Dear reviewer,

Thank you very much for your comments and recommendations. Our responses to the two important comments are as follows. If you feel more explanation is needed. Please do not hesitate to contact with us.

From the authors

The paper shows interesting results on distributed hydrological model calibration, in which the authors demonstrate that the SWAT model can be satisfactorily calibrated using 1-6 month daily discharge observation, that is much shorter than normally used for calibration. It can be a large contribution to hydrological modeling for ungauged or poorly gauged basins where long term observation is not available.

There are two comments and recommendations:

1. The major point of this paper is that a hydrological model can be successfully calibrated even based on a short term observation and wet conditions for both period and basin are preferable for effective calibration. It may be true but I wonder if it happens by chance. The authors discuss meteorological conditions of calibration years (2005-2007 for Jinjiang basin and 2003-2005 for Heihe basin) but do not discuss the conditions of validation years. If the study basins were wet in validation years, it is quite reasonable that short observation for wet period can provide successful calibration, while it is truly surprising if it can provide a good result even for the case that validation years are dry. I would like to recommend the authors to add plots for validation years to cumulative distribution shown in Figs 5 and 6 and discuss more about the conditions of validation years in relation to the conditions of calibration periods.

Response:

The validation years are also added to the cumulative distribution as shown in Figure R1 and R2. For the Heihe Basin (Figure R1), the validation years (2006, 2007 and 2008) are all wet years. Generally, as shown in many studies, model performance in the validation period will decrease, compared with calibration period. However, for the benchmark calibration of the Heihe basin, the performance between validation and calibration period does not show much difference, as shown in Table 3 of the manuscript. This phenomenon may come from the fact revealed by Figure R1 that, the three validation years (2006, 2007, and 2008) are all wet years. And two of the three calibration years (2003, 2005) are also wet years. Calibration data may contains sufficient information for parameters identification in wet years.

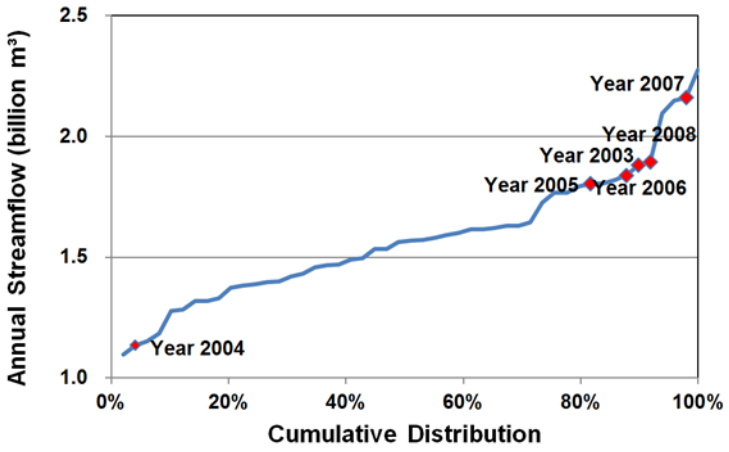

Figure R1 Cumulative distribution of annual streamflow at Yingluoxia station for the period of 1960 to 2008

For the benchmark calibration in the Jinjiang Basin, compared with calibration period, model performance in the validation period decreases. Figure R2 revealed that the two validation years (2008, 2009) are dry years. The three calibrations years are average (2005) and wet year (2006, 2007). The decrease in model performance is consistent with other studies (e.g. Todorovic and Plavsic 2016), in which model efficiency also decrease when calibration period is wetter than validation period.

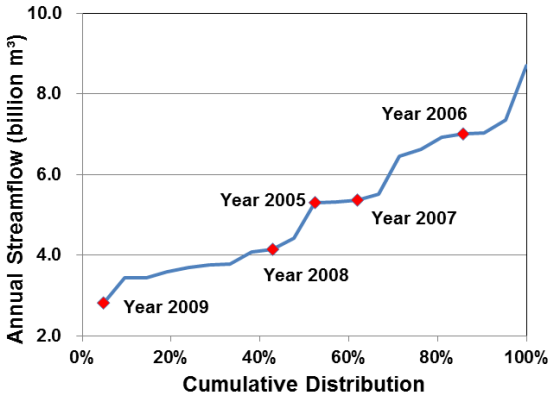

Figure R2 Cumulative distribution of available annual streamflow at Shilong station for the period of 1958 to 2009

2. I assume that the wet period of the Heihe basin is from April till September and expected that the calibration based on the six months from Apr. 2004 till Sep. 2004 was capable of giving a good result, but Table 5 shows that no behavioral parameter sets were obtained in this period although many behavioral sets were obtained for the two dry periods from 2003 to 2004 and from 2004 to 2005. This is different from the tendency that is found from other calibrations. It would lead to deeper understanding if the authors could give clear explanations for this exceptional case.

Response:

The Heihe basin is an inland basin in the arid northwest China. Most rainfall occurs in the summer season. About 75% of total annual streamflow come from the wet period from April to

September. As shown in Figure R1, 2004 is an extremely dry year. Compared with normal year, either in wet season or in dry season of 2004, the average streamflow decreased. Considering the big contribution to total annual streamflow, the degree of decreases of streamflow in the wet period has high possibility to be bigger than dry season. The runoff generation mechanism in this wet season with extremely low streamflow is very different from normal seasons, which made the model cannot capture the essence of variation in streamflow, therefore none of the randomly generated 10,000 parameter sets can reproduce the hydrograph of this wet season with acceptable accuracy. This is our explanation about why no parameter set was identified as behavioral ones using data of wet season in 2004.

References:

Todorovic, A. and Plavsic, J.: The role of conceptual hydrologic model calibration in climate change impact on water resources assessment, J. Water Clim. Change, 7 (1), 16-28, 2016