

Interactive comment on “Shift of annual water balance in the Budyko space for a catchment with groundwater dependent evapotranspiration” by X.-S. Wang and Y. Zhou

R. Donohue (Referee)

randall.donohue@csiro.au

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Hi again. I want to make a few comments or clarifications given your responses.

Glad to see you performed your analysis with water supply being P-Sw. You say that the purpose of your paper is to demonstrate what happens in original Budyko space when ground water provides additional water. That is fair enough, but that has been done previously (Wang 2012 WRR 48). As has demonstration of the effect on Budyko of the intereaction between intra-annual or seasonal application and stored water (Chen and Alimohammadi 2013 WRR; Potter et al 2005 WRR 41, Zhang et al. 2008 jHyd 360). So it seems important to me that you emphasize in your revised MS what is new about

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what you are demonstrating.

The three points that you have presented in your response for the 'summation of what is the Budyko framework' have all been clearly presented previously - there is no mystery surrounding them. To not understand them is to not understand the basics of the Budyko framework. So perhaps it would be best not to present them as something new, but as a reminder for the reader?

In the previous work (cited above) that employ the effective rainfall approach (P-Sw), this approach has been found to work quite well, reproducing the limits and scatter of the standard Budyko framework. Most particularly, Wang 2012 WRR showed that catchments with ground water contributions do adhere quite well to the original Budyko when effective rainfall is used. So it is now intriguing as to why yours haven't. Do you know why?

It might be worth having a close look at the Potter paper, above, as they show that (even with 'effective rainfall') climate seasonality, and particularly climates with in-phase energy and water cycles, can make the data points adhere to a lower energy limit than the limit set by 'potential evaporation'. It seems to me that you are finding the same result.

So overall, I'm still not convinced that ground water active catchments do not adhere to the Budyko framework when total water supply is parameterised properly (ie effective precipitation as introduced by several authors previously). To say that the aim of the paper is not to look at these issues but that it is to apply budyko to ground water catchments - and therefore there's no need to address these issues - is not a very satisfying defense of your approach!

If you still feel that your new modified curves are an important contribution, I think it would be less confusing to call them something other than a 'budyko-type', 'Budyko curves' or a 'modified Budyko' model. A 'budyko-type' model infers that the original assumptions in Budyko are being adhered to, which I'm still not convinced that your

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model achieves (yet).

Randall

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