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Interactive comment on "Trends in evaporative demand in Great Britain using high-resolution meteorological data" *by* E. L. Robinson et al.

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We thank the reviewer for their detailed reading of the paper and for their comments and suggestions. We will address them as follows.

Major comments

- P15 L10-11. This is a well-established method (see for example (Donohue et al., 2010; McVicar et al., 2012)). However, we appreciate the reviewer's concerns, and so have investigated their suggestions. This gives the same results to within a few percent, so we suggest we continue with the original method.

We will re-check the code for errors, but the difference between the fitted trends and the trend calculated as a sum of the contributions of the other variables are consistent

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to within the quoted uncertainties.

- Table 3: The suggestion of giving percentages of the actual trend is good, and we will do this.

- Trend maps: Rather than present maps of trends, we have carried out the analysis aggregated over regions, as this is commensurate with the level of detail and uncertainties in the data. We prefer to keep the analysis of regions, as this provides a summary of the same information that would be seen in the maps.

- For historical reasons, the code used to create the specific humidity uses a constant air pressure of 100kPa rather than air pressure from Sect 2.8. The difference it makes to the air pressure has been checked for a subset of the data and was found to be small (of the order of a few percent), particularly in lowland areas where the air pressure is close to 100kPa. For any future updates of the data we will revise the procedure to use the varying air pressure.

The vapour pressure lapse rate used was indeed %/m, which is quoted in the earlier MORECS reference (Thompson et al., 1981). After some discussion with the MetOffice, we have determined that the units in Hough and Jones (1997) should actually be hPa/hPa/100m (ie, a fraction, rather than a percentage). We will cite the earlier document, to remove confusion.

- The vapour pressure lapse rate is implemented in order to keep relative humidity constant with altitude, rather than assuming well-mixed specific humidity. We are not certain as to the best method with which to adjust humidity as the alternatives all involve assumptions that we do not have data to test, nor have we found much literature on the subject. Given this uncertainty we have preferred to follow the method used by the Met Office in calculating the MORECS data. We will continue to investigate this, and the impact on evaporative demand and other model calculations, and are open to adopting another procedure in any future versions of the product.

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Minor comments

- P5 L10-11. We will re-write this to clarify

- P7 L17-19. We have accounted for the possibility that this produces negative wind speeds and will add something to this effect in the manuscript.

- Section 2.7. The DTR data (from CRU TS) are only available at coarser temporal and spatial resolution than the MORECS variables and there is large uncertainty in how DTR varies with altitude across the landscape. In view of these uncertainties we decided not to interpolate DTR and will explain this in the text.

- P8 L9-10. This is indeed a method which integrates the hydrostatic equation, taking into account the variation of T with altitude. This will be more clearly explained in the text

- Fig 1. We will improve the choice of limits on these maps

- Fig 4. We think that the absolute difference will be more interesting (and relevant) to people who may use the PET(I) products, therefore we would prefer to keep the figure as it is, and add absolute differences to the text.

- Section 3-4. DTR is required for running a sub-daily land surface model with daily inputs, but is not required for the PET(I). We will clarify this.

- Trends per year vs. trends per decade: We will make these consistent through the text

- P13 L21-23: Yes, the evidence for drying summers is over a much longer time period. The report (Jenkins et al., 2008) on which we base this statement states that summers have been drying (decreasing precipitation) over the last 250 years, but it is not observable over the past 50 years (ie the duration of our dataset). We will clarify this in the text.

- Figure 11 caption: Yes, we will alter the caption to better describe the plot.

Technical corrections

- Eqs 2, 9, 10: This is just a typo in the manuscript, not in the code, and will be corrected

- P9 L9: Yes, this will be changed to qa

- P9 L20: Again, a typo in the manuscript, which will be corrected. The code is unaffected.

- P10 L21-22: Yes, wind speed will be added

- P14 L23: This will be changed from P to PET.

References

Donohue, R. J., McVicar, T. R., and Roderick, M. L.: Assessing the ability of potential evaporation formulations to capture the dynamics in evaporative demand within a changing climate, Journal of Hydrology, 386, 186-197, doi:10.1016/j.jhydrol.2010.03.020, 2010.

Hough, M. N., and Jones, R. J. A.: The United Kingdom Meteorological Office rainfall and evaporation calculation system: MORECS version 2.0-an overview, Hydrology and Earth System Sciences, 1, 227-239, doi:10.5194/hess-1-227-1997, 1997.

Jenkins, G. J., Perry, M. C., and Prior, M. J.: The climate of the United Kingdom and recent trends, Met Office Hadley Centre, Exeter, UK, 2008.

McVicar, T. R., Roderick, M. L., Donohue, R. J., Li, L. T., Van Niel, T. G., Thomas, A., Grieser, J., Jhajharia, D., Himri, Y., Mahowald, N. M., Mescherskaya, A. V., Kruger, A. C., Rehman, S., and Dinpashoh, Y.: Global review and synthesis of trends in observed terrestrial near-surface wind speeds: Implications for evaporation, Journal of Hydrology, 416, 182-205, doi:10.1016/j.jhydrol.2011.10.024, 2012.

Thompson, N., Barrie, I. A., and Ayles, M.: The Meteorological Office rainfall and evaporation calculation system: MORECS, Meteorological Office, Bracknell, 1981.

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