Hydrol. Earth Syst. Sci. Discuss., 11, C523–C527, 2014
www.hydrol-earth-syst-sci-discuss.net/11/C523/2014/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Quantitative contribution of climate change and human activities to runoff changes in the Wei River basin, China" *by* C. S. Zhan et al.

C. S. Zhan et al.

jiangshanshan@mail.bnu.edu.cn

Received and published: 20 March 2014

The authors thank the referee for the comments.After further consideration we have a more detailed reply.

In fact the two assumptions are fundamental assumptions and commonly used in Budyko-type elasticity studies for long term average (For example P.2 in Gentine et al. 2012 GRL), while not perfect we agree. We would not think there is any approach that can estimate the mean annual evaporation "precisely" but if any, the Budyko curve would be comparable at least for long term mean.

Reference: Gentine, P., P. D'Odorico, B. R. Lintner, G. Sivandran, and G. Salvucci (2012), Interdependence of climate, soil, and vegetation as constrained by the Budyko curve, Geophys. Res. Lett., 39, L19404, doi:10.1029/2012GL053492.

We agree there is potentially an influence from rainfall distribution. So we test the hypothesis by the Referee here. We estimated the maximum daily precipitation (purple) and also averaged the top five maximum daily precipitation (blue) for each year (Fig.1). The results are interesting. There is no steady decreasing trend in these two measures of extreme rainfall and distribution while the steady decrease in runoff investigated in this study would require a steady decrease in rainfall intensity if the change in distribution is the cause as referee suggested. Those results are consistent with our experience about this catchment. We propose to add the figure in the main text in our revision.

Here RH refers to mainly water consumption or water intake by human activities which mainly include measures of water and soil conservation, river dam construction, water intake from rivers, water transfer and so on. Evapotranspiration from crops and reservoirs was not considered here.

We consider this because the water intake directly from rivers is significant amount in almost all rivers in China. However in the original Budyko-type elasticity from this part was not considered (fig.2). We extended that framework by including the direct influence from water intake to adapt to catchments with intense water consumption and intake(fig.3). We believe this is a new contribution over the climate elasticity method reported in literatures.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 2149, 2014.

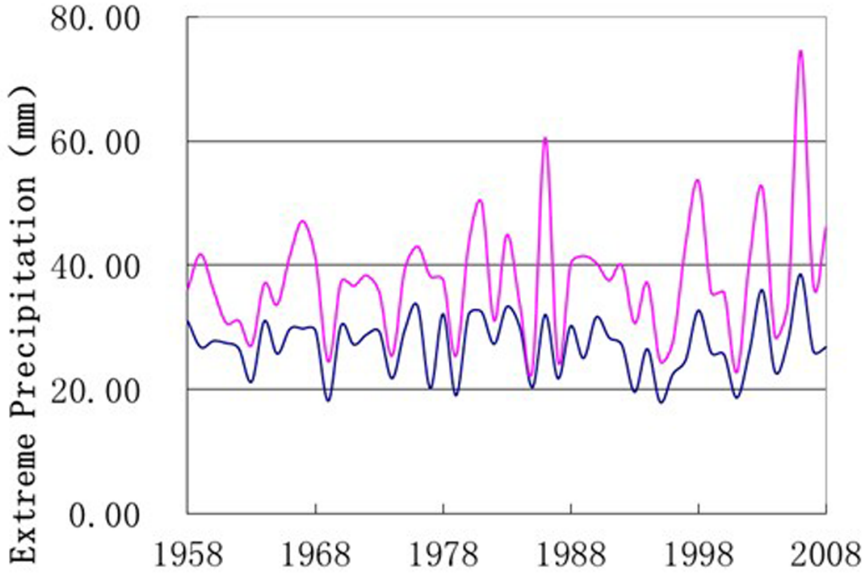

Fig. 1.

$$\Delta Q_C = \varepsilon_P \frac{d_P}{P} + \varepsilon_{E_0} \frac{d_{E_0}}{E_0}, \Delta Q = \Delta Q_C + \Delta Q_H$$

Fig. 2.

$$\Delta Q = \varepsilon_P \frac{\mathrm{d}_p}{P} + \varepsilon_{E_0} \frac{\mathrm{d}_{E_0}}{E_0} + \varepsilon_H \frac{\mathrm{d}_{R_H}}{R_H}$$

Fig. 3.