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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Separating the effects of changes in land cover and climate: a hydro-meteorological analysis of the past 60 yr in Saxony, Germany" *by* M. Renner et al.

Anonymous Referee #2

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The main contribution of this paper is the presentation of a methodology to quantify separately the effects of climate change and land use changes on actual evapotranspiration (ET) and thereby on catchment water availability. The methodology is applied to 68 catchments in a region of Germany for which data for the analysis is available for the 60 yr period between 1950 and 2009. The method is based on quantifying and separating the changes on the water and energy partitioning graph (ET/Eo versus ET/P). The paper is generally easy to read and very interesting as it presents a simple graphical method for separating the changes observed in ET due to climate and land use changes. However, in its current state I identified several problems mainly related

to the basis of the method and my recommendation is to be accepted after the following points are clarified:

- From the manuscript it is unclear the derivation of eq. 5 which provides the water partitioning coordinate qb. How fb disappears of eq. 5 when eqs. 3 and 4 are combined?

- Is P0 in eq. 6 right or it should be Pb, or is that P0=Pb?

- Although the methodology is simple: provided that the coordinates (q0, f0) and (q1, f1) are known by using eq. 5 one can obtain qb. This value will be used in eq. 6 to get ET,b and thereby the changes in ET related to land-surface changes (eq. 7) and to climate changes (eq. 8). However, the basis of the method such as the definition of climate changes as perpendicular to the original aridity index is not clear by just referring to the symmetry of water or energy limitation. This needs some additional explanations.

- What would be the advantage of this method compared to the one employed by Jaramillo et al. (2013) where changes in ET due to climate are calculated as a function of changes in P and E0 and the difference between this ET value from the climatic variables and the ET from the water balance (P-Q) is attributed to changes in land use?

- Why the runoff data is subject to a homogenization test procedure as pointed out in lines 17-20? Are the runoff data and the precipitation data reported initially as daily values?

- Lines 5-8 on pg. 8547 needs a reference to the study the authors are mentioning.

- In section 3.4 the authors explain the calculation method of potential evapotranspiration from reported monthly average data of the stations shown in Fig. 3b. However they do not explain how they interpolated the point data to obtain the spatial variability of E0 shown in the Figure.

- Line 20. Pg. 8557. I do not agree with the authors when they write the statement that

there has been a significant reduction in potential evapotranspiration from 1950-1980.

- Fig 1 legend. Change P0= 1400 mm by P1

- Fig 5 legend. The authors say “The thin grey lines show ....” but in reality they plot lines in green and red colors.

- Fig. 7 legend. Add in the legend the explanation about the pie charts, the map with forest damages and the Corine data.

- Line 16 on page 8560. In the sentence “Similar increases in ET have been found in the U.S. by (Walter et al., 2004...)”. Change the location of the parenthesis for the references.

Jaramillo F., Prieto C., Lyon S.W. and Destouni G. (2013). Multimethod assessment of evapotranspiration shifts due to non-irrigated agricultural development in Sweden, Journal of Hydrology 484, pp. 55-62, doi: 10.1016/j.jhydrol.2013.01.010

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 8537, 2013.