Hydrol. Earth Syst. Sci. Discuss., 12, C4012–C4017, 2015
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Hydrology and Earth System Sciences
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Discussions

Interactive comment on "Impacts of land use change and climate variations on annual inflow into Miyun Reservoir, Beijing, China" *by* J. K. Zheng et al.

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Received and published: 3 October 2015

Dear referee #2, Thanks a lot for your comments and proposals. According to the Comments, the replies were as followed.

General comment: Indeed, CEM and empirical Rainfall-runoff models are statistical models. Both models lacks physical basis. However, statistical model is often applied to evaluate the impact of climate change on annual streamflow in a long period of time. In the section of introduction, some past works in different parts of the globe were cited and discussed. Certainly, it is important to quantitatively evaluate the uncertainty

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analysis. But it is hard to carry out the uncertainty analysis in a few days. Furthermore, 3 models were employed in the form of effect range to increase the degree of belief. The quality of data set is vital for statistical test. Therefore, the quality of the hydro-meteorological data has been presented clearly in section 2.2.

Specific comment:

Abstract: On line 20, “forestlands” has been replaced by "forestland". “rates” has been deleted. Although uncertainty analysis has not been evaluated quantitatively, qualitative aspect also supported the result to some extent. Introduction: In page 7787, 3 literatures have been enriched to state hydrological impact of land use and climate change in different parts of the world. In the end of the paragraph on page 7788, line 15, the unique part of our study has been inserted. On page 7789, line 5, “Our objectives are to” was replaced by "This study attempts to".

Material and Methods On page 7790 under 2.2, about the hydro-meteorological data, some statements have been added to clarify the data quality in the end of line 13. For page 7791, in this study, the sequential version of Mann-Kendall test (Sneyers, 1975), not Mann-Kendall trend test (Mann, 1945), was applied to detect the break points. The sequential version of Mann-Kendall test is used to test assumptions about the start of a trend within the sample X1, . . . ,Xn from set of random variable X based on rank series of progressive and retrograde rows of the sample (Yang and Tian, 2009). It is also a non-parametric assessment which is not disturbed by few outliers and not complied with distribution test (Zhang and Wang, 2007). Moreover, the Double Mass Curve, combined with the historical record of water abstraction (Ma et al., 2010), were also employed to detect the break points of streamflow.

Results According to the opinion, section 3.1 have been removed and the information have been described in the discussion section. Consequently, Figure numbers from Figure 4 to Figure 9 have been modified. Page 7796, line 1-10, the sentence have been simplified and modified. Page 7797, line 8-9, the sentence have been paraphrased.

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Technical correction: Page 7793, line 7, " , K is the correction factor. " has been replaced by ". K is the calibration coefficient, which is set as 1.2 (Lu et al., 2005). " Line 8, " ◦ " has been replaced by "âĎČ". Equation 13 is correct. Page 7794, "hydrometeological" has been replaced by "hydrometeorological". Page 7796, line 15, 17, 18, "watersheds" changed to "catchments", and "watershed" changed to "catchment". Page 7797, line 19 and line 21, Eq. (14) and Eq. (15) were replaced by Eq. (16) and Eq. (17), respectively. Page 7799, line 27, “phases” has been replaced by “periods”. Page 7811, On page 7789 Line 15, drainage area is about 15380km2, including Zhangjiafen catchment (8762 km2) , Xiahui catchment (5891 km2) and surrounding area of Miyun reservoir. Page 7816, According to the comment. Dashed lines have been replaced as followed.

References Yang, Y. and Tian, F. Abrupt change of runo ïňĂ and its major driving factors in Haihe River Catchment, China, J. Hydrol., 374, 373–383, doi:10.1016/j.jhydrol.2009.06.040, 2009. Zhang, J. and Wang, G.: Impacts of Climate Changes on Hydrology and Water Resources, Science Press, Beijing, 18-19, 2007. Ma, H., Yang, D., Tan, S. K., Gao, B., and Hu, Q.: Impact of climate variability and human activity on streamïňĆow decrease in the Miyun Reservoir catchment, J. Hydrol., 389, 317–324, doi:10.1016/j.jhydrol.2010.06.010, 2010.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/12/C4012/2015/hessd-12-C4012-2015-supplement.pdf

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 7785, 2015.

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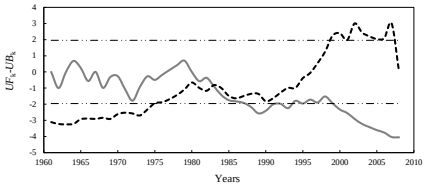

Figure 5. The Sequential Mann-Kendall test for annual streamflow in Miyun reservoir catchment with forward-trend UK_k (solid line), and backward-trend UB_k (dotted line). Dashed bold horizontal lines represent critical values at the 95% confidence.

Fig. 1. Figure 5.

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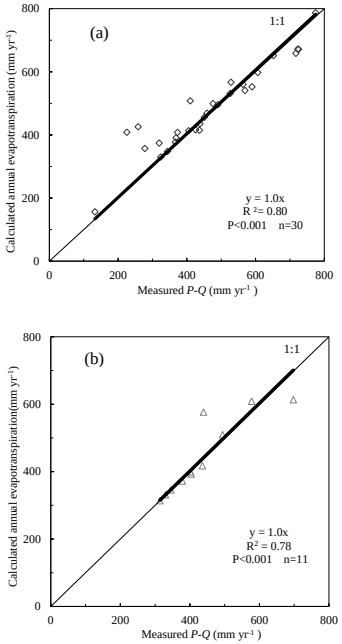

Figure 8. Scatter plots of calculated evapotranspiration using equation (7 & 8) against $E_a = P\text{-}Q$ during calibration phase (a) and validation period (b). The thin line is the 1:1 line and the bold line is the line of best-fit provided by the equation.

Fig. 2. Figure 8.

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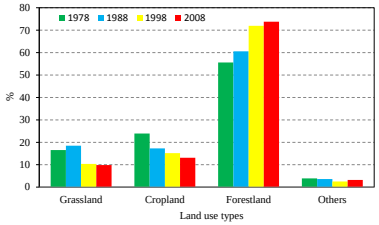

Land use types	1978	1988	1998	2008
grassland	16.54096	18.48505	10.37711	9.830949
cropland	23.94668	17.28869	15.16255	13.13394
forestland	55.61118	60.59168	71.93108	73.79064
others	3.90117	3.63459	2.529259	3.244473

Figure 9. Land use composition of Miyun reservoir catchment (14653 km^2) in 1978, 1988, 1998, and 2008.

Fig. 3. Figure 9.

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