

# A worldwide analysis of trends in water-balance evapotranspiration

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submitted to *HESS*

## Major remarks

The paper is well-written and provides interesting new results on historic trends in evapotranspiration (ET). ET links the land water balance and the energy balance and is a key variable of the hydroclimatological system. Previous assessments on trends in ET show diverse results. This study gives further insights on ET-trends for the 1960-1999 period for a wide-range of different river basins, following a comprehensive approach. The authors also attribute detected changes to variations in meteorological or land surface-related properties. However, the authors possibly should address the following comments to improve the manuscript:

1. Please provide a brief description of the variance partitioning method. Probably many potential readers of the study are not used to it and as you draw many conclusions based on this method, it would be nice to know at least basics without buying the referenced textbook. I guess, 2 to 3 additional sentences would be enough... or maybe add a small appendix.
2. You make very strong statements based on figure 3, like e.g. 'Wind speed significantly affected ET variability in some small coastal basins (see the Sacramento basin in Fig. 3).' (5749 l. 6-7). A strong relationship between precipitation and ET is obvious, but a relationship between ET and e.g. wind is not. Please support these statements with calculating at least a correlation (and its corresponding significance). Also, please comment shortly on causality. Of course, time series of ET and e.g. wind for Sacramento basin look maybe quite similar, but unfortunately, this tells you nothing about a causal relationship between them. I would guess its more probable to find a link between wind and precipitation, because when you have a lot of wind, you probably have a lot of precip or vice versa.
2. Provide some information on how you've tested on significance. You give some p-Values in your table, but it is not clear how they are computed. Also provide significance information on each basin in figure 4. Equal trends in tropical and subpolar basins will definitely have different significance levels... so maybe you could highlight basins having significant trends and leave out those with insignificant trends.
3. Why do you use just two precip datasets. Your analysis would definitely improve from using more datasets.

## Specific comments

5743 I. 15: Do you really need to fill gaps? You are able to calculate trends and other basic statistics without interpolating. However, if you want to interpolate, it is definitely better to choose another approach, as your technique is probably creating inconsistencies. Imagine a dry year with a missing month within two wet years, creating you a wet month in an overall dry year.

5743 I. 25-26: In fact, you do not need to introduce the Budyko framework here, as you just use the aridity index to determine 'dry' and 'wet' areas. Also, please motivate the choice of an aridity index of '1.5' for classification. Why don't you use an aridity index of '2', following UNEP's definition of semiarid and semihumid regions (see Middleton et al., 1997)? The distribution of wet to dry basins in figure 1 seems also a littlebit random. So, if you decide not to mention the Budyko framework here, also remove it from the abstract. If you decide to mention it here, introduce it briefly.

5745 I. 5: This datasets has a pretty coarse resolution. Could you please comment on this and emphasize corresponding limitations to your analysis.

5745 I.19: Could you please provide some insight on this kind of temporal interpolation and if it is appropriate or not?

5748 I. 17: If you like to draw conclusions from the Budyko framework, please introduce it briefly (like mentioned above) or give maybe the original reference: 'Budyko, M. I. Climate and life (Academic Press, New York, 1974)'

Regarding the figures: All the text in figures 2,4 and the tickmarks in figure 3 are quite small.

## References

Middleton, N., Thomas, D. et al. World atlas of desertification. Ed. 2 (Arnold, HodderHeadline, PLC, 1997).