Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2017-137-RC1, 2018
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Open Access Earth System Science Data Discussions

Interactive comment on "Historical gridded reconstruction of potential evapotranspiration for the UK" *by* Maliko Tanguy et al.

Anonymous Referee #1

Received and published: 21 February 2018

Historical gridded reconstruction of potential evapotranspiration for the UK Tanguy et al.

This paper produces a gridded reconstruction (at daily and monthly timesteps) of PET for the UK (excluding Northern Ireland) for the period 1891-2015. The paper presents the selection of methods and decisions in producing the final dataset and assesses the performance of the selected approaches relative to a naive climatology and CHESS-PET as a surrogate for observations. The work produces a valuable dataset of practical utility, especially for river flow reconstructions. Overall the authors do a good job and I support publication. However I have a number of specific points that I wish the authors to consider before publication. These relate to both the underpinning science and uncertainties but also the presentation of the paper to help readers interpret what was

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Discussion paper

done in a clearer way.

Specific Comment

The work uses UKCP09 monthly temperature (1910-2015), together with a gridded dataset of monthly temperature from the historical drought project. I am left wondering about some details of the underlying temperature datasets – i) is there a decrease in station density underpinning these products the further back in time one goes? ii) does this affect the spatial distribution or errors in your dataset? iii) does the joining of both datasets create a break in the data, has this been checked? iv) has the underlying temperature data been homogenised? If so, how, if not what might this mean for the derived product here. So far as I can see these issues are not outlined or discussed in the paper. A fuller discussion on the uncertainties associated with the derived product is required in the discussion. You indicate that MAPE can be used to estimate uncertainties but only based on the selected method. There are other, potentially greater uncertainties that should be transparently laid out.

While the authors do outline the different temperature based PET methods in a table it would be beneficial to include a discussion of the main differences between each method in the text. Are these an exhaustive selection, if not, why these methods, why not others.

There are a lot of datasets/methods/calibration designs/verification methods used in the paper and at times it is hard to follow. Some effort at making the presentation clearer though signposting is necessary. The authors do include a work flow diagram but this too is complex. Perhaps a table describing the different datasets developed and why used would be useful. Perhaps the flow diagram could be split in two – separate for validation with some further detail to help interpretation in both parts.

I do not know what the pchip method is or how it performed, or why is was used above other approaches for disaggregation. Would use of another methods affect results? Pchip is mentioned in the abstract and once or twice in the paper but we have not

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details about its application.

Minor Points/Technical corrections

Is there any influence of catchment size on the results?

In terms of extending to Northern Ireland, could reanalysis data be used here in future work. I think there is an onus on the authors to discuss how currently limitations may be overcome in future work. Abstract – needs to be reworked. You state that PET is needed at daily or shorter time step – do you mean longer? You examine monthly and daily, not hourly. I suggesting removing the word 'reconstructing' from line 3 of abstract – application of models before 1960 could be for a number of purposes – much flow data commences before PET data. Sentence commencing line 15 is too long, needs to be broken into at least two sentences. You need to tell the reader in the abstract what naive methods are. Line 25 -27 is perhaps too detailed for an abstract. What is pchip? Abstract also needs a final statement on envisaged uses of the dataset.

Introduction Is there a word missing from end of the first sentence?

Line 7 – suggest the word approaches rather than formulations. Also what are combination methods – used without any explanation in the first instance.

Line 13 – temperature as 'a' proxy

Page 3, line 1 – do you have a reference to support the claim that PET is mainly used for hydro modelling. If not suggest widely used rather than mainly.

Line 9 – as 'an' alternative

Line 12 – longest period in the UK – give us some context about the historical length of observations. Also maybe suggest that temp and precip are 'among' the those with longest records. Other variables such as Sea Level Pressure also have been rescued historically.

Actually, thinking about this, could reanalysis products that assimilate SLP observa-

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tions be used to supplement this work and temporally extend the record in future work? Perhaps you could come to this potential (or not) in the discussion.

Line 13 – where only temperature 'data' are available.

Line 24 – for the international reader use of Great Britain, UK, NI can be confusing. Keep the terminology the same – suggest UK (incl. NI).

When introducing temperature data please include in the bracket the term henceforth. . ..eg. (henceforth CHESS-temp daily)

Page 4 line 8 – Because of the coarser temporal and spatial resolution of temperature data prior to 1961 – please give us some details on this and the PET dataset is dependent on this data.

Line 10-25 – you need to help the reader more in introducing these datasets and study design. The text is a little terse here and too brief. Some futher reasoning and justification required. Eg. above, line 23 (iii) – I am not sure exactly what is going on here.

Line 29 – are 7 daily datasets derived?

Page 5 – Clearer signposting needed in introducing methods. Please link to section in which the detail can be found.

Line 13 – am not sure about the use of quality assessment tests here – to me these mean homogeneity tests which is not the case in this paper. I think you are assessing performance?

Lines 17-20 – you can delete the first two sentences – repetition

Rather than commencing with 'Four main temperature-based equations were evaluated. . .' Start with seven and then differentiate.

Line 23 – what do you mean by a calibration procedure?

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Line 28 – min max temps not always available historically either.

Page 6 – line 2 – what do you mean by time efficient?

Line 4 – can you provide some indication of range of catchments – size etc.

Line 13 – sentence beginning this line is long and confusing – break it into two.

Line 20 – delete of similar length

Line 21- were the assumptions of OLS checked?

Line 28 – can you call this forcing data – suggest temperature data

Page 7 line 7 – this sentence needs reworking- what about hydrological models? Is NSE a concept? Why might NSE be suited to assessing PET?

Page 8 – why these assessment criteria – later it becomes clear but state here.

Line 24 – 1P-GB introduced first time – at least link to the figure.

Page 9 – line 5-8 sentence too long, too many commas.

Line 12 delete in conclusion – this is not the conclusion

Am left wondering if reduction in temperature station density back in time is evident and if this affects results.

Page 10 – line 16 no need to present this correlation coefficient

Line 31 – give us the values of the more moderate performance

Page 11 – discussion and limitations needs to include fuller assessment of uncertainties . Line – 12 – please state what PM is here

Line 18 – replace would most likely be with are

Line 19 Great Britain? This include NI or Scotland?

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Line 19 – when and where such high resolution. . ..

Line 23 – replace unique with calibrated

Line 26 – e.g. provide guidance

Page 12 – line 11 – move this finding (vi) to higher prominence.

Line 14 – replace metrics grid with gridded metrics

Line 19 The name of the dataset is a little misleading potentially – as it is stated it reads that it is calibrated for the UK over the period 1890-2015. Consider rewording.

I have not checked the references

Captions Fig 1 – caption needs to be more informative and help the reader interpret this complex figure

Fig 2 – same, could be more informative

Fig 3 – same point

Fig 5 – in caption 4e should be 5e. What is upper VR range, please relate to part of the text where indices are described.

Fig 6 – 5d should be 6d and same for 5e

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