Replies to the comments by Referee #2

We would like to thank Referee #2 for his/her interest and the useful comments on our manuscript. These were related to the attribution to soil moisture, changes in seasonality and feedback effects between the drivers.

Attribution to soil moisture change

The authors explain the dependence of the ET change (partly) on change of precipitation is as a result of increased soil moisture arising from the precipitation change. Here is where I have some concern - I have trouble grasping the attribution to soil moisture change. Why would there be increased soil moisture when P and ET are changing in the same direction? I have trouble understanding it. Furthermore, if there is increased soil moisture why is Q not increasing? I would not be so quick to jump to this conclusion: perhaps they can take it more slowly, and in steps. Precipitation and atmospheric demand are both increasing, but at the same time for these same reasons (and other reasons, e.g., temperature) I can understand vegetation activity being increased, which probably removes the increased soil moisture in the root zone due to the increased precipitation (leading to increased ET) but without increased recharge, which keeps Q the same. Not sure if this logic is right.

Response: Thank you for this comment, which made us aware that using soil moisture as one of the drivers for the attribution is not ideal because of the feedbacks between changes in E and changes in soil moisture. For example, under conditions of increasing E due to increasing atmospheric demand, E increases more strongly at a location with increasing precipitation compared to a location with stationary precipitation but it is ambiguous whether this effect should be ascribed to changes in soil moisture (as done in the original manuscript). Furthermore, changes in interception were not mentioned explicitly. We therefore now use precipitation instead of soil moisture as one of the drivers for the attribution analysis.

Changes in seasonality

In any case I am afraid the observed phenomenon may not be fully explained without invoking changes to seasonal variability (of everything, especially NDVI). There must be some kind of nonlinearity caused by changes to the seasonality, which may contribute to the phenomenon. In other words, changes in precipitation and radiation (and wind) propagate through the system in more complex ways than the authors have concluded in the paper. For the present, the paper requires some moderate revisions to address these issues. I suggest that the authors try to refine their attribution exercise to account for this complex system perspective, and to allow for seasonality changes to play a role in contributing to the phenomenon.

Response: Seasonality effects are partly already considered in our analysis. E_0 was calculated on a daily basis considering daily inputs of global radiation, air temperature, and vapor pressure deficit. Thus, variable rates of increase in these inputs during different seasons and their variable effects on E_0 during different seasons are considered in the analysis. We investigated changes in NDVI over the year and these were considered in the analysis of changes in E_{0v}. With respect to the analysis of the water balance components, the manuscript already showed seasonal changes of precipitation (for the summer and winter half year; supplementary figures S4 and S5).

We have now also analyzed changes in P-Q and discharge on a seasonal basis (Fig. 1). P-Q shows increases during the summer half year (May-Oct) and decreases over the winter half year (Nov-Apr).

Precipitation increases during the summer half year but shows no trends or decreases over the winter half year. Discharge does not show trends over the summer or the winter half year.

Due to intraannual storage variations *P-Q* for the winter/summer half year cannot be interpreted as *E* in the winter/summer half year. Changes in *P-Q* represent a combination of changes in *E* and changes in storage. The negative trend in *P-Q* during the winter half year suggests an increase in evapotranspiration during the winter half year and/or a lower transfer of stored water from the winter to the summer half year. One possible explanation for a lower transfer of stored water might be the decrease in snow, i.e. a greater proportion of the precipitation that falls during winter contributes to discharge during the winter instead of being stored as snow and contributing to discharge or *E* during the summer half year.

Consideration of feedbacks

A further suggestion, anticipating future studies, is to present a conceptual model (in the form of a causal loop) that possibly accounts for some kinds of feedbacks that may need to be invoked to fully explain the phenomenon. The current paper looks like a stepping stone towards a more comprehensive model of the system in the future.

Response: We agree with the referee about the importance of considering changes in E_{wb} within a systems approach since the changes in *E*, vegetation, soil moisture, etc. are related through multiple feedbacks (Fig. 2). We now include a causal loop diagram that visualizes these feedbacks and supports the discussion section of our paper. We explicitly discuss which feedbacks are included or excluded with the different drivers in the attribution.

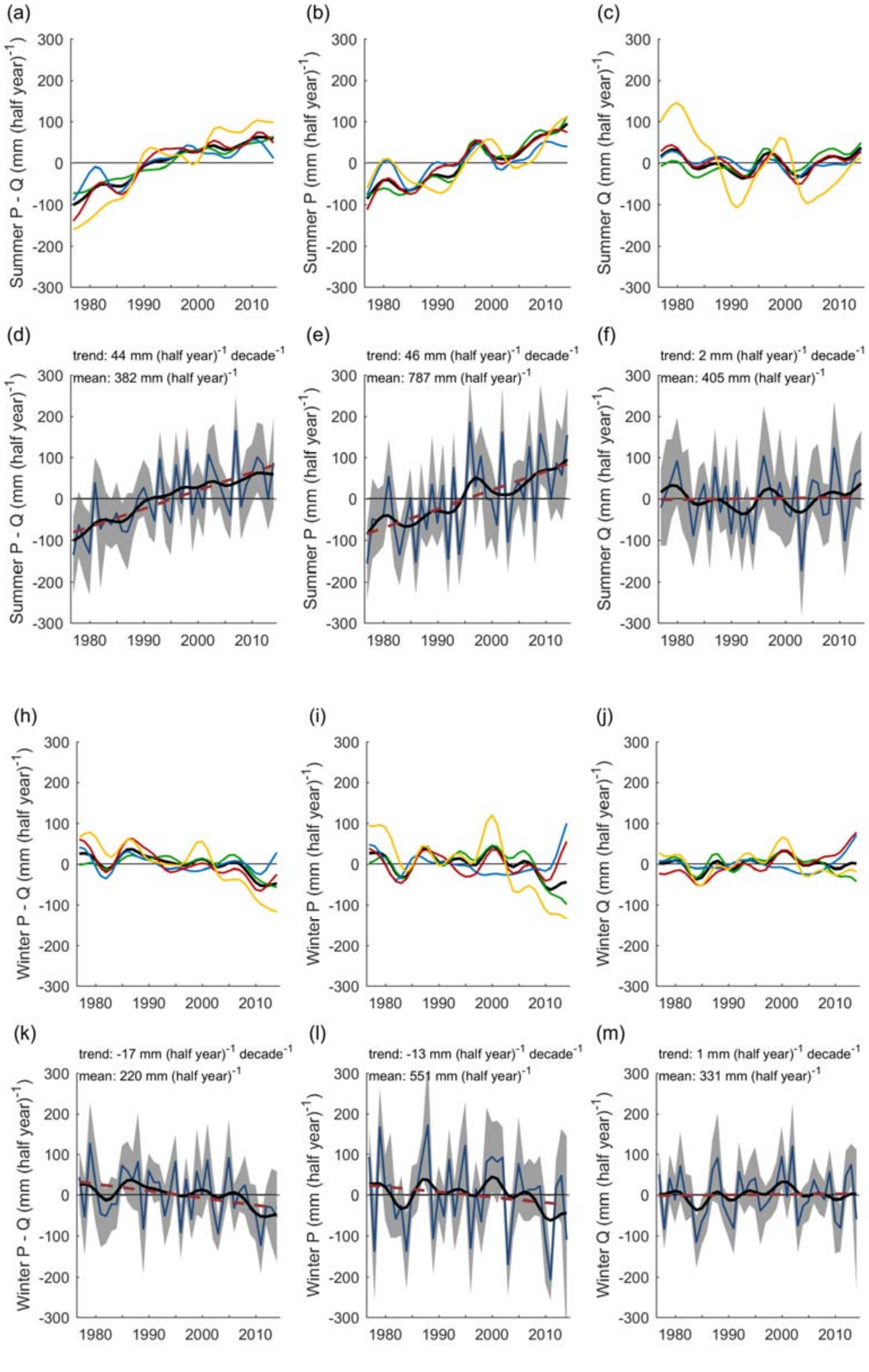

Fig. 1: Anomalies of (a, d, h, k) *P-Q*, (b, e, i, l) precipitation and (c, f, j, m) discharge for (a-g) summer half years and (h-m) winter half years over 1977–2014. (a–c and h–j) show anomalies by region. Data smoothed using a Gaussian filter with a standard deviation of 2 years. (d–f and k–m) show anomalies over all catchments. The thin blue line shows the mean over all catchments, the grey shaded area the variability between catchments (± 1 standard deviation), the bold black line the smoothed mean, and the red dashed line the trend.

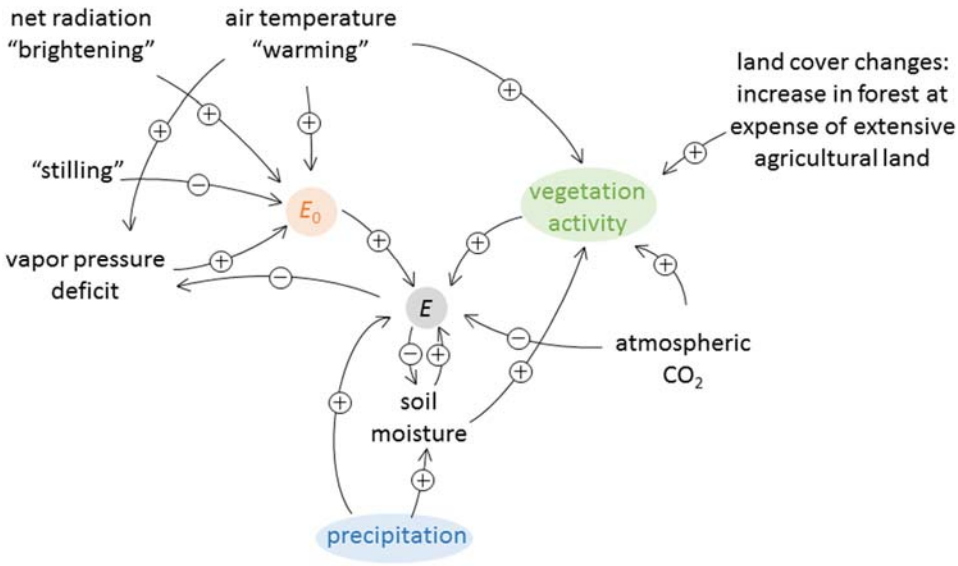

Fig. 2: Drivers of changes in *E* including feedback effects.