Review of HESS Manuscript # 2018-186

Title: Exploring the relationship between warm season precipitation, potential evaporation, and "apparent" potential evaporation at site scale

Author: Chen & Buchberger

This manuscript describes an updated analysis of a combined Budyko-Bouchet complementary relation using data from across the US.

There has been a growing (and sometimes confusing) literature on the CR in recent years. Many of these difficulties have been described in a recent mini-review (see section 2 in Aminzadeh et al 2016 WRR).

The manuscript under consideration skips over the above-noted difficulties and in essence returns more closely to the original CR formulations by Brutsaert and co-workers. In that context, the manuscript adds some ideas and much useful data the literature.

The manuscript is, in general, very clearly written, and with the extensive data, is a helpful addition to the literature.

Recommend: Accept subject to revision

Comments:

1. Lines 45-57. I agree with the first condition for potential, i.e. no limit on the water supply. However, the second definition, i.e., saturated surface vapour pressure, is used by some scientists but the relevance is not clear. For example, in this manuscript, potential is actually defined by Priestley-Taylor and this does explicitly refer to saturated surface air. The comments here fall into the "difficulties" categories noted above. There is a vast range of definitions of potential E over the years …….. So what to do? Maybe drop the text about saturated vapour pressure at the surface and acknowledge some of the difficulties.

2. Lines 45-57. I have advocated dropping the text about saturated vapour pressure in this paragraph. At any rate, it is also useful to note that for evaporation from a pure water surface (e.g. pan), the vapour pressure right at the evaporating surface is assumed to be saturated. I assume what you mean here is the vapour pressure of **adjacent near-surface air**. Please be specific.

3. Line 56. TYPO. ….. by **an** evaporation pan

4. Line 79. See comment 2.

5. Line 130-135. You set a = 1. Why? I note that you say it does not make much difference to your results but it is nice to use a reasonable parameter value if you have one available. That would be 0.7 (instead of 1). The Class A pan (as used here) is elevated above the ground and the water surface evaporation is effected by heat exchange across the side walls. The meaning of the pan co-efficient relates to this

additional heat. The traditional value for the pan co-efficient is around 0.7 (see Stanhill 1976 that you cite). Theoretical considerations suggest the value should be 0.65 to 0.9 with a mean close to 0.7 (see Fig. 10 in Lim et al 2013, AgForMet). So why not use 0.7?

6. Line 173. TYPO. for each year **at** each weather

7. Lines 188-196. I assume you set G to zero when calculation Ep? Please state how you did this calculation.

References

Aminzadeh, M., M. L. Roderick, and D. Or (2016), A generalized complementary relationship between actual and potential evaporation defined by a reference surface temperature, Water Resources Research, 52(1), 385-406, doi:10.1002/2015WR017969.

Lim, W. H., M. L. Roderick, M. T. Hobbins, S. C. Wong, and G. D. Farquhar (2013), The energy balance of a US Class A evaporation pan, Agricultural and Forest Meteorology, 182, 314-331, doi:10.1016/j.agrformet.2013.07.001.