**Editor Initial Decision: Reconsider after major revisions** (19 Dec 2014) by Dr. Bart van den Hurk  
Comments to the Author:  
*The paper is improved a bit but does not answer all the questions raised by the reviewers:  
- The title on the revised manuscript does not reflect the title in the reply*

**Response**: According to Reviewer 2, “the title is very promising, but from my point of view slightly overstated”. The title has been improved. It now reads as follows: “Impacts of climate or vegetation changes on evapotranspiration and streamflow trends in a large water-limited basin”.

*- A major comment was the poor justification of the assumed positive relationship between Ze and annual precip. I prefer not to give a long set of equations, but to provide a figure of how Ze varies with P in your model, and comment on the shape of this figure using biophysical arguments such as those proposed by Schenk and Jackson (2002).*

**Response:** Guswa (2008) used the *Ze* model as a function of climate, soil, and vegetation. In this model, *Ze* response to precipitation showed different patterns in the water-limited ecosystem and wet environment.

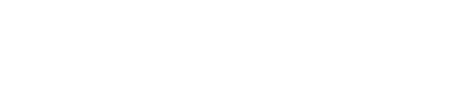
For water-limited ecosystems, Schenk and Jackson (2002) examined data from 1300 root depth records. They reported an increase in root depth with annual precipitation and deeper root systems in climates for which evapotranpiration demand and precipitation are out of phase.

According to Schenk and Jackson (2002), a simple conceptual model should be based on the assumption that roots grow only as deep as is necessary to fulfill plant resource requirements. The basis of this assumption is that shallow root systems are generally favored over deep root systems because (a) energy costs of construction, maintenance, and resource uptake are lower for shallow root systems; (b) shallow soil layers are usually less likely to be oxygen-deficient; and (c) nutrient concentrations are often greater in the upper soil layer. The conceptual model links rooting depths largely to water availability and predicts that rooting depth will increase if water is available at deeper depths and if there exists transpiration demand for it.



Figure 1 Conceptual model of the hypothesized relationship between climate and absolute maximum rooting depths.

In this context, Guswa (2008) deduced an analytical expression for a water-optimal root depth by equating the marginal carbon cost and benefit of deeper root systems. According to the model of effective rooting depth, Guswa (2008) deduced the equation as follow:



In its dimensionless form, the water-optimal root depth is a function of two variables: the wetness of climate, W, and a variable, (*β*) that incorporates climate, soil, and vegetation characteristics. The equation provides a compact means of relating rooting depth to characteristics of climate, vegetation, and soil.



Figure 3 (cited from Guswa (2008)) shows the water-optimal root depth as a function of mean rainfall, quantified as a change in the wetness index. In this figure, the solid line shows the effect of changing the average depth of an event (and holding the frequency constant at 0.2 events/day). For the solid line, the peak is shifted to a slightly larger value of *W*. For wet environments (W>1), root depth decreases with increasing wetness and shows a greater sensitivity to precipitation frequency than depth. For dry environments (W<1), root depth increases with increasing wetness and is more sensitive to depth than frequency.

Guswa, A.J., 2008. The influence of climate on root depth: A carbon cost-benefit analysis. *Water Resources Research* 44, W02427, doi: 10.1029/2007WR006384.

Schenk, H.J., Jackson, R., 2002. Rooting depths, lateral root spreads and below-ground/ above-ground allometries of plants in water-limited ecosystems. *Journal of Ecology* 90, 480-494.

*- In section 4 you discuss the relative influence of P, Ze, alpha and Ep on the actual evaporation. However, Ze is not an independent quantity as it depends on P. So the relative influence of these factors is not clear. Also it is not obvious how I can deduce the order of importance (P > Ze > alpha > Ep) from the figures you show. This needs more clarification*

**Response:** In this section, the relative contribution of different variables was calculated by different methods. I agree that *Ze* is not independent to *P*, which is true for *Ep* as well, while it is also influenced by biological factors of vegetation. In order to obtain the contribution of different variables on E or Q, we believe that: “Using the differential of *E* or *Q* to variables (e.g., *∂E/∂P*) multiplied by changes in variables (e.g., *dP*), contributions of different variables can be obtained (*∂E/∂P \* dP*)”. Results that show this are provided in Table 1, which has been incorporated into the new version of the manuscript.

*- The caption of Figure 2 misses a description of the period over which the trend is shown*

**Response**: The caption of Figure 2 has been improved as follows: “Fig. 2, Temporal trends in *P* (a) and *Ep* (b) (mm a-2) for the Yellow River basin throughout 1961–2010”.

*- The chosen color scale in figure 4 does not print very well*

**Response**: Thank you for bringing this issue to our attention. This color scale for this figure has been improved.

*- Figure 5 misses a significance indication, such as provided in Fig 6*

**Response**: Figure 5 previously showed modeled percentage differences in mean annual total *E* (a) and *Q* (b**)** between static *Ze* (*Ze* determined for 1961 was fixed throughout the 1961–2010 simulation period) and dynamic *Ze* (*Ze* was influenced by specific water and energy conditions for each grid cell in accordance to specific climate change conditions). Given that significant levels were not tested in this manner, significance levels were not provided for Figure 5.

*- I suggest to combine the upper and lower panels in Figure 6 by showing the significant grid points by a small dot or shading on top of the value. And a plot of the difference between the scenarios would be interesting as well*

**Response**: Figure 6 has been improved, and regions shaded by gray + symbols denote significant *E* slopes (*p* < 0.05) for both static *Ze* and dynamic *Ze* scenarios as determined by the Mann–Kendall method on top of the value.

*- Fig 7a and 7b seem to be exactly complementary (and adding up to 1). You can consider to use only one figure*

**Response**: Fig. 7a and Fig. 7b showed relative contributions of climate (a) and vegetation (b) to changes in E for the Yellow River Basin. It is agreed that the two figures are complementary in certain ways. According to your comments, Figure 7 has been improved and differences between relative contributions of climate and vegetation to changes in *E* for the Yellow River Basin (areas void of significant trends are showed in white) are provided in Figure 7.

*- The english still needs improvement*

**Response:** The English has been reviewed as requested. Note that if further English editing is required, our scientific editor has requested that the journal highlight particular points that it feels should be addressed and he will be happy to comply with their demands.