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.

Dear Prof. Savenije: Thank you for your comments which will improve the manuscript.

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 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.

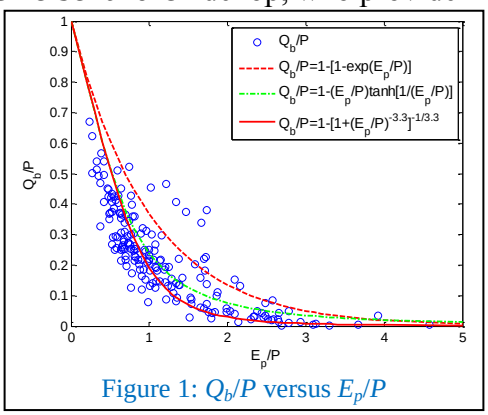

Figure 1: Q_b/P versus E_p/P

Thank you for your helpful suggestions. Gerrits et al (2009) is a very interesting paper. Thank you for the simpler equations of Schreiber (1904) and Ol'dekop (1911) indeed provide the upper and lower bound for the data points of $Q/P \sim E_p/P$. Based on the comments by Prof. Sivapalan, we will replace Q/P using Q_b/P where Q_b is long-term average base flow. The data points of Q_b/P are a little bit below the Budyko curve for Q/P shown in Figure 1. Therefore, we will use a single parameter Turc-Pike equation to fit the relationship $Q_b/P \sim E_p/P$ as shown in Figure 1, similarly for the normalized D_p.

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.

Thank you for the reference. Gerrits et al. (2009) indeed provides a theoretical basis of the empirical Budyko curve by incorporating simple evaporation model and rainfall characteristics. We will refer to Gerrits et al. (2009) for physical background of the Budyko curve.

3. 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.

Thank you very much for your suggestions. We agree with you and will change the unit to mm/year.

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.