Supplementary Materials

Runoff Components and the Contributions of Precipitation and Temperature in a Highly Glacierized River Basin in Central Asia

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This supplementary material contains additional two figures.

Figure S1 shows the performances of HBV-Light model on the monthly scale during the calibration (1964-1975) and validation (1976-1987) periods for each hydrological station. The Nash-Sutcliffe efficiency (NSE) of Xiehela in the calibration period was 0.85, and the Kling-Gupta efficiency (KGE) was 0.87, and the root mean squared error standard deviation ratio (RSR) was 0.38, while the NSE, KGE, and RSR during the validation was 0.91, 0.91, and 0.30, respectivley. The NSE, KGE, and RSR of the Shaliguilanke in the calibration period was 0.88, 0.88 and 0.34, respectivley, and was 0.82, 0.86, 0.42 in the validation periods (**Figure S1 a and b**).

For the Kaqun and Yuzimenleke hydrological stations, the NSE was 0.89 and 0.84 in the calibration, and was 0.95 and 0.90 in the validation peridods. The KGE was 0.90 and 0.88 in the calibration and was 0.89 and 0.86 in the validaration, respectivley. And the RSR was 0.33 and 0.39 in the calibration and was 0.22 and 0.31 in the validaration, respectivley (**Figure S1 c and d**).

The NSE of Tongguziluoke in the calibration period was 0.82, and KGE was 0.88, and RSR was 0.43, while the NSE, KGE, and RSR during the validation was 0.92, 0.92, and 0.28, respectivley. The NSE, KGE, and RSR of the Wuluwati in the calibration period was 0.84, 0.88 and 0.40, respectivley, and was 0.92, 0.906, 0.28 in the validation periods (**Figure S1 e and f**).

For the Dashankou hydrological stations, the NSE in the calibration was 0.84 and was 0.83 in the validataion period. The KGE in the calibration and validation periods was 0.82 and 0.81, respectivley. While, the RSR was 0.40 in the calbration and was 0.42 in the validation periods (**Figure S1 g**).

At the monthly scale, the NSE and KGE were higher than 0.8 at all hydrological stations and even above 0.9 at some stations. The RSR was approximately 0.3, which was lower than the daily value. The monthly PBIAS was the same as that for the daily scale.

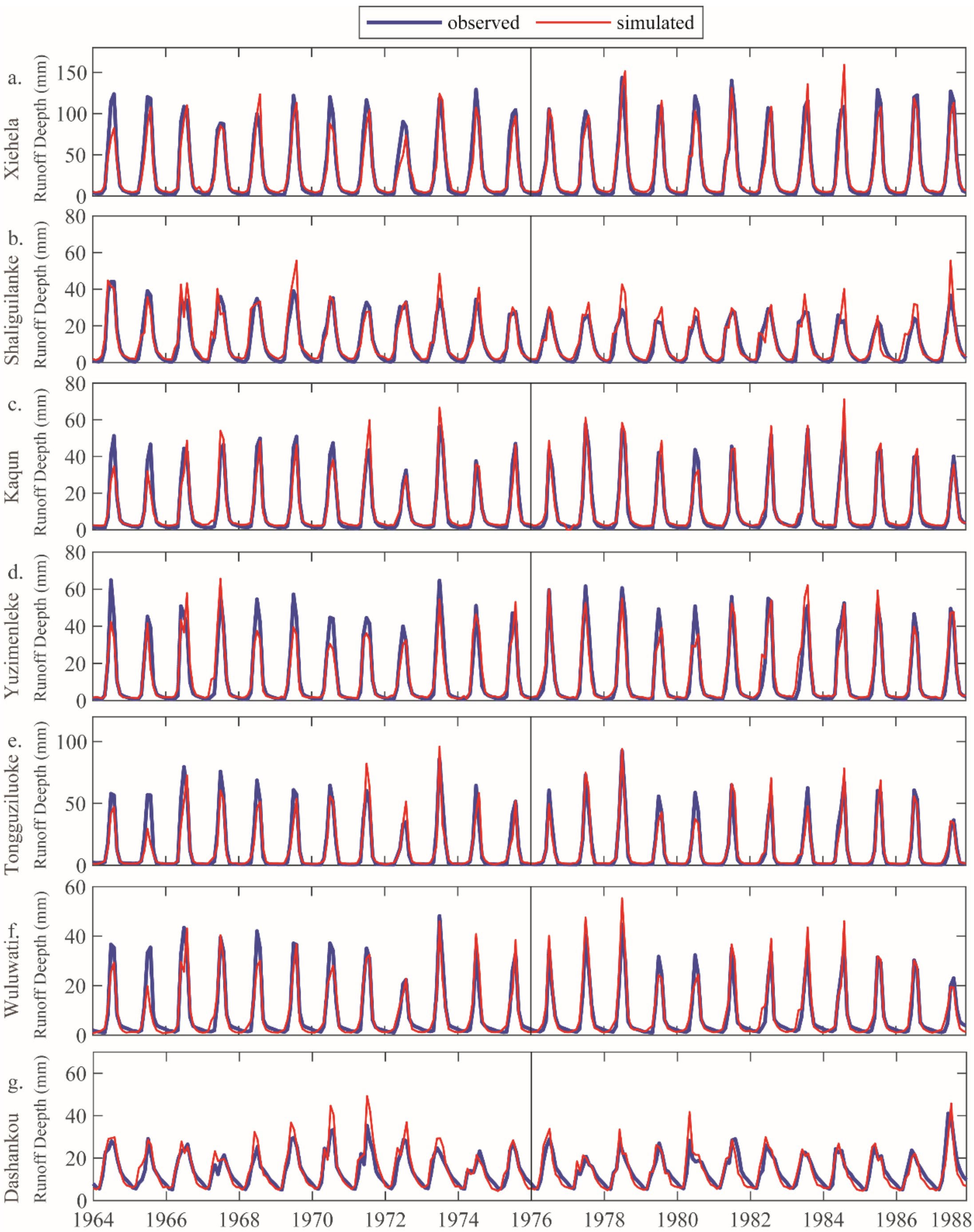

Figure S1 Observed and simulated monthly runoff by the HBV-light model for 1964-1987 at each hydrological station (calibration period: 1964-1975; validation period: 1976-1987)

To further describe the simulation ability of the hydrological model for annual discharge, we compared the annual river runoff depth between the observations and simulations by the HBV model in the calibration and validation periods (**Figure S2**). For the Xiehela hydrological station, the runoff depth difference between observed and simulated in the calibration was -30.14mm, and the percent bias

(PBIAS) was 8.81%, and the difference in the validation was 0.34mm, with the PBIAS was -0.09%. The PBIAS in the calibration and validation periods in the Shaliguilanke was -7.84% and -10.32%, respectively. For the two hydrological station in the Yarkand River subbasin, the PBIAS in the calibration of Kaqun and Yuzimenleke were -1.19% and 6.92%, while in the validation were -8.18% and -5.34%, respectively. PBIAS in the calibration period of Tongguziluoke and Wuluwati was 8.96% and 9.57%, respectively, while was -2.70% and -8.69%, respectively. For the Dashankou hydrological station, the PBIAS was -7.45% in the calibration, and the PBIAS was 3.76% in the validation.

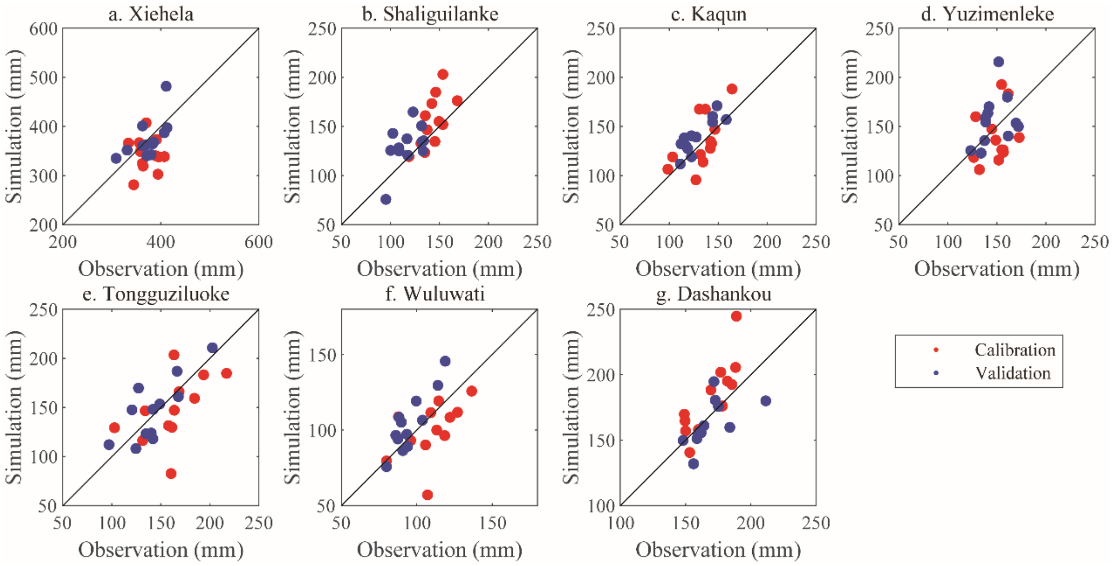

Figure S2 Comparison of annual depth runoff between observed and simulated discharge at each hydrological station in the calibration and validation periods