Chris Beales – review of:

Derivation of RCM-driven potential evapotranspiration for hydrological climate change impact analysis in Great Britain: a comparison of methods and associated uncertainty in future projections

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This is a useful paper. It describes some valuable research into the relative values of a wide range of PET calculation methods. This is very important for us in the UK, where the balance of PET vs rainfall is critical for our good understanding of catchment hydrology. In turn, understanding changes in future water availability are fundamental for our adaptation plans, as we hope to plan for population growth and climate change.

The conclusions seem good, given the evidence presented. The FAO56 method for PET calculation looks like a good compromise. And it is great to see this demonstrated. I cannot offer any comments into the use of the RCM data and the bias correction methods used. However, it seems sound and the authors have demonstrated useable results.

I have a couple of general comments:

- In the introduction (last paragraph p601): it could be worth emphasising how hydrological (and hydrogeological) models – calibrated using PET and rainfall – underpin Water Resources and Flood Risk Management catchment planning and, importantly, regulation.
- Section 2.2.1 (p605): it would be worth noting that MORECS has recognised inconsistencies in places. These result from changes to available meteorological data through time.

I noted a few minor corrections that should be made to the main text:

- Page 599, line 12: split the sentence “...the surrounding air. Soil water availability depends on...”
- Page 599, sentence starting line 21 is very long.
- Page 607, line 16: “Analyses focus on: the year; and the four months of the ...”

- And I agree with Marie Ekstrom's corrections, including the note about the smallness of the figures.

Finally, I spent some time looking through the supplementary document, as I think this is a useful resource.

- You could note that the FAO56 equation can be simplified: $\lambda^{-1} = 0.408$
- I didn't check the other PET equations.

In the table (Sect 2):

- It is worth noting that MORECS uses different equations for calculation of Solar declination (δ) and Max daylight length (N).
- Row 9: P is "Atmospheric pressure"
- Row 10: I think this should be ρ_a "Mean air density at constant pressure" = P / (T_k . R). Where R is the specific gas constant.
- Row 11: units are %
- Row 12: is ok but I'd emphasise the simplified version.
- Row 14: could note that $C_p = 1.013 \times 10^{-3}$ MJ kg^{-1} $^oC^{-1}$, and $\epsilon = 0.622$.
- Row 15: it is useful to have this equation in MJ mm^{-2} d^{-1} (i.e. replace the 15.392 for 37.62 in the equation). Note that the units column presumably contains the conversion formula but this is squeezed-out on the final page.
- Row 16: it would be good to show this equation generalised with constants: $R_s = S_0 (a_s + b_s(n / N))$. I think there are opportunities for us to improve PET calculations if we adjust these from the 0.25 and 0.50 defaults.
- Row 18: the equation should be corrected to be a positive measure of long-wave radiation, as the equation in row 19 is in the form $R_n = R_{ns} – R_{nl}$. Emissivity should be defined as $\epsilon' = 0.34 – 0.139 \sqrt{e_a}$. Correct the symbol to $\sigma = 4.903\ 10^{-9}$ MJ K^{-4} m^{-2} day^{-1} for the Stefan-Boltzmann constant. Finally, the temperature should be in Kelvin.
- It would be good to add a row defining C_p "Specific heat at constant pressure" – noting that it is a rearrangement of the equation for the Psychrometric constant – so that $C_p = \gamma\epsilon\lambda / P$