Hydrol. Earth Syst. Sci. Discuss., 12, C5384–C5386, 2015
www.hydrol-earth-syst-sci-discuss.net/12/C5384/2015/


Hydrology and Earth System Sciences
Open Access
Discussions

# *Interactive comment on* "Adaptation of water resource systems to an uncertain future" *by* C. L. Walsh et al.

**C. L. Walsh et al.**

Claire.Walsh@ncl.ac.uk

Received and published: 4 December 2015

We thank Y Xuan for his comments and questions which we address below.

1. The application of the spatial weather generator captures the non-linear impacts of climate change on the water resources of the Thames. Although as the referee points out this is then aggregated as input to the hydrological model, the approach does ensure correlated weather events between the three sub-catchments modelled. As described below in a publication forthcoming we use a physically-based spatially distributed hydrological model which uses spatially correlated precipitation and PET input data from the UKCP09-WG on a 5km grid. Thereby giving a better representation of input data across the Thames basin.



2. This is an interesting question but believe is beyond the scope of this paper. Others such as Wilby and Harris, 2006 have looked at two hydrological model structures, and two sets of hydrological model parameters for the Thames. As mentioned below in a publication forthcoming we use a physically-based spatially distributed hydrological model to drive LARaWaRM which if returns different flows may give an indication of the issue raised.

3. The calibration period against historical flows was 1/1/1961 - 31/12/1978 except for the Lee at Feildes Weir which was 1/1/1961 - 31/12/1975, as the gauge was out of commission for 2 years during 1976-8. The validation period was 1/1/1979 - 31/12/2002. This information would be added to the caption if Figure 3, alongside the Nash-Sutcliffe scores as suggested by referee, Wilby.

4. This question raised is similar to a point made by referee, Wilby. We recognise that the calculation of PET is essential in calculating future water resource availability and that different downscaling methods yield different PET change predictions. The Thames basin was divided into three sub-catchments to conduct the hydrological modelling as shown in Figure 2. Within each of the catchments there are a variety of land uses which would in turn affect moisture losses, as the reviewer highlights. Given the similarity in the three catchments in terms of elevation and heterogeneity of land cover, and that CATCHMOD is a lumped model, only one PET series for each sub-catchment could be used as input, it was decided to use the same PET record for the three areas. Unfortunately with applying a lumped model it is not possible to investigate how representative this is for the urban sub-catchment. However, in a publication forthcoming we use a physically-based spatially distributed hydrological model which uses spatially correlated precipitation and PET input data from the UKCP09-WG on a 5km grid. Thereby giving a better representation of input data across the Thames basin.

The paper presents the first published application of LARaWaRM which as referenced in the text is based upon the Environment Agency's representation of the water resource zone in AQUATOR. The model is a bulk demand supply model run on a daily timestep. There are five phases to the water movements: river flows are input at the start of each day via a time series of values; river regulators then augment river flows to satisfy river flow constraints; demand centres then try to satisfy their demands by drawing water from any or all available supplies, such as river abstractions, groundwater abstractions, reservoirs, etc.; reservoirs refill as necessary from their available supplies according to built-in rules; finally at the end of the day any reservoir which has had excess water pushed into it will spill into its attached river spillway. This information is provided in the referenced document and after addressing the comments by referee, Wilby, we would argue that no further details would add value.

---

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 8853, 2015.