Issue with UKCP Local (2.2km) simulation data.

Impact metric (with some example impact areas)	Do not use original UKCP 2.2km data for operational applications. Await new 2.2km data and/or use other UKCP18 products where appropriate.	Use original UKCP 2.2km data with caution. New 2.2km data should be preferred to original data once available.	Original UKCP 2.2km data can be used, alongside other UKCP18 products.
Snow (e.g. infrastructure inc. transport and energy, natural environment/habitat)	X Original UKCP 2.2km data underestimate snow and its future change		
Lightning (e.g. infrastructure inc. transport, communications and energy)	X Lightning data not released from original UKCP 2.2km		
Cold winter temperatures (e.g. infrastructure inc. transport and energy, health, natural environment/habitat)	X Original UKCP 2.2km data underestimate future increases in winter temperature (especially for cold winter days and nights over Scotland)		
Winter precipitation (e.g. winter flooding affecting multiple impact areas)		? Original UKCP 2.2km data underestimate winter mean precipitation, but graupel code error has small impact on future changes.	
Summer precipitation (e.g. summer flash flooding affecting multiple impact areas)		? Original UKCP 2.2km data likely overestimate present-day return levels and underestimate future changes in hourly precipitation extremes in some regions. Revised surface water flooding estimates from FUTURE-DRAINAGE	
Wind extremes (e.g. infrastructure inc. transport, water, communications, energy, forestry/natural environment)		? Original UKCP 2.2km data underestimate wind speeds, mostly over ocean, but graupel code error has small impact on future changes.	
Hot summer temperatures and heatwaves (e.g. transport, thermal building design and health)			✓ Results not significantly impacted by graupel code error

Table 1. Summary of advice on use of original UKCP Local (2.2km) data by impact sector. Use “with caution” category implies the need for sensitivity testing of adaptation decisions to the UKCP data.

Variable	UK-average future change in CPM_UKCP	UK-average response difference (CPM_fix minus CPM_UKCP)	Approx. largest local response difference (CPM_fix minus CPM_UKCP)	UK-average standard deviation across CPM ensemble	Impact of graupel code error larger than CPM ensemble spread?
Mean T, DJF	+2.5°C	+0.1°C	<0.5°C	0.6°C	No
Cold days, DJF	+3.0°C	+0.2°C	+2°C	0.8°C	Yes over parts of northern Scotland
Cold nights, DJF	+2.9°C	+0.6°C	+3°C	0.9°C	Yes locally
Mean T, JJA	+4.3°C	0.0°C	<0.2°C	0.5°C	No
Hot days, JJA	+5.7°C	0.1°C	+0.5°C	1.2°C	No
Mean P, DJF	+24.7%	-2.6%	-10%	11.0%	No
P_freq, DJF	+17.8%	-2.9%	-5%	7.5%	No
P_int, DJF	+6.1%	+0.3%	+/-5%	4.8%	No
Mean P, JJA	-23.7%	-1.3%	-10%	12.2%	No
P_freq, JJA	-30.5%	-1.0%	-5%	9.5%	No
P_int, JJA	+10.4%	-0.3%	+/-10% (local response differences are noisy)	8.3%	No (a few local grid points show large impact)
2yRL_hr, ALL	+28%	+5%	+10%	8%	No
5yRL_hr, ALL	+29%	+7%	+10-15%	8%	Yes for some regions
2yRL_dy, ALL	+13%	0%	+/-5%	7%	No
5yRL_dy, ALL	+14%	0%	+/-5%	8%	No

Table 2. Summary of impact of graupel code error on future changes for key surface temperature and precipitation metrics. Where T = surface temperature, P = precipitation, P_freq = frequency of wet hours (>0.1mm/h), P_int = mean intensity of wet hours, {n}yRL_hr = n-year return level of hourly precipitation extremes, {n}yRL_dy = n-year return level of daily precipitation extremes; for winter (DJF), summer (JJA) or all seasons (ALL). Where the impact of the graupel code error is smaller than the CPM ensemble spread, there could still be a systematic shift in the ensemble mean, if all ensemble members are impacted similarly to the single-member test.