

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

E. L. Robinson et al.

emrobi@ceh.ac.uk

Received and published: 15 April 2016

We thank the reviewer for their comments and will address them as follows.

1) Uncertainties of the CEH-GEAR precipitation (Keller et al., 2015), the CRU TS 3.21 DTR (Harris et al., 2014) and the WFD surface air pressure (Weedon et al., 2011) are discussed in the original papers. For the other variables, we are aware of other projects in progress to more thoroughly evaluate spatial fields generated from station data, but there are no results yet available. Our own work has involved some assessment of the data against flux sites. We will consider including examples of this to demonstrate uncertainties.

2) Note that there are plants which do have stomata on the upper sides of leaves as well as below (Camargo and Marenco, 2011). However, it is true that in the temperate

[Printer-friendly version](#)

[Discussion paper](#)



climate of the UK plants are more likely to have stomata only on the underside of the leaves. This does not, however, preclude the inhibition of transpiration by intercepted water.

Suppression of transpiration is well observed both by comparing eddy-covariance fluxes and observations of sap flow (Kume et al., 2006; Moors, 2012), and by observing stomatal and photosynthesis response to wetting (Ishibashi and Terashima, 1995). The suppression may simply be due to the fact that energy is used in evaporating the intercepted water, so less is available for transpiration (Bosveld and Bouten, 2003). It may also be due to water directly blocking the stomata, even if they are open (most likely to affect leaves with stomata on the upper side), or due to the presence of water causing stomatal closure. This latter mechanism can be observed even when the stomata are on the underside of a leaf and the water is lying on the upper side (Ishibashi and Terashima, 1995). It is also possible that the increased humidity of the air, due to evaporation of intercepted water, causes the stomata to close.

We will add some more detail about this to the manuscript, to make it clear that it is not simply that the intercepted water is directly blocking the stomata.

References: Bosveld, F. C., and Bouten, W.: Evaluating a Model of Evaporation and Transpiration with Observations in a Partially Wet Douglas-Fir Forest, *Boundary-Layer Meteorology*, 108, 365-396, 10.1023/a:1024148707239, 2003. Camargo, M. A. B., and Marengo, R. A.: Density, size and distribution of stomata in 35 rainforest tree species in Central Amazonia, *Acta Amazonica*, 41, 205-212, 2011. Harris, I., Jones, P. D., Osborn, T. J., and Lister, D. H.: Updated high-resolution grids of monthly climatic observations - the CRU TS3.10 Dataset, *International Journal of Climatology*, 34, 623-642, doi:10.1002/Joc.3711, 2014. Ishibashi, M., and Terashima, I.: Effects of continuous leaf wetness on photosynthesis: adverse aspects of rainfall, *Plant, Cell & Environment*, 18, 431-438, 10.1111/j.1365-3040.1995.tb00377.x, 1995. Keller, V. D. J., Tanguy, M., Prosdocimi, I., Terry, J. A., Hitt, O., Cole, S. J., Fry, M., Morris, D. G., and Dixon, H.: CEH-GEAR: 1 km resolution daily and monthly areal rainfall estimates

for the UK for hydrological and other applications, *Earth Syst. Sci. Data*, 7, 143-155, doi:10.5194/essd-7-143-2015, 2015. Kume, T., Kuraji, K., Yoshifuji, N., Morooka, T., Sawano, S., Chong, L., and Suzuki, M.: Estimation of canopy drying time after rainfall using sap flow measurements in an emergent tree in a lowland mixed-dipterocarp forest in Sarawak, Malaysia, *Hydrological Processes*, 20, 565-578, 10.1002/hyp.5924, 2006. Moors, E.: *Water Use of Forests in the Netherlands*, PhD, Vrije Universiteit, Amsterdam, the Netherlands, 2012. Weedon, G. P., Gomes, S., Viterbo, P., Shuttleworth, W. J., Blyth, E., Osterle, H., Adam, J. C., Bellouin, N., Boucher, O., and Best, M.: Creation of the WATCH Forcing Data and Its Use to Assess Global and Regional Reference Crop Evaporation over Land during the Twentieth Century, *Journal of Hydrometeorology*, 12, 823-848, doi:10.1175/2011jhm1369.1, 2011.

Interactive comment on *Hydrol. Earth Syst. Sci. Discuss.*, doi:10.5194/hess-2015-520, 2016.

[Printer-friendly version](#)

[Discussion paper](#)

