Dear Anonymous Referee #1,

We would like to thank you for your constructive and useful comments on how to improve our manuscript. We have already revised our paper according to your comments. The details are as follows.

Comment 1: Figure 11 compares simulated and observed annual runoff. My suggestion is to break the time period with observation (1960-2012) into calibration and validation periods (e.g., 1960-1989 for calibration and 1990-2012 for validation). The calibration period is used for parameter estimation for the EEMD, BPANN and nonlinear regression equation.

Response of authors: Yes, we revised that according to your suggestion. For calibration and validation purposes, we divided the whole data series into two periods, the calibration period, i.e. 1960-1989, and the validation period, i.e. 1990-2012. The calibration period is used for parameter estimation for the EEMD, BPANN and nonlinear regression equation. The validation period is used for validating the effectiveness of the hybrid model. The simulation results show the excellent performances of the model for both the calibration (1960-1989) and validation (1990-2012) periods with R2 and AIC value (Table 3), which is highly acceptable. Fig. 12 shows the observed data of AR and its simulated values by the hybrid model.

It should be noted that we inserted a new figure in our revised paper (i.e. Fig. 9), and the original figure 11 in the primary manuscript was change to figure 12.

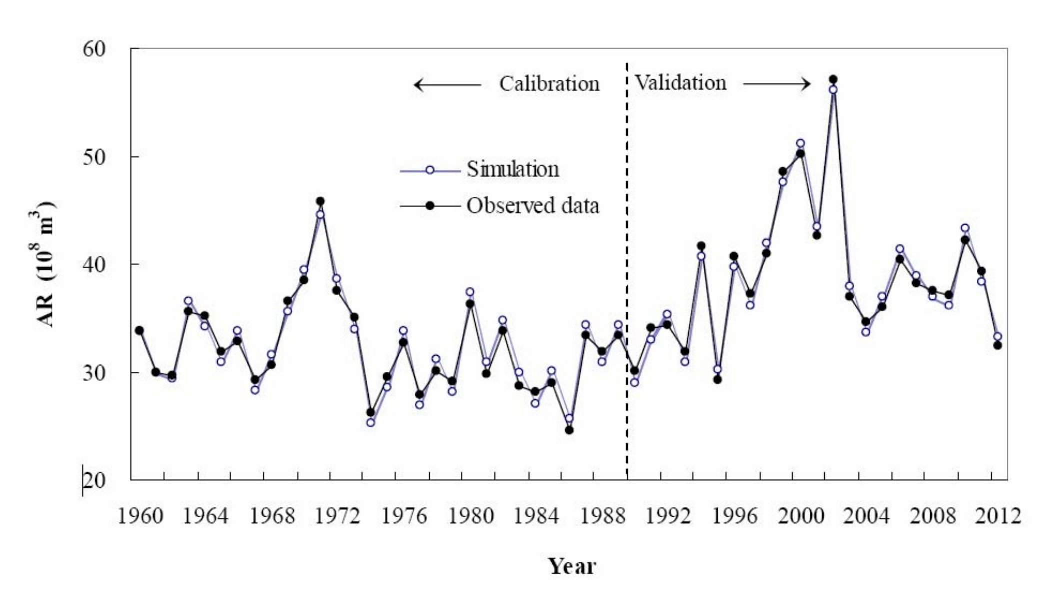

Figure 12 Comparisons between the observed data of AR and its simulated values for calibration period (1960–1989) and validation period (1990–2012)

Comment 2: Figure 7: the physical meanings for MF1, MF2, MF3, MF4 and Trend components need to be explained. MF1~ MF4 are corresponding to different frequencies. Which kinds of climatic phenomena are corresponding to each of the components (e.g., El Niño and La Niña)? What's the meaning of the trend and its contributing factors (e.g., land use change etc)?

Response of authors: Yes, each IMF component in Fig. 7 has its own physical meaning, which reflects the inherent oscillation at a characteristic scale. The four IMF components (IMF1-4) reflect the fluctuation characteristics from high frequency to low frequency. IMF1 presents the most high frequency fluctuation, IMF4 with lowest frequency fluctuation. Whereas the fluctuation frequency of IMF2 is higher than that of IMF3 but lower than that of IMF1, and the fluctuation frequency of IMF3 is higher than that of IMF4 but lower than that of IMF2. The residue (RES) of EEMD is a monotonic function that presents the overall trend of the AR time series.

The multi-scale oscillations of runoff in the Kaidu River reflect not only the periodic changes of the climatic system under external forcing but also the non-linear feedback of the climatic system. To compare the hydrological cycle of Kaidu River and the El Niño meteorological phenomena, we also decomposed the NINO3.4 index data series in the same period by using the EEMD method. The result is that the four IMF components (IMF1-4) of the NINO3.4 index data series respectively display quasi-3-year, quasi-6-year, quasi-11-year and quasi-28-year periodic fluctuation (Fig. 9), whereas the four IMF components (IMF1-4) of the AR series in the Kaidu River respectively show quasi-3-year, quasi-6-year, quasi-11-year and quasi-27-year cyclic variation (Fig. 7). The two cycles although are not complete same, but they show some comparability. A study showed that there is a possible variability in droughts and wet spells over China on the multi-year or decadal scale when one strong El Niño event happens, but it does not mean that each El Niño event must cause a wet-dry change (Su and Wang, 2006). Similarly, the larger fluctuations of runoff in the Kaidu River on the multi-year or decadal scale possibly relate to strong El Niño events, but it does not mean that a big change of runoff certainly corresponds to a strong El Niño event. The possible reason is that the influencing factors include not only El Niño event but also other factors.

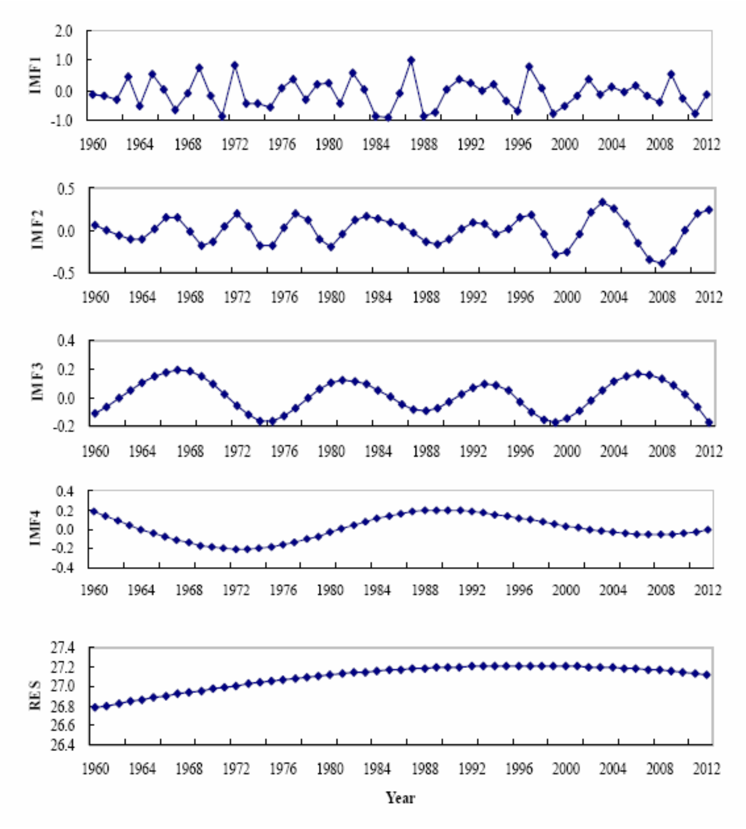

Figure 9 The EEMD results for the NINO3.4 index data series during 1960 – 2012
(a new inserted figure in our revised paper)

In fact, there are many other factors affecting the runoff, such as the varied topography, vegetation cover and construction of water conservancy project (Chen et al., 2013). Our previous study showed that the runoff process of the Kaidu River is closely related to the regional climate change

(Xu, et al., 2014; Bai, et al., 2015). To compare the cycles between the runoff in Kaidu River and the regional climatic factors in the study period, we used the EEMD method to decompose the data series of annual precipitation (AP) and annual average temperature (AAT) to four IMF components (IMF1-4) and a trend. The results are similar to that of the AR: the AP and AAT on the whole show an upward trend, meanwhile, a) the AP presents quasi-3-year, quasi-6-year, quasi-11-year and quasi-27-year cycles, and b) the AAT displays quasi-3-year, quasi-6-year, quasi-13-year and quasi-27-year cycles. To further analyze the correlation between runoff and precipitation and temperature, we reconstructed inter-annual and inter-decadal precipitation and temperature variations, in which the inter-annual precipitation/temperature is obtained by IMF1 and IMF2, while the inter-decadal precipitation/temperature is obtained by IMF3 and IMF4. The results of multi-scale correlation analysis among annual runoff, annual precipitation and annual average temperature are shown in Table 1 (a new inserted figure in our revised paper). Evidently, although there are differences in the length and strength of the periods among the precipitation, temperature and runoff changes, the positive correlation between runoff and precipitation, temperature are still significant except for inter-annual precipitation v.s. inter-decadal runoff, suggesting that the precipitation and temperature are both the main causes of runoff variation. Furthermore, the higher correlation between runoff and climate factors is precipitation, followed by temperature at both the inter-annual and inter-decadal scales.

Table 1 Correlations between runoff and climate factors
(A new inserted figure in our revised paper)

Time scale	Precipitation vs. runoff	Temperature vs. runoff
Inter-annual scale	0.666**	0.416**
Inter-annual v.s. inter-decadal scale	0.205	0.441**
Inter-decadal v.s. inter-annual scale	0.279*	0.438**
Inter-decadal scale	0.822**	0.617**

Note: **correlation is significant at the 0.01 level (2-tailed); *correlation is significant at the 0.05 level (2-tailed).

Comment 3: For the BPANN, what are the inputs each of the components (MF1~MF4)? Does these inputs vary from MF1 to MF4?

Response of authors: The four-tier structure of the BPANN for each IMF is as follows (Fig. 4): an input layer with three variables, i.e. (*t*-1)-th, (*t*-2)-th and (*t*-3)-th value of the IMF; two hidden layers, in which the first layer contains three neurons and the second layer contains four neurons; an output layer with a variable, i.e. *t*th value of the IMF.

Comment 4: Line 15 on page 2: ": : :contain three types, i.e. stochastic models, dynamics models and distributed models." Please revise this since stochastic VS deterministic, lumped vs distributed, conceptual VS physically-based. Correspondingly, the first paragraph on page 3 may need to be revised. Lines 20-21 on page 2: "Therefore, stochastic models and dynamics models all focus on climatic- hydrological process." The logic is unclear. Please revise this paragraph.

Response of authors: Yes, we revised these according to your suggestion. Please see page 2~3. The descriptions in the revised paper are as following: the description of hydrological processes is the basis of hydrological modelling and simulation. Many different types of models have been developed for describing hydrological processes during the past decades. These hydrologic models can be classified as stochastic and deterministic models according to their mathematical property, or classified as conceptual and physically based models according to the physical processes involved in modelling, or classified as lump and distributed models according to the spatial description of the watershed process (Refsgaard, 1996; Moglen and Beighley, 2002).

Comment 5: I think the manuscript needs some general revision of the English language.
Response of authors: Yes, According to the comments and suggestions, some grammars and spelling errors have been corrected, and the English has also been polished by one of my colleagues from America.

Again, we would like to thank you for your generous comments given to the improvement of our manuscript.

Best wishes,

Yours sincerely,

Authors,
Jianhua Xu, Yaning Chen, Ling Bai, Yiwen Xu

2016-02-06