Responses to interactive comment on "Sensitivity of potential evapotranspiration to changes in climate variables for different climatic zones"

by Danlu Guo et al.

Black text – Reviewer's comments

Green text – Authors' responses

We would like to thank Giovanni Ravazzani for his feedback on the manuscript. Our detailed responses to the each comment are as follows.

Overview

This paper does not present absolutely new findings but presents a systematic application of existing methods to assess sensitivity of models to compute potential evapotranspiration that is a relevant topic when dealing with climate change impacts analysis. So the paper is interesting, it is well written and matches the scope of this journal.

Comments

1. L1: the manuscript considers a wide area but not all the climatic zones as I would understand by reading the original title. I suggest to change it to: Sensitivity of potential evapotranspiration to changes in climate variables for different climatic zones of Australia

We agree with your suggestion and will change the title to: "Sensitivity of potential evapotranspiration to changes in climate variables for different Australian climatic zones".

2. L452: Thus I would conclude that, as PET models are more sensitive to temperature data and climatic projections of all meteorological forcings except temperature show a high degree of uncertainty, it is better to use temperature based equations for assessing impacts of climate change. This is consistent with results shown in Ravazzani et al. (2014) in which they conclude that, in a humid alpine river basin, the bias introduced by the approximations from the method used to compute the evapotranspiration was less than the uncertainty associated with climate models, when you need to quantify climate change impacts.

   Ravazzani G, Ghilardi M, Mendlik T, Gobiet A, Corbari C, et al. (2014) Investigation of Climate Change Impact on Water Resources for an Alpine Basin in Northern Italy: Implications for Evapotranspiration Modeling Complexity. PLoS ONE 9(10): e109053. doi:10.1371/journal.pone.0109053

Thank you for the interesting point. The discussions between L431 and L453 in the original version focused on the sensitivity results of the two methods (Penman-Monteith and Priestley-Taylor) analysed in this paper, and therefore it was difficult to broaden out the discussion to other models in that section. However, in response to this comment, we will expand the discussion of the potential advantages and disadvantages of using alternative PET formulations in the introduction (L56 to L71 in the original manuscript), highlighting the tension between selecting more complex process-based PET models and

simpler approaches (such as the temperature-based equations). We will add a citation to Ravazzani et al. (2014) in this section. The updated discussion will be as follows (with changes underlined):

- *"Complex models such as the Penman-Monteith model are often recommended for their ability to better represent the physical processes that affect PET (McVicar et al., 2012;Donohue et al., 2010;Barella-Ortiz et al., 2013). For example, the Penman-Monteith model can account for the effects of wind, and thus can assist with explaining at least part of the observed decreases in pan evaporation with an increasing in temperature in many locations globally due to the observed decreases in wind speed (this is sometimes referred to as the 'pan evaporation paradox; see Roderick et al., 2007;McVicar et al., 2012;Lu et al., 2016). However, simpler empirical models may also be preferable under some conditions, as they require a smaller number of input climate variables, which might be able to be projected with greater confidence with GCMs, thus leading to greater confidence in the corresponding PET estimates (Kay and Davies, 2008;Ekström et al., 2007;Ravazzani et al., 2014). For example, there is reasonable confidence in projections of temperature and relative humidity in Australia for a given emissions scenario, but less confidence in projections of wind due to sub-grid effects of orography and other land-surface features (Flato et al., 2013;CSIRO and Bureau of Meteorology, 2015). In these situations, models such as the Priestley-Taylor model that do not depend on wind may produce more reliable estimates of PET compared to the more complex Penman-Monteith model. Thus, the choice of climate variables to include in climate impact assessments must be informed both by the relative importance of each variable on projections of PET (e.g. Tabari and Hosseinzadeh Talaee, 2014), and the likely confidence in the projections of each variable (e.g. Flato et al., 2013;Johnson and Sharma, 2009)."*

3. Fig.1: Legend displays much more zones than those illustrated in the map and this makes difficult to associate color to the proper class. i suggest to leave in the legend only climatic classes present in Australia

We agree with your suggestion and will reflect this change in the revised manuscript.

4. Fig.4 to 8: captions of this and following figures use letter to describe figure content but letters are not present in figures. Also in the text authors use reference to specific panel within a figure (for example fig 3a) and the reader would benefit finding letter close to the panel. The same comment for figures 4 to 8.

We agree with your suggestion and will reflect this change in the revised manuscript.