

Interactive comment on “Similarity between runoff coefficient and perennial stream density in the Budyko framework” by D. Wang and L. Wu

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I think this is a very interesting and useful study to relate the permanent stream density to the aridity index. Since permanent stream density depends on the permanent groundwater discharge, and hence on groundwater recharge, this is an important result that can be used in ungauged basins.

I don't have critical remarks, but I have a few suggestions and also I suggest some corrections:

1. The authors use the equation of Budyko, which is the root mean of two earlier equations by Schreiber (1904) and Ol'dekop (1911). The equation of Schreiber is the

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simplest, being:

$$\frac{E}{P} = 1 - \exp\left(-\frac{E_p}{P}\right)$$

I think that for the purpose of this paper, this very simple equation suffices. I suggest you refer to Gerrits et al (2009) who present an overview of all the Budyko-type equations and their references. Alternatively, you can include the curves of Schreiber and Ol'dekop, who provide two 'envelopes' that bracket most of the data points.

2. Moreover, Gerrits et al. (2009) provide a theoretical backing of the Budyko curve, relating it to characteristic statistics of the rainfall (using the exponential probability distribution of rainfall on a rainday and the Markov property of rainfall), which one may consider as the rainfall signature of the climate. I think it is worth mentioning.

Finally, I think the units of rainfall should always be in a depth per unit of time. In the paper the authors use the unit mm, where this should be mm/year. This is bad practice and should be corrected. Pay attention to this issue on page 7574 lines 3-5 and on page 7575 line 7.

Reference:

Gerrits, A.M.J., H.H.G. Savenije, E.J.M. Veling, and L.Pfister, 2009. Analytical derivation of the Budyko curve based on rainfall characteristics and a simple evaporation model, *Water Resources Research*, 45, No. 4, W04403, p.1-15.

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